SECTION 22 67 13 – REVERSE OSMOSIS WATER SYSTEM

REVERSE OSMOSIS WATER SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and Pipe Fittings.
B. Pumps.
C. RO Unit
D. FilterS
E. Valves
F. Rotameters
G. RO Water Storage Tank
H. Ultraviolet Sterilizer
I. Water Softener
J. Brine Bulk Storage Tank

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 01010 - Summary of Work: Owner furnished purified water polishers.

1.03 RELATED SECTIONS

A. Section 03300 - Cast-in-Place Concrete.
B. Section 23 00 00 - Basic Mechanical Requirements.
C. Section 23 05 29 - Supports and Anchors.
D. Section 23 05 53 - Mechanical Identification: Identification of piping system.
E. Section 23 05 48 - Vibration Isolation.
F. Section 23 13 16 - Plumbing Piping.

1.04 REFERENCES

A. ASME - Boiler and Pressure Vessel Code.
B. ASME B16.3 - Malleable Iron Threaded Fittings.
C. ASME B16.18 - Cast Bronze Solder-Joint Pressure Fittings.
D. ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings.
E. ASME B16.26 - Cast Bronze Fittings for Flared Copper Tubes.
F. ASME B31.9 - Building Services Piping.
G. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
H. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses.

I. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

J. ASTM B32 - Solder Metal.

K. ASTM B88 - Seamless Copper Water Tube.

L. ASTM D2683 - Socket-Type Polyethylene Fillings for Outside Diameter-Controlled Polyethylene Pipe.

M. NFPA 70 - National Electrical Code.

1.05 SUBMITTALS

A. Submit under provisions of Section 23 00 00.

B. Shop Drawings: Indicate piping system schematic with electrical characteristics and connection requirements.

C. Product Data: Provide manufacturers catalog literature with capacity, weight, and electrical characteristics and connection requirements.

D. Test Reports: Submit inspector's certificate for air receiver for inclusion in Operating and Maintenance Manuals.

E. Manufacturer's Installation Instructions: Indicate hoisting and setting requirements, starting procedures.

1.06 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 23 00 00.

B. Record actual locations of equipment and components. Modify shop drawings to indicate final locations.

1.07 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 23 00 00.

B. Operation Data: Submit for RO unit, water softener, ultraviolet light, sterilizer, pumps and filters.

C. Maintenance Data: Submit for RO unit, storage tank, level sensors and pumps.

1.08 REGULATORY REQUIREMENTS

A. Conform with applicable ASME codes for installation of pressure vessels.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for the purpose specified and indicated.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 23 00 00.

B. Accept delivery of packaged RO water equipment, storage vessel, etc. on site in factory fabricated containers with shipping skids and pipe end protectors in place. Inspect for damage.

C. Protect piping and equipment from weather and construction traffic.

1.10 WARRANTY

A. Provide five year warranty under provisions of Section 23 00 00.

B. Warranty: Include coverage for RO water system, storage tank by system equipment installer.

1.11 MAINTENANCE MATERIALS

A. Provide maintenance materials under provisions of 23 00 00.

PART 2 PRODUCTS

2.01 The Reverse Osmosis Unit shall be furnished and installed by Water Resources Co., (210-698-8960) who shall also furnish and install the miscellaneous pipe and electrical work from points shown on the Drawings to complete the installation.

2.02 The Reverse Osmosis water cartridge units shall be furnished and installed by Water Resources Co. who shall also furnish the water quality controller that operates solenoid valves, local alarm for used-up cartridge bank, solenoid valves, miscellaneous piping and electrical work from points on the Drawings to complete the installation.

2.03 The entire Reverse Osmosis water treatment system assembly shall be provided complete with all major equipment, accessories, interconnecting piping and electrical work. It shall be completely pre-plumbed and pre-wired with single points of water supply, purified water, RO reject water and electrical connections, mounted on a single house keeping pad. The entire RO system assembly shall be furnished by Water Resources Co. or equal.

2.04 The Contractor's work shall include furnishing and installing the following items.

Piping Hangers
Piping and Sleeves
House keeping Pad

2.05 SYSTEM CAPACITY:

A. System shall have a capacity of 45,000.00 gallons per day in a 24 hour period and shall be capable of 50 GPM maximum flow rate.

B. Reverse Osmosis Unit shall have a capacity of 33.3 GPM, requires 30 PSI minimum entering pressure, power for 460 volt, 3 phase, 60 Hz, 7.5 HP motor, power from a 15 amp, 115 volt single phase control circuit and provision for 20 GPM to drain when unit is operating.

C. RO cartridge system shall have a capacity of 51 GPM with 1 PSI maximum clean pressure drop with 5 micron filtration capability.

D. The Mechanical Contractor will not be responsible for system capacity or system water quality since he does not furnish the prime equipment. He shall be responsible for the equipment piping, etc., that he furnishes and installs to meet the provision of Drawings and Specifications.

E. System shall produce water quality better than 8 micromhos of conductance

2.06 WATER SOFTENER

A. General: Provide vertical pressure type co-current twin alternating water softeners with single brine tank. Each unit shall have a maximum grain removal capacity of 300,000 grains per generation, with a normal flow of at least 215 gpm at 25 psi drop pressure drop. Each resin tank shall have 40 cubic foot capacity. Unit shall have a minimum backwash rate of 25 gpm.

B. Main control valve: Each tank shall be equipped with a multi-port diaphragm, slow opening and closing type valve. Valve shall be equipped with automatic self-adjusting brine injector to draw brine and rinse at constant rates regardless of water pressure. Valves shall have an internal bypass for untreated water during regeneration. Complete with test cock on each valve.

C. Mineral Tanks: Structural steel with 8-10 mils DFT epoxy lining, primed exterior with 1-2 mils DFT polyurethane coating. Tanks shall include elliptical manway in top head, and 3" circular hand hole in bottom side..

D. Brine Tank: Polyethylene or fiberglass reinforced with a minimum of 2000 pound brine tank capacity.

E. Controls: Factory-wired main operating valve mounted regeneration sequence controller shall provide fixed time intervals for each regeneration step and an indicator to show the cycle in process. Provide electrical lockouts to prevent both units from regenerating at the same time. Adjustable time of regeneration shall be provided.. Arrangements for manual initiation and temporary initiation lockout shall be provided. Regeneration initiation shall be a reset flow meter with a 120 volt, single phase power requirement.

F. Water softener assembly shall be Hydroteck model FAF360 twin as provided by Water Resources Co..

2.07 PIPING, VALVES AND FITTINGS (Polypropylene):

A. Pipe valves and fittings for purified water service shall be Schedule 40, virgin, unpigmented polypropylene.

B. Installation practices, including support spacing and joint fusion, shall be in compliance with manufacturer's printed recommendations.

C. Materials from which pipe, fittings and valves are manufactured shall have been tested and approved for conveying potable water by the National Sanitation Foundation (NSF). All pipe, fittings and valves shall bear the NSF hallmark indicating that the material has been tested and approved for conveying RO water by the national Sanitation Foundation, and shall be as manufactured by Enfield Industrial Corporation, GSR R&G Sloane Manufacturing Company ("PPRO-SEAL") or approved equal.

D. To ensure installation uniformity, all system piping components shall be the products of one manufacturer.

E. All piping shall be thoroughly rinsed and flushed to remove all dirt and debris before installation. After installation the Contractor shall flush the entire piping system with RO water to the satisfaction of the Owner.

F. Valves shall be ball valve type and shall be manufactured of the same virgin, unpigmented molding compound as the fittings to assure compatibility.

G. All ball valves shall have Viton seals, and PTFE seats. Ball valves shall carry a pressure rating of 150 psi at a minimum of 68F, and shall be of True Union design as

manufactured by Enfield Industrial Corporation, GSR R&G Sloane Manufacturing Company ("PPRO-SEAL") or approved equal.

H. The contractor shall supply a fusion welding machine to the owner prior to completion of the project. The contractor shall also furnish training for a minimum of two of the owners personnel on the operation of the fusion machine, installation of the piping and fittings, and the maintenance required for the machine and piping systems. The training shall consist of a minimum of 4 hours at a location convenient to the owner, preferably on the owners premises at the Physical Plant of the institution where this project is constructed. The training

I. The training manual shall consist of actual course material designed for the training of maintenance and installation personnel, where actual hands-on training is involved. <u>This training shall not be a sales session consisting of only sales literature and without hands-on training.</u>

2.08 REPRESSURIZATION WATER PUMPS:

A. Pumps shall be heavy duty 316 stainless steel multi-stage centrifugal type.

B. Pump heads, sleeve and impeller shall be polypropylene. Seal shall be mechanical type.

C. Capacity of each of the pumps shall be 50 GPM at 92 foot head. Pump motor shall be 3 HP, 460 volt, 3 phase, 60 Hz.

D. Each pump shall be provided with a fused safety switch and a magnetic starter providing overload and under voltage protection. A mechanical alternator shall automatically alternate the operation of the pumps.

E. Pumps shall be furnished completed with plastomatic, or approved equal, discharge pressure gauge isolator-activators to separate gauge from RO water.

2.09 FLOW CONTROL VALVES:

A. The Mechanical Contractor shall furnish and install a 3/8" PVC flow control valve in each and every deionized water outlet that limits the flow to 1/2 GPM. The Contractor shall supply and install a 2 GPM a natural, virgin, unpigmented polypropylene flow control valve in each deionized water connection to washers.

B. Flow control valves shall maintain a constant flow regardless of inlet pressure changes between 15 and 100 psig. No metal shall be in contact with the liquid.

C. The flow control valves shall be Series "FC", as manufactured by Plast-o-matic Valves, Inc., or approved equal.

2.10 PRESSURE REGULATING VALVES

A. Contractor shall supply and install, where shown on the drawings, socket fusion natural, virgin, unpigmented polypropylene pressure regulating valves.

B. Valves shall accurately reduce and regulate steady or varying inlet pressures and maintain a constant predetermined outlet pressure.

C. Pressure regulating valves shall be Series "PR", as manufactured by Plastomatic Valves, Inc., or approved equal.

2.11 PRESSURE GAGES

A. Pressure GAGES shall be 2-1/2" diameter, dual calibrated for 0 to 100 psi and SI units, having 316 stainless steel bourdon tube. The gauges supplied and/or installed for the service specified shall be manufactured by Ashcroft, Fig. No. 1079-S or approved equal.

2.12 PURIFIED WATER STORAGE TANK:

A. Tank capacity for vertical closed top atmosphere tank with manway is 65” diameter by 150” high, and 2000 gallons.

B. Manway shall be 16" round and fittings shall be of size and location shown on the Drawings.

C. Tank shall be of high-density polyethylene made with FDA approved resin as manufactured by RAMCO, Beatle Plastics Manufacturing Company, Bailiff or approved equal. Mandrel tanks with oriented fiber construction, as manufactured by Owens-Corning, Justin, or approved equal, will be acceptable.

2.13 CONTROL PANEL :

A. Nema 4x enclosure complete with storage tank low water level audible alarm, pressurization pump low water shutdown, silencer switch, main disconnect switch, step down transformer, flow monitor, conductivity alarm, and pressurization pump controller and necessary motor starters. Unit shall require a single 480 volt, 3 phase, 60 hz power service. Control panel shall contain all necessary step-down transformers for 120 volt single phase powered equipment. Size enclosure for heat dissipation in a non-ventilated space. Provide dry set of contacts for conductivity alarm low suction pressure alarm for RO units.

2.14 LEVEL SENSORS

A. Level sensors shall have only stainless steel and polypropylene,PVDF, and Viton in contact with the fluid. Each shall have a snap action switch rated for 125 volts, with an adjustable deadband initially set by the RO manufacturer. One level sensor, as shown on the drawing, shall be wired with the solenoid valve to automatically maintain the liquid level in the tank. The other is to be connected to the Central data Acquisition System.

B. One level sensor, as shown on the Drawing, shall be wired with the solenoid valve to automatically maintain the liquid level in the tank. The other is to be connected to the Central Data Acquisition System.

2.15 ULTRAVIOLET LIGHT:

A. An ultraviolet sanitizer (UV) shall be installed prior to the final filters. The UV system shall include UV intensity monitor, elapsed time inductor, lamp out alert, and manual wiper. UV shall be rated for 50 gpm at 33,000 mw sec/cm2. UV shall be constructed of electropolished 316 stainless steel and be UL listed.

B. Provide system as manufactured by Atlantic Ultrviolet. Wedeco or approved equal.

2.16 FINAL FILTERS:

A. Provide two final filters after the UV system to filter to 0.2 microns. Filters housings shall be stainless steel and shall be rated for 50 gpm at a maximum pressure of 150 psig. Each filter shall be rated for 100% of flow.

B. Filter catridges shall have an absolute rating of 0.2 microns and be rated for a maximum flow of 3 gpm at a clean pressure drop not to exceed 3 psig.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install equipment on concrete housekeeping pad. Refer to Section 23 00 00.

C. Install line size isolation and check valves on circulation pump discharge.

D. Install valved bypass around purification equipment.

E. Install manual air vent valves at all high points of piping system, including piping direction changes from horizontal to vertical drops (ells only).

F. Install take offs to outlets with shut off valve after take off. Slope take off piping to outlets.

G. Identify piping system and components. Refer to Section 23 05 53.

3.02 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 23 00 00.

B. Repair or replace piping as required to eliminate leaks, and retest to demonstrate compliance.

C. Cap (seal) ends of piping when not connected to mechanical equipment.

END OF SECTION

- o 0 o -