PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Close-coupled, horizontal, in-line centrifugal pumps.

1.2 DEFINITIONS

A. ECM: Electronically commutated motor.

B. EPDM: Ethylene propylene diene monomer.

C. EPR: Ethylene propylene rubber.

D. EPT: Ethylene propylene terpolymer.

E. FKM: Fluoroelastomer polymer.

F. HI: Hydraulic Institute.

G. NBR: Nitrile rubber or Buna-N.

H. ODP: Open, drip proof.

I. TEFC: Totally enclosed, fan-cooled.

J. TENV: Totally enclosed, non-ventilated.

K. VFD: Variable-frequency controller.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of pump.

1. Include published performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated.
2. Indicate pump's operating point on curves.

B. Shop Drawings: For each pump.

1. Show pump layout and connections.
2. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.
3. Include diagrams for power, signal, and control wiring.

C. Delegated Design Submittal: For each pump.

1. Design calculations and vibration isolation base details, signed and sealed by a qualified professional engineer.

a. Design Calculations: Calculate requirements for selecting vibration isolators[**and seismic restraints**] and for designing vibration isolation bases.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.

B. Seismic Qualification Data: Certificates for pumps, accessories, and components.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For pumps to include in operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish spare parts that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Seal Kit: [**One**] <**Insert number**> mechanical seal kit(s) for each pump.
2. Bearings.
3. Gaskets.
4. <**Insert spare parts**>.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide pumps and associated equipment that are in compliance with energy conservation guidelines published in 2020 by the U.S. Department of Energy Rulemaking Committee for commercial and industrial pumps.

B. 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.

C. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design vibration isolation[**and seismic restraints**].

D. Seismic Performance: Pumps to withstand the effects of earthquake motions determined in accordance with [**ASCE/SEI 7**] <**Insert requirement**>.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified[**and the unit will be fully operational after the seismic event**]."
2. Component Importance Factor: [**1.5**] [**1.0**].
3. <**Insert requirements for Component Amplification Factor and Component Response Modification Factor**>.

2.2 CLOSE-COUPLED, HORIZONTAL, IN-LINE CENTRIFUGAL PUMPS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Taco Comfort Solutions, Inc.; 1900 Series <**Insert product name or designation**> or comparable product by one of the following:

1. Bell & Gossett.
2. Thrush Co. Inc.
3. <**Insert manufacturer's name**>.

B. Source Limitations: Obtain pumps from single source from single manufacturer.

C. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, horizontal, close-coupled, [**NSF 61-compliant,**]in-line pump as defined in HI 14.1, HI 14.2 and HI 14.3; designed for installation with motor shaft mounted horizontally.

D. Pump Construction:

1. Casing: Radially split, [**cast iron**] [**ductile iron**]flanged connections[**, replaceable bronze wear rings**] [**, and threaded companion-flange**].
2. Impeller: ASTM A351/A351M stainless steel; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For pumps that are not variable-frequency-drive controlled, trim impeller to match specified performance.
3. Pump Stub Shaft: Type 416 stainless steel.
4. Seal: Mechanical seal consisting of [**carbon rotating ring against a ceramic**] [**silicon carbide rotating ring against a silicon carbide**] seat held by a stainless steel spring, and [**NBR**] [**EPDM**] [**FKM**] <**Insert material**> rubber bellows and gasket. Include water slinger on shaft between motor and seal.

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

1. Enclosure: [**Totally enclosed, fan cooled**] [**Open, drip proof**] <**Insert enclosure type**>.

2. NEMA Premium Efficient motors as defined in NEMA MG 14.
3. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 14.0.
4. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
5. [**Single**] [**Variable**]-speed motor.
6. Provide integral pump motor variable-frequency controller.
7. <**Insert unique motor characteristics**>.

F. Capacities and Characteristics:

1. Capacity: <**Insert gpm (L/s)**>.
2. Total Dynamic Head: <**Insert feet (kPa)**>.
3. Maximum Operating Pressure: [**175 psig (1204 kPa)**] [**250 psig (1720 kPa)**] <**Insert value**>.
4. Maximum Continuous Operating Temperature: [**225 deg F (107 deg C)**] [**250 deg F (120 deg C)**] <**Insert temperature**>.
5. Inlet and Outlet Size: <**Insert NPS (DN)**>.
6. Impeller Size: <**Insert inches (mm)**>.
7. Motor Speed: <**Insert rpm**>.
8. Motor Horsepower: <**Insert value**>.
9. Turndown Ratio: [**4:1**] <**Insert ratio**>.
10. Electrical Characteristics:

    a. Volts: [**120**] [**240**] [**208**] [**460**] <**Insert value**> V.
    b. Phase: [**Single**] [**Three**].
    c. Hertz: 60 Hz.
    d. Full-Load Amperes: <**Insert value**> A.
    e. Minimum Circuit Ampacity: <**Insert value**> A.
    f. Maximum Overcurrent Protection: <**Insert amperage**> A.

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 the Work.

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

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

3.2 PUMP INSTALLATION

A. Comply with [**HI 14.4**] [**and**] [**HI 2.4**].

B. Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.

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

D. Equipment Mounting:
   1. Comply with requirements for vibration isolation and seismic-control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
   2. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

E. Equipment Mounting: Install in-line pumps with continuous-thread hanger rods and [**elastomeric hangers**] [**spring hangers**] [**spring hangers with vertical-limit stop**] of size required to support weight of in-line pumps.

   1. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
   2. Comply with requirements for hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

3.3 ALIGNMENT

A. Engage a service representative to perform alignment service.

B. Perform alignment service. When required by manufacturer to maintain warranty coverage, engage a factory-authorized service representative to perform it.

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

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

3.4 PIPING CONNECTIONS

A. Where installing piping adjacent to pump, allow space for service and maintenance.

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

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

D. Install [**check, shutoff, and throttling valves**] [**check valve and throttling valve with memory stop**] [**triple-duty valve**] on discharge side of pumps.

E. Install [**Y-type strainer**] [**suction diffuser**] and shutoff valve on suction side of pumps.

   1. Use startup strainer for initial system startup. Install permanent strainer element before turnover of system to Owner.

F. Install pressure gauges on pump suction and discharge or at integral pressure-gauge tapping, or install single gauge with multiple-input selector valve.

G. Install check valve on each condensate pump unit discharge unless unit has a factory-installed check valve.

3.5 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate to be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate to be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch (13 mm) high.

3.6 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

3.7 STARTUP SERVICE

A. [**Engage a factory-authorized service representative to perform**] [**Perform**] startup service.

1. Complete installation and startup checks in accordance with manufacturer's written instructions.
2. Check piping connections for tightness.
3. Clean strainers on suction piping. Use startup strainer for initial startup.
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.
    c. Verify that pump is rotating in correct direction.

5. Prime pump by opening suction valves and closing drains, and prepare pump for operation.

6. Start motor.
7. Open discharge valve slowly.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: [**Owner will engage**] [**Engage**] a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections[**with the assistance of a factory-authorized service representative**].

D. Hydronic pumps will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.9 DEMONSTRATION

A. [[**Train**] Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps.

END OF SECTION 232123