SECTION 23 21 23

HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this and other Sections of Division 23.

1.2 SUMMARY

A. This Section includes the following:
   1. Close-coupled, in-line centrifugal pumps.
   2. Pump Specialty Fittings.

B. The chilled water pumps will be furnished and install by the air-cooled chiller manufacturer on the chiller skid.

1.3 DEFINITIONS

A. ASCE: American Society of Civil Engineers.

B. ASHRAE: American Society of Heating Refrigeration and Air Conditioning Engineers.

C. BMS: Building Management System—Building heating ventilating and air conditioning system utilizing direct digital control (DDC) hardware and software. The system communicates using one or more digital communication networks.

D. Contractor: Trade contractors responsible for constructing the project.

E. Construction Manager: Construction partner responsible for delivery of the project.

F. Engineer: Refers to kW Mission Critical Engineering (KW MCE), Milwaukee, WI.

G. Drawings: Refers to kW MCE documents (drawings and/or specifications) for this project.

H. Owner: Refers to Aligned Energy.

I. SEI: Structural Engineering Institute.

J. Buna-N: Nitrile rubber.

K. EPT: Ethylene propylene terpolymer.

L. HI: Hydraulic Institute.

1.4 SUBMITTALS

A. Compliance Review: In addition to the submittal requirements of this section, preorder bidders shall provide a Compliance Review of the Specifications and Addenda. The Compliance Review shall be a paragraph-by-paragraph review of the Specifications with the following information, “C”, “D,” or “E” marked in the margin of the original Specifications and any subsequent Addenda.

1. “C”: Comply with no exceptions.
2. “D”: Comply with deviations. For each and every deviation, provide a numbered footnote with reasons for the proposed deviation and how the intent of the Specification can be satisfied.
3. “E”: Exception, do not comply. For each and every exception, provide a numbered footnote with reasons and possible alternatives.
4. Unless a deviation or exception is specifically noted in the Compliance Review, it is assumed that the Bidder is in complete compliance with the plans and Specifications. Deviations or exceptions taken in cover letters, subsidiary documents, by omission or by contradiction do not release the Bidder from being in complete compliance, unless the exception or deviation has been specifically noted in the Compliance Review submitted with the Bid.

B. Product Data: Include rated capacities, certified performance curves, final impeller dimensions, electrical load data, physical dimensional data, weights (shipping, installed, and operating), component specifications, sound data, power and control wiring diagrams, furnished specialties, and accessories. Indicate pump's operating point on pump curves.

C. Shop Drawings: Provide project specific dimensional drawings, including required service clearances.

D. Installation Procedures: Provide step by step descriptions and details for the field installation of the equipment. Include fabrication details for anchorage and attachment to the structure and to support the equipment.

E. Lead times to manufacture equipment and to deliver equipment to project site.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

D. Comply with NFPA 70.

E. Source Limitations: Obtain hydronic pumps through one source from a single manufacturer.

F. Product Options: Drawings indicate size, profiles, and dimensional requirements of hydronic pumps and are based on the specific system indicated.

G. UL Compliance: Comply with UL 778 for motor-operated water pumps.

H. Pumps shall be selected to the left of the highest efficiency curve.

I. Pumps and motor combinations will be non-overloading.

J. Pump impellers shall be no greater than 85% of the largest impeller diameter for the selected pump.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment with protective factory-installed crating and covering. The materials shall be shipped by direct and dedicated carrier on an air ride truck. Final delivery location, date, and time shall be coordinated with the Modular Central Plant Enclosure Supplier prior to shipment of the equipment. The shipping costs shall be included in the Bid. The sales tax shall be listed as excluded.

B. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

C. Protect bearings and couplings against damage from sand, grit, and other foreign matter.

D. The pumps shall be shrink-wrapped in plastic or other protective covers at the factory prior to shipment to prevent damage due to weather and road debris during transportation and thereafter while in storage awaiting installation.

E. Pipe openings shall be temporarily capped.

F. The loose shipped items shall be packed, protected, and secured with or inside the units. The spare components shall be shipped loose from the factory, either with the unit delivery or at a later date, as dictated by the Modular Central Plant Enclosure Supplier.

G. Store pumps in a clean, dry place, and protected from weather and construction traffic.

H. Retain protective covers for flanges and protective coatings during storage.

I. Handle units carefully to avoid damage to components, enclosures, and finish. Do not install damaged components. Damaged or rusted parts or equipment shall be rejected by the Construction Manager. Replace damaged parts and units with new.

J. Comply with the manufacturer's rigging instructions for unloading and moving units to final location.

K. Final delivery location and timing shall be coordinated with the Modular Central Plant Enclosure Supplier prior to shipment of equipment.

1.7 COORDINATION

A. Coordinate size and location of pump supports.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Mechanical Seals: One set of mechanical seal(s) for each pump type on the project.

1.9 WARRANTY

A. The Equipment Supplier shall warrant that the equipment supplied is of a proven design and can meet the requirements specified. Workmanship shall be of the best quality, free from any defects that might render the equipment unsuitable or inefficient for the purpose for which it is to be used. In the event of problems or malfunctions, the Equipment Supplier shall have qualified technicians capable of affecting the necessary repairs and restoring the system to full operation within eight hours of notification. There shall be no cost to the Owner for corrective repairs or firmware upgrades during the first twelve (12) months following successful integrated site commissioning and the project substantial completion date. Owner and Engineer shall be made aware prior to any firmware flashes after equipment has left the factory.

B. If at any time during the first twelve (12) months of operation as defined below, the Owner shall accumulate sufficient evidence to reasonably indicate that the equipment or any part thereof, is not in accordance with the Specifications, the Owner shall so notify the Equipment Supplier in writing, and the Equipment Supplier shall repair or replace the defective components. The cost of removal, reinstallation and complete re-testing of the equipment, and any associated freight charges (via air ride truck) or service engineering charges, shall be at the Equipment Supplier's expense. The warranty for the repaired or replaced equipment shall be extended for twelve (12) months from the completion of repairs or replacement.

C. If the equipment fails to meet the specific performance guarantees, the Equipment Supplier shall recommend to the Owner adjustments or modification. Upon approval by the Owner, the adjustments or modifications shall be made, and tests shall be

rerun. The cost of these adjustments or modifications and complete re-testing shall be made at the Equipment Supplier's expense. After such adjustments or modifications, should the equipment fail to achieve the guaranteed performance, an equitable settlement shall be made which may, without limitation, include an adjustment of the contract price.

D. Complete re-testing, as referred to in this Section, shall mean site acceptance testing as stipulated in testing portions of this Specification. The conditions which apply to original testing requirements, shall also apply to the re-testing of any equipment performed under the conditions of this warranty.

E. Commercial operation is defined as commencing on the date on which the equipment covered by these Specifications has successfully completed final site integrated acceptance testing and the project substantial completion date.

F. Identify any manufacturer's standard warranty periods that exceed the time frame listed above.

1.10 COMMISSIONING

A. Commissioning of equipment or systems specified in this section is part of the construction process. Documentation and testing of these systems, as well as training of the Owner's operation and maintenance personnel, is required in cooperation with the Owner's Construction Manager and the Commissioning Authority. Project Closeout is dependent on successful completion of the commissioning procedures, documentation, and issue closure. Refer to Commissioning Specification sections for detailed commissioning requirements.

PART 2 - PRODUCTS

2.1 CLOSE-COUPLED, IN-LINE CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements:

B. Basis-of-Design Product: Subject to compliance with requirements, provide ITT Corporation; Bell & Gossett, Vertical Inline pump with integral variable frequency drive.

C. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump designed for installation with pump and motor shafts mounted horizontally or vertically.

D. Pump Construction:

1. Casing: Radially split, cast iron, with threaded gage tappings at inlet and outlet, replaceable bronze wear rings.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For constant-speed pumps, trim impeller to match specified performance.

3. Pump Shaft: Stainless steel shaft.
4. Seal: Mechanical seal consisting of carbon rotating ring against a silicon carbide seat held by a stainless-steel spring, and Buna-N or EPT (best material for application) bellows and gasket. Include water slinger on shaft between motor and seal.
5. Pump Bearings: Permanently lubricated ball bearings.
6. Motor: Variable speed and rigidly mounted to pump casing.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Default motor characteristics are specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

G. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

H. Verify enclosure types with manufacturer of specified equipment. Delete "Enclosure" Subparagraph below if included in schedule on Drawings or in "Capacities and Characteristics" Paragraph below.

I. Enclosure: Open, dripproof for applications in controlled environments or Totally enclosed, fan cooled for motors subject to ambient conditions.

J. Enclosure Materials: Cast iron.

K. Permanently lubricated ball bearings are available up through 5 hp. Larger motors have grease-lubricated ball bearings.

L. Motor Bearings: Permanently lubricated ball bearings.

M. Electric Motor: The motor shall be a heavy-duty squirrel cage induction type, NEMA Design B, 1800 RPM vertical hollow shaft motor, with a non-reverse ratchet to prevent reverse rotation of the rotating elements. A suitable thrust bearing shall be incorporated in the upper end of the motor adequate to receive the entire hydraulic thrust load of the pump unit plus the weight of the rotating parts under all conditions of operation. The motor shall be premium efficiency with a WP-1 enclosure, 1.15 service factor, and shall be suitable for use on a 460 volt, three phases, 60 cycle electric service.

N. Efficiency: Premium efficient motor as defined in NEMA MG 1. Meet or exceed 10:1 turndown ratio.

O. NEMA Design: 4x where applicable

P. Service Factor: manufacturer recommended (should be explicitly communicated in submittal material).

Q. Pump Rating: Pump shall be rated for 150 psig or 1.5 the dead-head pressure capability of the pump, whichever is greater.

2.2 CAPACITIES AND CHARACTERISTICS

A. Chilled Water Pumps: Refer to the Drawing Schedule.

2.3 PUMP SPECIALTY FITTINGS

A. Suction Diffuser: Angle pattern, 175-psig pressure rating or 300-psig pressure rating for applications to the open loops systems located in the lower levels of the facility, cast or ductile-iron body and end cap, pump-inlet fitting; with bronze startup and bronze or stainless-steel permanent strainers; bronze or stainless-steel straightening vanes; drain plug; and factory-fabricated support.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.

C. Examine foundations and inertia bases for suitable conditions where pumps are to be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PUMP INSTALLATION

A. Comply with Hydraulic Institute HI 1.4 and HI 2.4.

B. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.

C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

D. Set base-mounted pumps on concrete inertia base. Disconnect coupling before setting. Do not reconnect couplings until alignment procedure is complete.

1. Support pump baseplate on rectangular metal blocks and shims, or on metal wedges with small taper, at points near foundation bolts to provide a gap of 3/4 to 1-1/2 inches between pump base and foundation for grouting.

2. Adjust metal supports or wedges until pump and driver shafts are level. Check coupling faces and suction and discharge flanges of pump to verify that they are level and plumb.

E. Installing contractor will verify that there are no obstructions in the system (intake / outlet volute, strainer, closed isolation valve, etc.) prior to prolonged operation of the pump(s).

3.3 ALIGNMENT

A. Align pump and motor shafts and piping connections after setting on foundation, grout has been set and foundation bolts have been tightened, and piping connections have been made.

B. Perform baseline vibration analysis and submit report to owner for record.

C. Comply with pump and coupling manufacturers' written instructions.

D. Adjust pump and motor shafts for angular and offset alignment.

E. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill baseplate with non-shrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Connect piping to pumps. Install valves that are same size as piping connected to pumps.

D. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

E. Install check valve on discharge side of pumps.

F. Install Y-type strainer or suction diffuser and shutoff valve on suction side of pumps.

G. Install flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves.

H. Install pressure gages on pump suction and discharge, at integral pressure-gage tapping, or install single gage with multiple input selector valve.

I. Install electrical connections for power, controls, and devices.

J. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

K. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Check piping connections for tightness.
   3. Clean strainers on suction piping.
   4. Perform the following startup checks for each pump before starting:
      a. Verify bearing lubrication.
      b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
   5. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
   6. Start motor.
      a. Verify that pump is rotating in the correct direction.
   7. Open discharge valve slowly.

3.6 COMMISSIONING ASSISTANCE

A. A factory-authorized service representative is not required to be on-site during the commissioning process.

B. A factory-authorized service representative shall correct any deficiencies discovered during the commissioning process. The anticipated schedule is for commissioning to occur during the last six to eight weeks of construction. The construction timeline, duration, and schedule shall be dictated by the Owner and Construction Manager.

3.7 DEMONSTRATION

A. A factory-authorized service representative shall train Owner's maintenance personnel as specified below.
   1. Provide a written training agenda to the Owner, through the Construction Manager, a minimum of 7-days prior to training session.
   2. Schedule training with Owner, through the Construction Manager with at least 7 days of notice.
   3. Provide a minimum of 8-hours of on-site technician-level training. Training to be performed within one year of the substantial completion date.
   4. Review data in the maintenance manuals.

END OF SECTION

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