DIVISION 23 – Heating, Ventilating, and Air-Conditioning (HVAC)
23 21 00 – Hydronic Piping and Pumps
23 21 23 – Hydronic Pumps

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Provide pumps and required system trim for heating, chilled water, and dual temperature water systems including all related appurtenances for a complete and operating system.

1.02 SECTION INCLUDES

B. Split Coupled, Vertical Inline Pump

1.03 RELATED SECTIONS

A. Drawings and general provisions of the contract, including general and supplementary Conditions and Division 1 Specification Sections, apply to these Sections:

- Section *** - Alignment of Rotating Equipment
- Section *** - Cast-in-Place Concrete
- Section *** - Mechanical General Requirements
- Section *** - Supports, Anchors, and Sleeves
- Section *** - Motors and Starters
- Section *** - Drives
- Section *** - Mechanical Identification
- Section *** - Vibration Isolation
- Section *** - Piping Insulation
- Section *** - Equipment Installation
- Section *** - Hydronic Piping and Specialties
- Section *** - Testing, Adjusting, and Balancing
- Section *** - Meters and Gauges
- Section *** - Electrical

1.04 REFERENCES

A. HI - Hydraulic Institute.
B. ANSI - American National Standards Institute.
C. OSHA - Occupational Safety & Health Administration.
D. ASHRAE – American Society of Heating, Refrigeration and Air-Conditioning Engineers.

E. NEMA - National Electrical Manufacturers Association.
F. UL - Underwriters Laboratories.
G. ETL - Electrical Testing Laboratories.
H. CSA - Canadian Standards Association.
I. NEC - National Electric Codes.
J. ISO - International Standards Organization.
K. IEC - International Electrotechnical Commission.
L. ASME – American Society of Mechanical Engineers.

1.05 SUBMITTAL

A. Submit each item in this article according to the Conditions of the Contract and Division 1 Specification Sections.
B. Submit manufacturer's installation instructions under provisions of General Conditions and Division 1.

- Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts lists.
- Under provisions of commissioning documentation, testing of pumps, as well as training of owner's operation and maintenance personnel may be required in cooperation with the commissioning consultant.

C. Product Data including certified performance curves and rated capacities of selected model, weights (shipping, installed, and operating), furnished specialties, and accessories. Indicate pump's operating point on curves.
D. Complete Package information Product Data including:

- System summary sheet (where applicable)
- Sequence of Operation
- Shop drawing indicating dimensions, required clearances and location and size of each field connection
- Power and control wiring diagram
- System profile analysis including pump curves, system curve, and variable speed pump curves (where applicable)
- Pump data sheets - Rated capacities of selected models and indication of pump's operating point on curves.
- Submittals on furnished specialties and accessories
- Submittals must be specific to this project. Generic submittals will not be accepted.

E. Hanging and support requirements should follow the recommendations in the manufacturer's installation instructions.
F. Complete Package information Product Data including:

- System summary sheet (where applicable)
- Sequence of Operation
- Shop drawing indicating dimensions, required clearances and location and size of each field connection
- Power and control wiring diagram

- System profile analysis including pump curves, system curve, and variable speed pump curves (where applicable)
- Pump data sheets - Rated capacities of selected models and indication of pump's operating point on curves.
- Submittals on furnished specialties and accessories
- Submittals must be specific to this project. Generic submittals will not be accepted.

G. A detailed weighted average pump efficiency-Part Load Efficiency Value (PLEV) - Pump Rating Report shall be submitted for each pump. Pump PLEV shall be based on the standard load profile developed in AHRI 550/590-2020 also known as IPLV or Integrated Part Load Value. The pump PLEV Rating shall be based points A: 100%, B: 75%, C: 50% and D: 25% with each Pump Efficiency ratings shown with flow matched to load percentage and Specified Control Head.

H. Specified Control Head shall be 30% TDH or calculated minimum control head specified within the equipment schedule

I. Pump PLEV shall be expressed with load weighting Pump PLEV = 1 / (0.01/A+0.42/B+0.45/C+0.12/D) where
A= Pump Efficiency at 100%
B= Pump Efficiency at 75%
C= Pump Efficiency at 50%
D= Pump Efficiency at 25%
Actual job specific load profile weighting may be substituted for standard IPLV weighting

J. Hanging and support requirements should follow the recommendations in the manufacturer's installation instructions.

K. Submittals that are "rejected" as being "non-compliant" will be re-reviewed once with all time for subsequent reviews back charged to the contractor in accordance with the engineer's current prevailing rate schedule. If a rate schedule for additional services is included, as part of the contract with the owner that rate schedule shall be used in lieu of the "current prevailing" rate schedule.

1.06 QUALITY ASSURANCE

A. All equipment or components of this specification section shall meet or exceed the requirements and quality of the items herein specified, or as denoted on the drawings.

B. Ensure pump operation, at specified system fluid temperatures without vapor binding and cavitation, is non-overloading in parallel or individual operation, and operates to ANSI/HI 9.6.3.1-2017 standard for Preferred Operating Region (POR) unless otherwise approved by the engineer.

C. Ensure pump pressure ratings are at least equal to system's maximum operating pressure at point where installed but not less than specified.

D. Equipment manufacturer shall be a company specializing in manufacture, assembly, and field performance of provided equipment with a minimum of 20 years experience.

E. Equipment provider shall be responsible for providing certified equipment start-up and, when noted, an in the field certified training session. New pump start-up shall be for the purpose of determining pump alignment, lubrication, voltage, and amperage readings. All proper electrical connections, pump's balance, discharge and suction gauge readings, and adjustment of head, if required. A copy of the start-up report shall be made and sent to both the contractor and to the Engineer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the site in such a matter as to protect the materials from shipping and handling damage. Provide materials on factory provided shipping skids and lifting lugs if required for handling. Materials damaged by the elements should be packaged in such a matter that they could withstand short-term exposure to the elements during transportation.
B. Store materials in clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage.
C. Use all means necessary to protect equipment before, during, and after installation.
D. All scratched, dented, and otherwise damaged units shall be repaired or replaced as directed by the Architect Engineer.

1.08 WARRANTY:

A. Provide a minimum One (1) year warranty on materials and installation under provision of Section 01 78 36

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. The specifying engineer reserves the right to specify a primary supplier / lead spec manufacturer on all supplied schedule and specification documents. These primary suppliers have led their respective industry in research and development and their products have had proven track records in the field. These primary suppliers, in the opinion of this engineering firm, produce a superior product to the alternately listed manufacturers. The contractor may choose to supply equivalent equipment as manufactured by the alternately specified manufacturer. This alternately specified equipment shall be supplied on a deduct alternate basis and based on the approval of the supplied alternate manufacturer's submittals. The use of a primary supplier and deduct alternates protects the specifying engineer's design concept, but allows for a check-and-balance system to protect the post-commissioning owner.
B. Contractor shall furnish and install new split coupled vertical inline pump for chilled water and hot water heating systems as indicated on the drawings. Pumps shall be Series e-80SCXL as manufactured by **Bell & Gossett** under base bid. Equivalent units as manufactured by other manufacturers may be submitted as deduct alternates. Pumps shall meet types, sizes, capacities, and characteristics as scheduled on the Equipment Schedule drawings. Pump substitutions shall be provided with connection sizes equal to those scheduled. Pump connections shall not be downsized. Pump substitutions shall not be provided at efficiencies less than those scheduled.

2.02 COMPONENTS

A. The pumps shall be a split-coupled, inline for vertical installation, in cast iron stainless steel fitted construction specifically designed for quiet operation. Suitable standard operations at 250° F and 175 PSIG working pressure (or optional operations at up to 250° F and 250 PSIG working pressures with EPR/Carbon/Tungsten/Carbide/SS seal). Working pressures shall not be de-rated at temperatures up to 250°F. The pump internals shall be capable of being serviced without disturbing piping connections.

B. The pumps shall have a 420 stainless steel shaft that is guided by a bronze throttle bushing.

C. Pump shall be equipped with a Unitized inside mechanical seal assembly with flush line. The seal assembly shall have an EPR elastomer bellows and a positive metal-to-metal drive system to reduce torsional stress on the bellows. The bellows will be pressure supported without creases or folds for long life. The mechanical seal shall have a rotating carbon face against a stationary silicon carbide face. (As an option, an outside mechanical seal may be used in lieu of the inside mechanical seal design. The outside seal materials shall be Viton elastomer with Silicon Carbide-Silicon Carbide.)

D. Pump shaft shall connect to a stainless steel impeller. Impeller shall be hydraulically and dynamically balanced to Hydraulic Institute Standards ANSI/HI 9.6.4.5-2020. The allowable residual imbalance conforms to ANSI grade 6.3, keyed to the shaft and secured by a stainless steel locking capscrew or nut.

E. The pump shall include a spacer coupling of high tensile aluminum, split to allow the servicing of the mechanical seal without disturbing the pump or motor.

F. The motor bracket and volute coverplate shall be bolted to volute to ensure concentric alignment of the motor to the pump casing. A stainless steel coupler guard conforming to both ANSI B15.1-2000 and OSHA 1910.219 standards shall be mounted on the motor bracket for safety.

G. Pump volute shall be of a Class 35 cast iron design for heating systems rated for 175 PSIG with integral cast iron flanges drilled for 125# ANSI companion flanges (Optional 250 PSIG working pressures are available and are 250# flange drilled). Volute shall include gauge ports at nozzles, and vent and drain ports. The volute shall have an integrated cast baseframe or separated baseframe bolted to volute for installation on concrete base following the recommendations in the manufacturer's installation instructions.

H. Motors shall be NEMA Premium efficient. Motors above standard NEMA frames (i.e. A-NEMA) shall be supplied by a factory preferred manufacturer. All motors shall be the size, voltage, and enclosure called for on the plans. Motors shall have heavy-duty grease lubricated ball bearings, completely adequate for the maximum load for which the pump is designed.

I. Pumps shall conform to ANSI/HI 9.6.3.1 standard for Preferred Operating Region (POR) unless otherwise approved by the engineer.

J. Pump shall be of a maintainable design and for ease of maintenance should use machine fit parts and not press fit components.

K. Pump manufacturer shall be ISO-9001 certified.

L. Each pump shall be factory tested and name-plated before shipment.

M. Where noted on schedule pumping equipment may require one or all of the following optional tests: Certified Lab tests (unwitnessed), Hydraulic Institute Level B tests, or Witnessed Tests.

2.03 ACCESSORIES

A. Where noted on the schedule, provide one mechanical seal for each model type of primary pump.

B. Where noted on schedule a Bell & Gossett Sediment Separator shall be furnished for installation on the flushing line between the pump discharge flange and the seal area. The sediment separator is installed to increase the overall life expectancy of the seal on inherently dirty systems. The separator shall remove dissolved solids from the flushing medium before the fluid enters the seal area where it can damage and shorten the life of the seal.

C. Where noted on schedule a Bell & Gossett Brazed Plate Heat Exchanger Kit shall be furnished for installation on the flushing line between the pump discharge flange and the seal area. The heat exchanger is installed to increase the overall life expectancy of the seal on high temperature systems (greater than 225° F). The kit shall decrease the temperature of the flushing water being provided to the seal area as a flushing medium to a temperature less than 225° F. Flushing temperatures higher than 225° F can damage and shorten the life of the seal.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions.
B. Reduction from line size to pump connection size shall be made with eccentric reducers attached to the pump with tops flat to allow continuity of flow.
C. Furnish and install triple duty valves on the discharge side of all pumps and furnish and install a line size shut-off valve on the suction side of all pumps. Anywhere that 5 straight pipe diameters of pipe cannot be provided on the inlet side of a pump a suction diffuser shall be used to provide appropriate flow distribution into the eye of the pump's impeller.
D. Provide temperature and pressure gauges where and as detailed or directed.
E. On systems where pump seals require flushing water or cooling water for a heat exchanger kit, provide cooling water supply piping and connections as well as the return piping, if required. Piping should be of adequate size to pass required flow rate.
F. Proper access space around a device should be left for servicing the component. No less than the minimum recommended by the manufacturer.
G. Provide an adequate number of isolation valves for service and maintenance of the system and its components.
H. Circulating pump shall have sufficient capacity to circulate the scheduled GPM against the scheduled external head (feet) with the horsepower and speed as scheduled and/or as denoted on the drawings. Motors shall be of electrical characteristics as scheduled, denoted and/or as indicated on the electrical plans and specifications. Pump characteristics shall be such that the head of the pump under varying conditions shall not exceed the rated horsepower of the drive motor.
I. On systems where the final balancing procedure requires the triple duty valve to be throttled more than 25% to attain design flow (on a constant speed pumping system), and no future capacity has been built into the pump, the pump impeller must be trimmed to represent actual system head resistance. The pump provider and engineer of record, based on the balancing contractor's reports, shall determine the final impeller trim diameter.
J. All piping shall be brought to equipment and pump connections in such a manner so as to prevent the possibility of any loads or stresses being applied to the connections or piping. All piping shall be fitted to the pumps even though piping adjustments may be required after the pipe is installed.
K. On components that require draining, contractor must provide piping to and discharging into appropriate drains.
L. Power wiring, as required, shall be the responsibility of the electrical contractor. All wiring shall be performed per manufacturer's instruction and applicable state, federal, and local codes.

M. Control wiring for remote mounted switches and sensor / transmitters shall be the responsibility of the control's contractor. All wiring shall be performed per manufacturer's instructions and applicable state, federal, and local codes.

END OF SECTION

Xylem |'zīləm|

1) The tissue in plants that brings water upward from the roots;
2) a leading global water technology company.

We're a global team unified in a common purpose: creating advanced technology solutions to the world's water challenges. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. Our products and services move, treat, analyze, monitor and return water to the environment, in public utility, industrial, residential and commercial building services settings. Xylem also provides a leading portfolio of smart metering, network technologies and advanced analytics solutions for water, electric and gas utilities. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise with a strong focus on developing comprehensive, sustainable solutions.

For more information on how Xylem can help you, go to www.xylem.com

Learn more about Series e-80SCXL Pumps:

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