

SPECIAL SPECIFICATION

SECTION 15511S

PROCESS CHILLED WATER SYSTEM

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Process chilled water distribution system for all fab levels.
- B. A complete process chilled water supply system with associated piping located in subfab.

1.2 REFERENCES/PROJECT REQUIREMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Requirements of the following Project Specification Sections apply to this section:**
 - 1. Section 13085-S - Seismic Protection.
 - 2. Section 15050 – **Basic Mechanical Materials and Methods**.
 - 3. Section 15051 - Piping Systems
 - 4. Section 15090-S - Polymer Process Piping Systems.
 - 5. Section 15070-S - Vibration **Limits and control**.
 - 6. Section 15250-S – **Pipe and Equipment Insulation For The MicroFab**.
 - 7. Section 15130-S - Pumps.
 - 8. Section 15755 - Heat Exchangers.
 - 9. Section 16001 – Electrical Work
 - 10. Section 16269-S - Variable Frequency Controllers
 - 11. Section 15185S – Chemical Water Treatment**

1.3 DEFINITIONS

- A. N - Number of components required at each unit process to operate system at design conditions.
- B. N+1 - Required number of components for each unit process to be installed to meet redundancy, maintenance and/or other requirements.

1.4 SYSTEM DESCRIPTION

- A. **System Parameters:**

1. System rated maximum pressure: 150 psig.
2. Supply pressure (point of use): 100 psig.

3. Process flow: 400 gpm expandable to 600 gpm
4. Process supply temperature: 60 degrees F.
5. Process return temperature: 70 degrees F.

1.5 SUBMITTALS

- A. Submit under provisions of Sections 01300 and 15050.

- B. Product Data: Provide manufacturers literature and data indicating rated capacities, dimensions, weights and point loadings, accessories, electrical requirements and wiring diagrams, and location and sizes of field connections.
- C. Pump curves with specified operating point clearly plotted.
- D. Manufacturer's Installation Instruction: Indicate assembly and installation instructions.
- E. System Startup plan to include:
 1. Cleaning and flushing procedures.
 2. System filling procedure.
 3. Position of all automatic and manual valves.
 4. Verification of pump rotation, electrical requirements and VFC control.
 5. Heat exchanger requirements.
 6. Final leak check.
 7. System performance curve.
- G. Upon completion of design, submit plan for flushing and cleaning of system prior to start-up.

1.6 QUALITY ASSURANCE

- A. Provide highest quality and reliability with latest proven technology; utilize total cost of ownership concepts.
- B. Comply with applicable environmental and safety regulations.
- C. Maintain high level of communication with Owner on all levels of project.
- D. Assign an individual solely responsible for quality control functions, resident on job site. Quality control functions to include as a minimum cleanliness checks, component inspection, pipe welding, craftsmanship inspections, and certification. Maintain incoming quality control records for audits by Owner.
- E. Provide skilled laborers certified in their trade.
- F. Provide training and instruction of pipe joining techniques for personnel assigned to make such joints. Include training and certification by pipe manufacturer for joining technique selected. Include random inspections by representative of pipe manufacturer to ensure quality of joint on a daily basis.
- G. Coordinate with Owner for source inspections at manufacturer's factory or assembly plant

prior to shipping equipment.

1.7 DELIVERY, STORAGE, AND HANDLING

A. not used

1.8 PROJECT/SITE CONDITIONS OR SPECIAL CONDITION

A. Power for Pumps: 480 VAC, 3 phase, 60 Hz.

1.9 SEQUENCING

A. The contractor shall refer to other parts of these specifications covering the work of other trades which must be carried on in conjunction with the mechanical work, so that the construction operations can proceed without interference or delay.

1.10 SCHEDULING

A. Not in use

1.11 SYSTEM STARTUP

A. Review and verify plan and schedule with Owner to conduct system startup at least two weeks prior to anticipated startup date.

B. Execute startup plan with Owner in attendance.

1.12 OWNER'S INSTRUCTIONS

A. not used

1.13 COMMISSIONING

A. Reference 01710S, 01715S

1.14 MAINTENANCE

A. Operation Data: Include instructions for lubrication, motor and drive replacement, spare parts lists, and wiring diagrams.

1.15 PROJECT RECORD DOCUMENTS

A. Include test and start-up documentation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Pump: Goulds
- B. Heat Exchangers : Tranter
- C. Filter Housing: Filterite
- D. Expansion Tank: Taco
- E. Air Separator: Taco
- F. PVC- Valves : Nibco, Chemtrol, Fisher, Asahi, Spears or approved equal.
- G. Butterfly Valves : Centerline, Grinnell, Keystone or approved equal.
- H. Check Valves : Technocheck, Keystone or approved equal.
- I. Relief Valve: Cla-Val
- J. **Inertia Base: Mason Industries, Inc.**

2.2 EXISTING PRODUCTS

- A. not used

2.3 MATERIALS

A. Pipe and Fittings:

1. Where indicated on drawings, process piping, valves and fittings shall be Schedule 80, CPVC, Socket end fittings, pipe, fittings and cement to conform to ASTM-F-1784, ASTM-F-441, ASTM-F-439, and ASTM-F-493. Use factory made tees and long radius elbows. Mitered elbows and saddle type tees are prohibited.
2. Where indicated on drawings, process piping shall be schedule 10 stainless steel, seamless, bevel ends, ASTM A312, type 304L. All fittings shall be schedule 10 stainless steel, butt-weld, ASTM A403, grade WP304L, ANSI 16.9. Conform to ANSI/ASME B31.1 for welding materials and procedures. Use factory made tees and long radius elbows. Mitered elbows and saddle type tees are prohibited. Flanges shall be butt-weld, full face, class 150, ASTM A403, grade WP304L, welding neck, ANSI B16.5. All bolts and gaskets shall conform with the requirements of Standard Specification, section 15050. Mitered elbows and saddle type tees are prohibited.
3. All new MTCW piping, fittings, flanges, bolts and gaskets shall conform with the requirements of Standard Specification, section 15050.

B. Process valves:

1. Sizes 2 inch and smaller: True union ball type CPVC.
2. Sizes greater than 2 inches: Cast iron body, all wetted parts stainless steel, EPDM liner, fully lugged type butterfly with gear indicating operators rated for bubble tight shut off at 200 psig.
3. Check Valves: Spring type check valves, stainless steel lug type with body, hinge, seat, spring and disk stainless steel.
4. Pressure Relief Valve: Hydraulically operated, pilot-controlled modulating globe valve, 4"-150# flanged connections, stainless steel valve body and cover, all wetted parts to be stainless steel. Pilot adjustable range to be 20 – 200 PSIG .
5. Valves to meet ANSI Class 150

C. Insulation:

1. Conform to Special Specification 15250-S.

D. Local Indicators:

1. Pressure indicators: Glycerin filled, 304 stainless steel wetted parts, 4 inch dial.
2. Temperature indicators: 4 inch dial, scaled in 1 degree F units.
3. Furnish and install thermometers, thermowell and gauges in accordance with standard specifications 15051 "Piping Systems".

E. Elastomers: Provide full face, EPDM gaskets at flanges and other required locations.

F. Vibration Isolators:

1. 2 Inches and Smaller: Threaded ends, corrugated inner tube and wire braid outer shield, Type 321 stainless steel. MetraFlex M/L or S/L.
2. 2-1/2 Inches and Larger: Flanged ends, corrugated inner tube and wire braid outer shield, Type 321 stainless steel. MetraFlex M/L or S/L.

2.4 MANUFACTURED UNITS

A. Air Separator with strainer: Taco AC6 with stainless steel wetted surface

B. Expansion Tank: Taco CA300 with stainless steel wetted surface

2.5 EQUIPMENT

A. Process Pumps:

1. Provide 2 centrifugal, horizontal base mounted, top vertical discharge pump, Model 3196 with VFD control, rated at 400 gpm at 304 feet head. Pump is to be long coupled to a Toshiba 60 hp 2 pole Premium Efficiency EQPIII electric motor, and set on a steel reinforced concrete inertial base. Base is to be designed for three pumps and to be fitted with open spring mounts and seismic snubbers per equipment schedule.
2. Refer to Sections 15242 and 15540 for additional requirements.

B. Heat Exchangers:

1. Provide two plate frame heat exchanger Tranter Super Changer UFX-51-7.
2. Design condition:
 - a. Flow rate at hot side 400 gpm expandable to 600 gpm
 - b. Flow rate at cold side 400 gpm expandable to 600 gpm
 - c. Inlet temperature of hot side 70 degree F
 - d. Outlet temperature of hot side 60 degree F
 - e. Inlet temperature of cold side (**Medium Temperature Chilled Water Supply**):55 degree F
 - f. Outlet temperature of cold side (**Medium Temperature Chilled Water Return**): 65 degree F
 - g. Design pressure 300 psig
 - h. Material of plate 316 SS
 - i. Material of gaskets EPDM
 - j. Material of frame Carbon steel epoxy painted
 - k. Material of bars Carbon steel epoxy painted

C. Filters:

1. Provide two filter with the filter housing Filterite 72MSO2 and 50 micron filter.
2. Design condition:
 - a. Element Type : Cartridge
 - b. Provide one set of start up filters and one set of permanent filters.
 - c. Leakage: None at 40-psi differential pressure.
 - d. Filter housing Construction: Type 304 stainless steel.
 - e. Accessories: Vent, drain, gauge connections with differential pressure gauges and associated stainless steel valves.
 - f. Inlet and outlet connections: Flanged.
 - g. Rated and tested at 150 psig pressure.
 - h. Plumb filter housings in parallel, with isolation valves at each filter housing.
 - i. Design and size a bypass around the filters so that one filter housing can be off line for maintenance.
 - j. Pressure drop: 2 psi maximum, across any one filter housing with one filter housing

off line and with all clean filters.

2.6 - 2.11

A. not used

PART 3 – EXECUTION

3.1 - 3.4

A. not used

3.5 INSTALLATION

- A. Provide required pipe hangers, support rods, anchors, and other components for installation of complete system.
- B. Provide pipe labels, valve tags, and framed system schematic. Pipe labels shall be of owner approved type, style, and size. Place labels every 20 feet, at each valve, tee, and elbow and on each side of wall penetration.
- C. Pumps:
 - 1. Install pump on inertia pad. Provide each pump inlet and discharge pipe with a bellows type vibration isolator rated for 150 psig and 250 psig operating pressure, respectively.
- D. System Pressure Control: Primary control: Maintain 102 psi differential pressure on 6” main at the west end of main by using variable frequency drive pumps. Pumps shall be running at same time with balanced flow rate. If one pump is out of order, the VFC will speed up other pump to meet the pressure requirement.
- E. System Temperature Control:
 - 1. Install thermowell at heat exchangers for monitoring purposes. Temperature sensing device for monitoring to be provided by others.
 - 2. Install one control valve provided by others on primary side return line of heat exchanger.
- F. Flow Meter: Install one process water flow meter provided by others on supply main. Install flow meters provided by others for the medium temperature return pipe **at each heat exchanger**.
- L. Local Indicators: Install in following locations:
 - 1. PCW temperature before and after heat exchanger.
 - 2. MTCW temperature before and after heat exchanger.
 - 3. Pump inlet and outlet pressure sensors.
- M. Isolate pressure indicators with stainless steel ball type isolation valves.
- N. Insulation:
 - 1. Insulate supply and return water lines with owner approved insulation and jacketing. Refer to Specification 15250.

- 2. Insulate heat exchanger and pump. Paint to color code standards.
- R Back welding or thermal fusion not allowed on CPVC piping.
- T Pipe, Valves and Fittings:
 - 1. Do not use pipe couplings in straight runs of CPVC pipe less than 20 feet in length.
 - 2. Cap, plug, or blind flange unused valves.
 - 3. Install isolation valves at pump inlets and outlets.
 - 4. Install isolation valves at heat exchanger process piping inlets and outlets.
 - 5. Install isolation valves at supply and return of medium temperature chilled water to each heat exchanger.
 - 6. Install isolation valves for all local pressure indicators.
- U Prime and paint non-insulated, non-stainless steel components, hangers, supports, and other components unless otherwise specified. Paint insulated components.
- V. Provide clearance around and under equipment for maintenance.
- W. Hook up RO makeup water to PCW system.**

3.6 TESTS

A. General:

Before insulation is applied, all piping, equipment, and accessories installed under this contract shall be inspected and pressure tested by the Contractor in the presence of the Sandia Delegated Representative (SDR) and approved before acceptance. All labor, material, and equipment required for testing shall be furnished by the Contractor. The Contractor shall be responsible for all repairs and re-testing as required. All instruments and other equipment whose safe pressure range is below that of the test pressure shall be removed from the line or blanked off before applying the tests. Prior to performing tests, all lines shall be blown free of all loose dirt and foreign particles. The lines shall then be thoroughly flushed with water (liquid lines only) or compressed air (for gas lines) at a sufficient flow rate and period of time to insure complete cleaning on the line of all dirt, scale, and foreign matter. Cleaning and flushing of the lines shall be subject to approval by the SDR. After testing and flushing lines, all filters and strainers shall be cleaned.

B. Testing:

Process chilled water (PCW) and medium temperature chilled water (MTCW) piping shall be tested hydrostatically at the test pressures specified and shall show no drop in pressure in a 2-hour period.

C. Test Pressures:

Hydrostatic test pressure for the PCW system shall be 150 PSIG and MTCW system shall be 100 PSIG.

3.6 - 3.15

A. not used

END OF SECTION