SECTION 15400

MEDICAL EQUIPMENT PROCESS PIPING SYSTEMS FOR REVERSE OSMOSIS WATER AND CONCENTRATES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes materials, equipment, labor and incidentals required for and to install complete and ready for operation, all reverse osmosis water treatment process piping and SDS Polyethylene Tubing Systems as shown on the contract documents and as specified herein.

B. Owner furnished equipment installed by contractor (O.F.I.C.):
   1. Tech repair R.O. Water and Drain Kit.
   2. Dialysis Valve Box Assembly Kits.
   3. A & B Concentrate tubing.
   4. Heat exchanger.
   5. Solution Delivery System Head Vessel Assembly.
   6. Mixing Valve Unit

C. Related Sections:
   1. Section 15100: “Mechanical Materials and Methods.”
   2. Section 15700: “Covering and Insulation.”
   3. Section 15800: “Testing, Adjusting and Balancing.”
   4. Section 07800: "Roof Penetrations."

1.02 SYSTEM DESCRIPTION

A. Medical equipment process piping system is intended to supply city water to the R.O. water processing system and distributes the R.O. water from the storage tank(s) to the patient dialysis machines tech repair, SDS unit, Granuflo Mixer and return back to the storage tank(s).

1.03 SUBMITTALS

A. Submit shop drawings and product data in accordance with Sections 00700 “General Conditions”, and 00800 “Supplementary Conditions” of this specification and comply with pertinent provisions of Specification Section 01340.

B. Product data: Within 20 calendar days after the Contractor has received the Owner’s Notice of Proceed, submit the following:

   1. Materials list of items proposed to be provided under this Section;
   2. Manufacturer’s specifications and other data needed to prove compliance with the specified requirements;

3. Two foot sample of schedule 80 PVC R.O. water pipe split longitudinally for interior wall smoothness inspection by, Project Manager.

C. Submit certifications to Project Manager that PVC schedule 80 piping to be used for R.O. water has been manufactured from the same extrusion "lot" as the sample above, prior to delivery and installation at the job site.

1.04 WATER TREATMENT AND SDS EQUIPMENT DELIVERY, STORAGE, AND HANDLING

A. Special care shall be taken to protect R.O. water process piping and piping components from dirt and debris entering the pipe and piping system components prior to installation. FMC's water treatment vendor shall be responsible to unpack and set equipment into place.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All PVC pipe, fittings and appurtenances shall be constructed from class 12454-B PVC compound. **All medical equipment process piping connections to fittings shall be socket welded type only.** Threaded connections shall be limited to the true union ball valves unions and the socket by threaded coupling at the owner furnished valve box. Pipe and fittings shall meet the following requirements:

1. The R.O. water pipe shall show no irregular pitting or micro orifices under 10X magnification. Pitting and micro orifices would allow the attachment of cellular masses to the interior wall orifice cavity of the PVC pipe and thus protecting the embedded cells from the microbicidal action of disinfectants, subsequently serving as the reservoir for continuous contamination.

2. Schedule 80 PVC pipe 3/4" & 1" for R.O. water shall be manufactured by (Charlotte Pipe, Foundry Company and Harvel) or approved equal. Pipe shall have a smooth interior wall without imperfections, as noted in paragraph one above. (Apache brand pipe manufactured by Certainteed, Inc. has a history of micro orifices and not to be used).

3. Pipe: 3/4 " - 2" shall be seamless schedule 80 PVC pipe meeting ASTM specification D-1785.

4. Fittings: 3/4 " - 2" shall be socket type fittings meeting ASTM specification D-2467.

5. Couplings: 3/4 " - 2" shall be socket type couplings meeting ASTM specification D-2467.

6. Unions: 3/4 " - 2" shall be socket type unions meeting ASTM specification D-2467.

7. Flanges: 3/4 ” - 2” shall be socket type flanges meeting ASTM specification D-2467.

8. Gaskets: shall be flat ring, 1/8” thick viton.

2.02 COMPONENTS

A. Backflow preventers shall be reduced-pressure type, sized as scheduled or noted as manufactured by Watts Regulator Co., series 909 with WYE Strainer and blow off valve with 5/8” hose bibb.

B. Pressure Gauges shall be 3 ½ inch, stainless steel case, white dial with black figures and graduations, acrylic window, black stainless steel pointer, phosphor bronze bourdon tube, 1/4 inch NPT brass socket, bottom outlet. Pressure gauges shall meet ANSI B40.1, grade A 1% accuracy standard. Pressure gauges shall be equal to #690 as manufactured by H.O. Trerice Co.

C. Ball valves shall be PVC or CPVC double true union ball valves with EPDM o-rings, teflon seats and socket by threaded union connections. Valves shall be full port design and have a fine pitch threaded seal retainer for seat adjustments. Valve seat shall be reversible and self-lubricating. Valves shall be rated to 225 psi at 70°F. Valves shall be equal to Safe-Block true union ball valves as manufactured by Hayward Industrial Products, Inc.

D. Ball check valves shall be PVC or CPVC with socket connections. Seals and seats shall be EPDM. Valves ¼ inch and 3/8 inch shall be of trim-check design. Valves ½ inch to 4 inches shall be of double true union design. Seat and o-ring shall be square-cut for positive sealing with minimal backpressure. Valves shall be equal to ball check valves as manufactured by Hayward Industrial Products, Inc.

E. Process Water Heaters:

Gas Fired: shall be capable of providing water a scheduled on the drawings. Units shall be ASME approved over 199,900 BTUH for 150 psi working pressure and equipped as follows:

a. Burners – steel alloy with burner tray easily removable for inspection
b. Refractory Panels – interlocking construction
c. Headers – shall be bronze and designed to prevent damage due to thermal shock.
d. Tank exterior - galvanized or corrosion resistant steel with baked enamel finish.
e. Heat shields - galvanized or stainless steel.
f. Fittings - corrosion resistant steel.
g. Tank exterior lining - suitable for potable water service.
h. Controls – factory wired for single connection to electrical service and rated for 14 inches wc.

i. Automatic flue damper
ii. Pressure relief valve

iii. Electronic ignition, thermostatically controlled
iv. Low water shut –off
v. High temperature shut-off
vi. Adjustable thermostat
vii. Automatic gas valve with safety shut-off on flame failure
viii. Combustion chamber pre-purge
ix. Gas pressure regulator
x. Manual gas shut-off

2. Electric: shall be capable of providing water as scheduled on the drawings and shall be equipped as follows:
    a. Elements – high efficiency, low watt density elements thermally fused to protect the tank as highest dry-firing
    b. Factory prewired and tested and U.L listed.
    c. Tank – designed for 150 psi working pressure and tested to withstand 300 psi hydrostatic test pressure and insulated with foam designed to meet efficiency requirements of ASHRAE std. 90 lb. Tank shall be also be furnished with an anode rod rigidly supported.

F. Water heater flue system shall be factory prefabricated and laboratory tested, proven and certified for use with gas-fired boilers. The system shall be suitable for exhaust gases up to 600°F under continuous operating conditions. Stack shall be double-wall with galvanized steel, 0.025 inch thick outer jacket. The inner pipe shall be type 304 stainless steel 0.035 inch thick minimum. A 1 inch minimum air space shall be between the insulation and the outer jacket. The flue system shall include all flue piping, cleanout "Tees", ventilated roof thimble, stack cap and supports as recommended by the manufacturer. Flue system shall incorporate one expansion devices for every 30 feet of flue pipe. Flue system shall be equal to "Metalbestos" model PS as manufactured by Selkirk Metalbestos, Co.

G. Booster pump shall be sized as scheduled on the drawings. Pump shall be two-piece design coupled to double ball bearing motor. Normally serviceable parts shall be easily removable for replacement. Pump shall have 1 ½ inch NPT suction port and 1 ¼ inch discharge port. Pump shall be constructed of heavy-duty cast iron body, brass impellers and seal, and stainless steel, buna N and carbon/ceramic parts. Pump shall be 2PC series as manufactured by Teel for W.W. Grainger, Inc.

H. Expansion tank shall be diaphragm type, shell construction, heavy duty butyl seamless diaphragm, separate non-corrosive water reservoir, mechanical seals, copper lined acceptance fitting, floor stand, polypropylene liner and two-part polyurethane finish. Liner shall be tested and listed by NSF. Tank shall be #WX-302 as manufactured by Amtrol, Inc.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Pipe and pipe fittings:
   1. All pipe and tubing shall be cut accurately to measurements established at the job site. All pipes shall be cut with tubing cutters designed for such purpose. Deburr and ream all sections of pipe prior to installation.

      a. Threaded Connections - threaded connections at R.O. water pipe to dialysis box and true union ball valve shall be made leak tight with Teflon tape. Under no circumstances shall pipe dope, liquid, semi-liquid, paste or solid hardening leak **tight compound be used**. Upon final assembly, not more than three threads on the pipe shall remain exposed.

      b. Socket welded connections - shall be made as recommended by the pipe and pipe fitting manufacturer. Special care shall be taken so that no dirt, debris or excess adhesive shall enter the piping system.

   2. All pipe shall be installed such that any no part of the pipe or pipe system shall contact any surface through its normally installed position.

   3. Install pipe so that no undue strain is imposed on any part of the piping system.

   4. All connections to equipment shall be made with the appropriate reducers, unions, valves, ect. as required to facilitate the removal or servicing of equipment without extensive dismantling of the piping system.

   5. Install valves with stems facing up on horizontal runs and facing opposite support wall on vertical runs.

B. Pipe supports:
   1. Pipe supports and hangers shall be securely fastened to the structure above without overstressing any portion of the supports or the structure itself. No drilling or cutting of building steel shall be permitted. In cases where supplementary steel is required, steel support shall be designed in accordance with AISC specifications. Piping shall not be supported from gratings, fireproofing material, ducts, other pipes, electrical conduit, wires or other non-structural supports.

   2. Secure pipe supports to steel by welded brackets or beam clamps. Secure pipe supports to concrete by means of inserts.

   3. PVC piping supports shall be spaced at a maximum of the lessor of 3 feet 6 inches or the manufacturer's recommendation. Provide hangers at a maximum of 12 inches from each change in pipe direction. Provide additional pipe supports as required.

3.02 FIELD QUALITY CONTROL

A. All R.O. water piping shall be hydrostatically tested to a minimum of 50 psi and hold the test pressure for a minimum of 2 hours. All joints, valves, fittings, ect. shall be inspected for the presence of leaks after 2 hours but before the test pressure is released.

Any leaks, defects or failures found during the inspection shall be repaired in the following manner:

1. Pipe - cut and remove leaking section and replace with new.

2. Threaded joints - tighten or remake joint.

3. Flanged joints - tighten or remake joint.

4. Socket joints - break and remake joint.

B. Subsequent to repairing any leaks, defects or failures, the contractor shall retest the entire piping system in accordance with this specification. The piping system shall not be considered complete or acceptable until the entire piping system passes a complete systems' test with no failures requiring repair.

C. All pipe and pipefittings shall be inspected prior to installation and no piece shall be installed which is determined to be defective. If any defective pipe or fittings are discovered to be defective they shall be replaced with like pipe of fittings determined to be defect-free.

D. Manufacturer's Field Service

3.03 CLEANING

A. All pipe and pipefittings shall be wiped clean prior to installation.

END OF SECTION