SECTION 11295 - FLUID POWER SYSTEMS

City of San Diego, CWP Guidelines

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

A. The WORK of this Section includes providing packaged fluid power systems complete with reservoir, pumps, motors, accumulators, valves, piping, fittings, filters, wiring, and control panel for a complete and operable installation.

B. The WORK also requires that one manufacturer accept responsibility for furnishing the WORK as indicated but without altering or modifying the CONTRACTOR'S responsibilities under the Contract Documents.

C. The WORK additionally requires that the one manufacturer who accepts the indicated responsibilities shall manufacture the reservoir.

D. The WORK also includes coordination of design, assembly, testing and installation.

1.2 RELATED SECTIONS

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 11000 Equipment General Provisions

1.3 SPECIFICATIONS AND STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

1.	ASME Boiler and Pressure Vessel Code	Section VIII, Pressure Vessels
2.	ASME B31.1	Power Piping
3.	JIC H-1	Hydraulic Standards for Industrial Equipment and General Purpose Machine Tools
4.	ASTM A 105	Specification for Forgings, Carbon Steel, for Piping Components

1.4 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted in compliance with Section 01300, in addition to the provisions of Section 11000:

1. Piping, wiring and control schematics and diagrams.

2. Calculations demonstrating that the equipment will satisfy the indicated requirements.

3. Control panel arrangement drawing.

4. Information on at least one successfully performing installation of comparable size and complexity constructed in the recent past, including contact name, address, and telephone number.

1.5 SERVICES OF MANUFACTURER

A. **Inspection, Startup, and Field Adjustment**: An authorized representative of the manufacturer shall visit the site and witness the following:

1. Installation of the equipment for not less than [2] days.
2. Inspection, checking, and adjusting the equipment for not less than [1] day.
3. Startup and field-testing for proper operation for not less than [1] day.

B. **Instruction of OWNER'S Personnel**: The authorized service representative shall visit the site for not less than [2] days to instruct the OWNER'S personnel in the operation and maintenance of the equipment including step-by-step troubleshooting procedures with necessary test equipment.

1.6 QUALIFICATIONS

$# _____

NTS: In the paragraph below, define the terms "comparable size and complexity" for the equipment or system specified. Requiring experience of more than one successful project requires sound justification and prior written approval from the City Project Manager.

_____ #$

A. **Manufacturer**: Company specializing in packaged fluid power systems with minimum one successfully performing installation of comparable size and complexity constructed in the recent past. Systems of comparable size and complexity shall have the following characteristics: [ ].

PART 2 -- PRODUCTS

2.1 GENERAL

A. **Capacity**: Each fluid power system shall be designed to provide adequate volume and pressure for the operation of all connected equipment in accordance with JIC H-1 as follows:

Equipment	Quantity	Size	Operating Pressure (psi)	Operating Cycle (seconds)	Location of Connected Equipment
[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

B. **Pressure**: Unless otherwise indicated above, the connected equipment shall be sized for an operating pressure of [1,750] psig, with a pressure of [3,000] psig in the accumulator.

2.2 EQUIPMENT COMPONENTS

A. **Oil Reservoir**: The reservoir shall serve as the mounting base for the other equipment as far as practicable. It shall be of ample capacity to contain all the oil in the system. Internal baffles or other design features shall allow time for air bubbles to separate from the discharged oil before reaching the pump suction. The reservoir shall be of heavy welded steel construction with welded supports, pipe connections, manhole, level gauge with cast aluminum or steel armor, drain valve, vent, and welded pads for the support of the auxiliary equipment and pumps. The capacity of the reservoir shall be not less than [ ] gallons.

B. **Pumps**: Two positive displacement pumps of the variable axial piston type with a discharge pressure of [3,000] psig shall be mounted on top of the reservoir, or below the reservoir. Each pump shall have a capacity of not less than 1.5 times the combined flow rate of all the connected [cylinders] in gpm and it shall be suitable for continuous operation. Each pump shall be complete with a direct connected, heavy duty, [TEFC] electric motor suitable for [480 volt, 3-phase, 60 Hz] supply. All necessary unloader valves, check valves, pilot valves, safety valves, air release valves, drain valves, and control valves shall be installed in accessible locations. In addition, a hand pump, complete with pipe connections and valves, shall be mounted to the reservoir to pressurize the system in case of a power failure.

C. **Accumulator**: The power system shall be provided with an accumulator which shall be sized to provide sufficient volume and pressure to operate all connected equipment under maximum conditions through 3 complete operating cycles with the pumps not operating. The accumulator shall conform to the requirements of ASME Boiler and Pressure Vessel Code, Section VIII, and all local regulations. A precharge kit shall be furnished, including all required fitting, hoses, connections, gauge, regulators, and nitrogen bottles sufficient for one years's operation. The accumulator shall be suitable for an operating pressure of [3,000] psig, with a pressure regulator set to supply hydraulic fluid at [1,750] psig to the system.

D. **Piping**: All necessary piping and valving within the unit and between the unit and the connected valve cylinders and equipment shall be provided. The piping system shall be of seamless steel pipe, conforming to ASTM B 31.1, designed for a maximum velocity of 15 feet per second, at a maximum operating pressure of [3,000] psig. The pipe wall thickness shall give a minimum factor of safety of 4. The fittings shall be 3,000 lb forged steel socket-welded type conforming to ASTM A 105. The flanges shall be 3,000 lb socket welded. The suction lines shall be equipped with expansion and vibration isolating joints. All individual lines to connected equipment shall have isolating valves at the power unit.

E. **Accessories**: The fluid power system shall be provided with all necessary accessories, such as pressure gauges, relief valves, oil level sight glass, pressure and level switches, filters, pressure reducing valves, operating and isolating valves, nameplates, electrical and control wiring, and all other appurtenances for a complete and operable installation. 110-mesh (149 micron) stainless steel strainers shall be installed in the pump suction line. The return lines to the reservoir shall have 10 micron filters at the reservoir. Both filters shall have an internal bypass and visual clogging indicators.

2.3 OPERATION

A. The fluid power system shall operate all connected [equipment] [valves] [gates] [cylinders] through a complete opening and closing cycle in the time indicated above, with minimum operating oil pressure in the accumulator. All opening and closing times shall be independently adjustable between [30 and 300] seconds. Rigid and secure means of locking these adjustments shall be provided.

2.4 CONTROLS

A. **Control Cabinet**: All electrical control devices and wiring termination shall be located in an enclosed cabinet with NEMA rating in accordance with the area designations of Section 16050. Cabinet shall be mounted on the power unit, or wall-mounted as indicated. Terminal blocks shall be provided for interconnection to any other control devices indicated. All controls shall be suitable for 120 volt power supply.

B. **Electrical Equipment**: The system shall be provided complete, with all required electrical components, including pump starters, branch circuit protection, magnetic circuit breakers, control transformers, elapsed time meter, pressure gauges, and switches.

C. **Automatic Controls**: Automatic controls shall be provided to:

1. Start the first pump when pressure in the accumulator drops to a pre-determined lower limit.

2. Start the second pump when required to maintain adequate operating pressure.

3. Stop the pump(s) when the pressure in the accumulator rises to a pre-determined upper limit.

4. Start the second pump and initiate an alarm should the first pump fail.

5. Alternate operation between the two pumps.

If variable-displacement, pressure-compensating pumps are provided, only items 2, 4, and 5, above, shall apply. In addition, however, under item 2, the second pump shall automatically stop when the first pump can adequately maintain the pressure in the accumulator.

D. **Protection Devices**: Protection devices shall be provided to perform the following functions:

1. Low oil pressure - alarm

2. Low-low oil pressure - shutdown

3. High oil pressure - alarm

4. Low reservoir oil level - alarm

5 Low-low reservoir oil level - alarm and pump shutdown

2.5 OIL COOLER

A. The fluid power system shall be equipped with a readily accessible heat exchanger to cool the hydraulic fluid at high ambient temperatures of up to 110 degrees F. The heat exchanger shall be of the shell and tube type, with thermostat control and all necessary controls, solenoid valves, temperature gauges, valves, and fittings, connected to the available cooling water supply. The equipment shall be sized for the quality and temperature of the available cooling water, to maintain the oil temperature at maximum 130 degrees F. The heat exchanger shall be mounted in such a way as to facilitate withdrawal and cleaning of the tubes.

2.6 OIL HEATER

A. Where fluid power systems are located in areas subject to ambient temperatures below 50 degrees F, the oil reservoir shall be equipped with an electric immersion heater with thermostat control, sized for the manufacturer's recommended temperatures.]

2.7 NAMEPLATES, TOOLS AND SPARE PARTS

A. **Spare Parts**: The WORK includes the following spare parts:

1. 2 sets of all packings, gaskets, O-rings, and seals
2. 3 sets of oil filter cartridges
3. 2 sets of all fuses
4. 1 set of all motor and pump bearings

Spare parts shall be stored in tool boxes, and identified with the equipment number by means of stainless steel or solid plastic name tags attached to the box.

B. **Supplies**: Oil to test, flush and initially fill the hydraulic system shall be provided. A supply of oil equal to the total volume of the system shall also be furnished for future use. The oil shall be a mineral based oil to the manufacturer's specifications.

2.8 MANUFACTURERS

A. Fluid power units of the type or model indicated shall be manufactured by one of the following (or equal):

1. R.W. Atkinson Co., Inc.
2. Miller Fluid Power
3. Parker Hannifin Corporation
4. Rexroth Corporation

PART 3 -- EXECUTION

3.1 INSTALLATION

A. Fluid power systems and equipment shall be installed in accordance with the manufacturer's written instructions.

3.2 CLEANING

A. Before installation, all piping components must be shipped to a pickling plant to undergo the following cleaning process. Remove all extraneous materials, remove all oils or grease in an alkaline bath, rinse with water, coat all vulnerable surfaces of valves, flanges, etc., acid-pickle, dry, and inspect piping before closing cleaned pipes.

B. After installation, the piping shall be thoroughly inspected and cleaned, to remove all foreign material, including mill scale, dirt, rust, oil, grease, weld spatter, and cutting chips. Cleaning may be accomplished by hot oil flush or other approved method. All cleaning shall be done in strict accordance with the manufacturer's written instructions.

3.3 FIELD TESTING

A. After installation, the fluid power system and piping shall be hydraulically tested to 150 percent of the maximum working pressure. The reservoir shall be tested for leakage by hot oil or other approved method, prior to painting. Operational tests shall be performed on all equipment and devices to demonstrate their proper function. Adjustable devices shall be checked for range of adjustment and given final adjustment.

** END OF SECTION **