

ARMPak HVAC pumping package

Typical specification

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1.0 GENERAL

Furnish and install a duplex or triplex ARMPak Model _____ factory assembled constant or variable speed pumping system for **(Application)** as manufactured by Armstrong Pumps Inc., Buffalo, NY. The complete Packaged Pumping System shall include Armstrong series 4280V or 4200V pumps, Armstrong triple duty Flo-Trex valves, Armstrong IPS Controller and variable frequency drive(s) w/bypasses (on variable speed packages), NEMA 1 control panel with gauges and interconnecting piping, headers, valves, and fittings. The complete pumping package shall be UL listed and the control equipment shall be also listed under UL Section 508 Industrial Control Equipment.

The system manufacturer shall provide 'Single Source Responsibility' for all components.

Acceptable manufactures include Armstrong, or other vendors listed as acceptable if they meet the specification. Equal and alternate manufacturers must submit a request to bid in writing to the owner, or owner's consultant prior to tender closing. Alternate bids must be entered with savings over base bid. The manufacturer must provide the following information for consideration prior to entering a bid:

- A Equipment selection data
- B Control sequence of operation
- C List of similar installations with references
- D List of deviations to the specification

2.0 PRODUCTS

- 1 Pumps and motors
- 2 Valves, Fittings and Piping
- 3 Variable Speed Pump Controller
- 4 Constant Speed Pump Controller
- 5 DP Sensor(s)/Transmitter(s)
- 6 Flow Sensor
- 7 Pipework, Welding and Pipe Supports
- 8 Paint

2.1 PUMPS AND MOTORS

End suction vertical split-coupled:

Pumps shall be Armstrong series **4200V** Vertical split coupled type End suction centrifugal style.

Supply and install as shown on plans and specifications Armstrong Series 4200V, Vertical split coupled type End suction

Centrifugal pumping unit. The pump shall be of the radially split casing type of center-line discharge design with back pull out feature permitting removal of the pump internals without disturbing pipe connections. The pump shall be supplied with separate tapped flush line with Cuno filter as option and pressure gauge connections. The impeller is bronze and dynamically balanced, stainless steel shaft, lower carbon throttles bushing. Standard mechanical seal is of the outside balanced type with resin impregnated carbon rotating face, silicon carbide stationary seat and viton O-ring.

The pump is to be fitted with a factory installed flush line. The squirrel cage induction type, TC frame, with ODP enclosure and shall be connected to the pump through a high tensile aluminum, split type spacer coupling to permit Servicing of the mechanical seal without disturbing pump, motor or electrical wiring. Coupling shall be protected by a guard.

The driving motor shall be NEMA split-coupled type with a TC frame shaft, ODP or TEFC, standard, premium or inverter duty motor, _____hp, 1800 or 3600 rpm and suitable for operation on a _____ Volt, 60 Hertz, 3 phase supply. The motor shall be non-over-loading at run out without using the service factor.

End suction vertical split-coupled:

Pumps shall be Armstrong series **4280V** Close coupled type End suction centrifugal style.

Furnish and install, as indicated on the plans and specifications, an Armstrong Series 4280 End-Suction Motor Mount Centrifugal Pump. The pump shall be of the radically split casing type of center-line discharge design with back pull out feature permitting removal of the pump internals without disturbing pipe connections. Pump constructions shall be BF (Bronze Fitted) suitable for a maximum working pressure of 175 psi. Casing gasket to be confined within pump casing.

The driving motor shall be NEMA close-coupled type with a vertical motor JM/JP vertical shaft, vertically mounted, squirrel cage induction type, ODP or TEFC, standard, premium or inverter duty motor, _____hp, 1800 or 3600 rpm and suitable for operation on a _____ Volt, 60 Hertz, 3 phase supply. The motor shall be non-over-loading at run out without using the service factor.

2.2 VALVES, FITTINGS AND PIPING

Butterfly valves:

Butterfly valves shall be furnished on the suction of each pump. Valves shall be constructed with a cast iron lug style body, EPDM seat, bronze disc, and stainless steel shaft. Valves 4" and smaller shall be provided with lever operators and valves.

Strainers:

Install on the suction of each pump a diffuser type or inline "Y" type strainer with cast iron body, removable perforated 304 stainless steel screen and fine mesh start up screen with blow down valve.

The mechanical contractor shall inspect the strainer prior to start up of pump and remove the fine mesh brass strainer after a short running period. Space shall be provided for removal of strainer and connection of blow-down valve.

Triple duty Flo-trex valves:

Install on the discharge side of each pump an Armstrong model FTV Flo-Trex combination valve incorporating three functions in one body: tight shut-off, spring closure type non-slam check and flow measurement/throttling.

Valve body shall be cast iron with 125 # ANSI flanged ends. The body shall have two 1/4" NPT connections on each side of the valve seat. Two connections to have brass pressure and temperature metering ports, with Nordel check valves and gasketed caps. Two other connections to be supplied with drain plugs. Metering ports are to be interchangeable with drain ports to allow for measurement flexibility when installed in tight locations.

The valve disc shall be bronze plug disc type with high impact engineered resin seat to ensure tight shut-off and silent check valve operation. The valve stem shall be stainless steel with flat surfaces provided for adjustment with open-end wrench.

Alternate use of check valve, orifice plate and isolation valve combination in lieu of a Flo-trex valve is acceptable only with prior written permission.

Pressure gauges:

Install 3 or 4 panel-mounted, ANSI Grade 4 1/2" diameter dial pressure gauges in the following locations: 1 on suction header and 1 on discharge of each pump. Install gauge cocks for balancing purposes.

2.3 VARIABLE SPEED PUMP CONTROLLER**2.3.1 GENERAL**

Provide an Armstrong IPS Controller 4000 (with built-in display and keypad) for the control of variable speed pumps.

The controller must be capable of controlling pumps in parallel or duty/standby operation.

The controller must be a dedicated pump controller, and design specifically for hydronic pumping or chilled water applications.

Controller that will operate other mechanical equipment will not be considered as a dedicated pump controller and a separate second controller will be needed.

The pump controller must be from the same manufacturer as the pumps

2.3.2 PRODUCT

The controller shall be enclosed inside a NEMA 12 or NEMA 4X as option, UL & CSA rated enclosure and contain the VFDs and bypasses with main disconnect switch for single point power connection.

The IPS Controller shall be capable of receiving up to 12 signals from zone DP sensors, process their value and compare to individual zone DP set-point. The controller shall speed up or slow down to maintain the active zone DP setting. The controller shall stage pumps up and down in order to meet system demands.

The controller shall be capable of controlling 2 or 3 pumps in parallel or duty/standby operation, alternate the pumps manually and automatically based on hours of operation. The logic controller shall be of the same manufacturer as pumping package manufacturer.

The IPS Controller shall have a standard terminal block for easy connection of field installed devices such as zone DP sensors, flow sensors and for connection to BAS.

The standard Operator Interface shall be a 4.3" back-lit touchscreen for all necessary user interface functions. Keypad based interfaces, LCD readouts, and LED displays will not be accepted. It will be powered by 100-240/1/50-60 AC power supply.

**2.3.3 VARIABLE SPEED CONTROLLER
STANDARD FEATURES**

2.3.3.1 Capabilities: The pump set controller software shall be preprogrammed to perform, but will not be limited to the following:

- A** Manual or automatic pump set controller
- B** Schedule start/stop
- C** Duty cycling
- D** Automatic lock-out of malfunctioning equipment
- E** Backup sequences of control for any sensor failure
- F** Secondary pumps control to satisfy pressure or temperature zones demand
- G** Control sequences for pumps speed and sequencing

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- H Optimized sequencing of the Chilled/Heated Water pumps
- I Control sequences for Sensorless™ and zone sensors distribution pump speed control options
- J Zone setpoints reset based on most open load valve
- K Scanning and alarm processing
- L Graphic screen reporting

2.3.3.2 Trending and Reporting capabilities: The controller provides a data-logging feature including alarms, and events (adjustment to system parameters). The controller shall be capable of displaying the alarm history on its graphical touchscreen.

2.3.3.3 The pump set controller shall display live data on demand. The pump set controller shall provide graphic screens of system schematics.

2.3.3.4 Communication protocol: The pump set controller shall be able to communicate with the Building Automation System over one or more of the following protocols: Modbus RTU, BACnet MS/TP, BACnet IP.

2.3.3.5 The pump set controller shall allow changes in the field of the network address of the variable speed pumps and its own address on the interface it communicates to the BAS. Network addresses cannot be hard coded.

2.3.3.6 Remote access: The pump set controller shall include webserver functionality and be accessible through an internet IP internet address with read/write functionality. This access shall allow the relevant staff to:

- A Remotely view all screens available at the local graphic user interface (GUI), with the same functionality. i.e.: view plant status, view and modify parameters and set points, override equipment and navigate screens.
- B View all available live and historic data and navigate screens.
- C Receive alarm messages, automatically processed and conveyed via the network.
- D BAS and Internet connection shall be provided by others, but the controls contractor installing the pump set controller is responsible of requesting it and coordinating with the IT contractor.
- E Remote manual override by the BAS shall be possible for the following equipment settings:
 - I Pump set controller ON/OFF

2.3.3.7 Alarms: Alarms shall be generated and the alarm messages shall be displayed in clear textual form on the screen, until it is acknowledged by the operator. Alarms shall include but not limited to the following list:

- A System fault alarms
- B General alarm
- C Pumps run feedback alarms
- D Pump alarm
- E No flow protection
- F Zone/sensor alarm
- G Pump communication alarm
- H 4 potential free contacts shall be provided for general alarm, buzzer, communication alarm and general sensor alarm

2.3.3.8 Safety Features shall include but not limited to the following list:

- A Auto omission of pump in case of pump failure
- B Auto omission of zone/sensor in case of any zone sensor
- C Backup sequences in case of flow sensor failure, temperature sensor failure, and all zone sensors failure.
- D System End of Curve protection with flow/dp sensor
- E No flow alarm
- F Indication of any Failure (or) malfunctioning in the touchscreen screen user interface, the remote access screens, in the BAS communication.
- G Pumps status confirmation with differential pressure switches
- H Remote stop for emergency shutdown.

2.3.3.9 Graphics shall be included for ease of system operation. Graphic screens shall include, but will not be limited to, the following:

- A System schematic

2.3.3.10 Access security: The pump set controller shall have at least 2 levels of password security: Level zero (view only), Level one modify all parameters visible on the touchscreen and set equipment in Hand (Site Operator).

2.4 CONSTANT SPEED PUMP CONTROLLER

The constant speed control panel shall be supplied with NEMA 12 and shall be UL 508 listed. The control panel shall be able to control constant speed primary or secondary pumps and shall consist of:

- A Terminal block
- B IEC rated starters
- C Motor overloads
- D 1 main disconnect switch
- E Branch fused disconnect for each pump
- F P1-Auto-P2 switch for auto and manual alternation
- G H-O-A switch per pump
- H Power ON light
- I RUN lights for each pump
- J Motor overload alarm light
- K Reset button
- L Line 3 phase voltage to fused 115 V AC power transformer
- M Connection for remote start/stop mode of operation

2.5 DP SENSOR(S)/TRANSMITTER(S)

Provide quick response capacitance DP zone sensor(s)/ transmitter(s). The sensor(s) shall provide a 4 to 20 mA DC output signal proportional to differential pressure with $\pm 0.25\%$ accuracy. For ease of installation and maintenance, The sensor shall be supplied with 3-valve manifold assembly. Bleed ports allow for total elimination of air in the line and pressure cavities.

2.6 OPTIONAL FLOW SENSOR

Provide, when required, insertion dual turbine flow meter, which is suitable for measuring electrically conductive water-based liquids. The flow sensor shall provide non-isolated 4-20 mA analog output signal that is linear with the flow rate. The flow sensor shall display flow in USgpm.

2.7 PIPEWORK, WELDING AND PIPE SUPPORTS

2.7.1 FABRICATION

When connecting pipe to installed equipment connect pipe in accordance with manufacturer's instructions unless otherwise indicated. Use valves and flanges for isolation and ease of maintenance and assembly.

Provide manufacturer's recommended clearances around all systems, equipment and components for observation of opera-

tion, inspection, servicing, and maintenance. Provide space for disassemble and removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, and components.

Install piping to facilitate drainage and/or condensate management. Install drain valves at low points in piping systems, at equipment and at section isolating valves. Provide drain valve at each drain locator. Discharge to be visible. Drain valves shall be nps $\frac{3}{4}$ ball valves with hose end male thread, cap and chain.

Install air separator (by contractor) complete with automatic air vents at high points in each piping system. Install isolating valve at each air separator. Install drain piping and terminate where discharge is visible.

Assemble piping using fittings manufactured to ANSI standards.

Layout and connections of the package pipe-work shall be designed using a 3 dimensional engineering software package that is capable of presenting isometric 3-D images that can be viewed from and infinite number of angles to confirm clearances, access point dimensions, structural construction features, and provide deflection calculations.

2.7.2 PIPE WELDING

Welding to be in accordance with ANSI/ASME B31.1, ANSI/ASME Boiler and Pressure vessel code, Sections I and IX and ANSI/AWWA C206, using procedures conforming to AWS B3.0, AWS C1.

Hydrostatically test chilled glycol and steam pipework to pressures of 100 psi, and maintain specified test pressure without loss for twelve (12) hours minimum. Ensure that equipment and other parts, which are not designed to withstand test pressure, are isolated prior to tests.

Defects causing rejection shall be as described in ANSI/ASME B31.1 and ANSI/ASME Boiler and Pressure vessels code. Re-inspect and re-test repaired or re-worked welds.

2.7.3 PIPE SUPPORTS

Pipe supports (where applicable) shall be Behringer Heavy Series Pipe Clamps to support systems and pipework under all conditions of operation and prevent excessive stresses and vibration from being introduced into pipework or connected equipment.

U-clamp pipe supports are not acceptable.

Shop fabricates equipment supports not provided by equipment manufacturer from structural grade steel.

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Provide removable blocking (as required) and bracing to prevent movement of pipework and equipment during shipping.

2.8 PAINT

All piping, bases, and enclosure floors and exteriors are to be factory painted.

Paint shall be applied and allowed to dry for a sufficient amount of time before shipping.

The paint shall be a non-isocyanate enamel that produces a durable, chemically resistant coating similar to urethane.

The vehicle type shall be a cross linked acrylic with an oxygenated and aromatic hydrocarbon solvent.

All surfaces shall be prepared with a zero induction epoxy primer before applying the paint.

The primer vehicle shall be an epoxy polyamide with a titanium dioxide pigment, and oxygenated and aromatic hydrocarbon.

The two-part paint process shall be applied to all equipment and pipe spools before assembly.

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