SECTION 11217 - HIGH PRESSURE PISTON MEMBRANE PUMPS

City of San Diego, CWP Guidelines

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

A. The WORK of this Section includes providing high pressure piston membrane pumps consisting of pump, base, motor, [adjustable frequency drive,] and necessary appurtenances for pumping [a mixture of primary sewage sludge and waste activated sludge] through a [force main several miles long].

B. The WORK also requires that one manufacturer be made responsible for furnishing the WORK of this Section 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, as a minimum, manufacture the pump.

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 11030 Variable Speed Drives, General]
[2. Section 11032 Variable Frequency Drive]
3. Section 11175 Pumps, General

[1.3 SHOP DRAWINGS AND SAMPLES

A. The following information shall be submitted in compliance with Section 01300:

1. Proof that variable frequency drives and motors are capable of meeting the high torque requirements at low speeds.]

1.4 ENVIRONMENTAL CONDITIONS

A. The equipment to be provided under this Section shall be installed [indoors] [outdoors] at elevation [ ].

1.5 SERVICES OF MANUFACTURER

A. **Inspection, Startup, and Field Adjustment**: An authorized representative of the manufacturer shall visit the site for not less than [ ] day to furnish the indicated services.

B. **Instruction of OWNER'S Personnel**: The authorized service representative shall also furnish the indicated services for instruction of the OWNER'S personnel in the operation and maintenance of the equipment including step-by-step troubleshooting procedures with necessary test equipment for not less than [one] day.

PART 2 -- PRODUCTS

2.1 GENERAL

A. **Operating Conditions**: The pumps shall be designed to pump a [50][50] blend of [raw primary sludge] and [waste activated sludge] through a forcemain, [ ]-inch in diameter, approximately [ ] miles long. The pumps shall be designed for continuous heavy duty pumping of the blended sludge in concentrations up to [3] percent solids by weight.

$# _____

NTS: Please modify the paragraph below appropriately to reflect actual operating conditions.

_____ #$

[The pumps shall be operated manually in a lead/follow sequence. The pump(s) shall run until shutdown manually or automatically by a low level switch. The low level switch shall also activate a light at the main control panel. A high pressure discharge switch shall shut of the pump(s).]

2.2 DESIGN CONDITIONS

A. **Performance**: Pump(s) shall be designed for the following:

Equipment No.	- [	]
Capacity, gpm, max.	- [	]
Capacity, gpm, min.	- [	]
Discharge pressure, psig, max.	- [	]
Solids concentration, percent, max.	- [	]
Motor horsepower, hp, min.	- [	]
Strokes per minute	- [	]
Diameter of ball valves, in.	- [	]
Total dynamic head	- [	]
Net positive suction head, available, ft.	- [	]

2.3 MATERIALS

Component		Material
Cylinder housing	-	[Nodular cast iron] [cast steel]
Membrane housing	-	Cast steel
Membrane housing cover	-	Cast steel

Ball valve housing	- Nodular cast iron
Piston	- Bronze/chrome nickel steel
Cylinder lining	- Chrome nickel steel
Piston rod	- Chrome nickel steel
Triple valve	- Bronze/chrome nickel steel
Hydraulic reservoir	- Galvanized mild steel
Gear box	- Cast iron
Gear wheels	- Nodular cast iron
Connecting rod	- Nodular cast iron
Integral pinion gears with shaft	- Chrome moly steel
Gear wheel shafts	- Chrome manganese steel
Gear busings	- Bronze
Ball valve seat	- Chrome nickel steel
Membrane	- [Polyurethane]
Ball	- [Polyurethane coated steel]

2.4 EQUIPMENT FEATURES

A. **Pump**: Pumps shall be the piston [cylindrical] membrane type with [two] double acting pistons and [four] membrane chambers. Each membrane chamber shall contain a flexible membrane with a membrane status control device to provide a warning alarm dry contact in the event of a primary membrane rupture. Both suction and discharge ball check valves shall be provided to prevent backflow of pumpage. Hydraulic fluid shall be replenished through control valves when required from a storage reservoir. The hydraulic fluid reservoir shall be galvanized after fabrication. The hydraulic fluid shall be oil. The pump shall be protected with a pressure regulatory safety valve to prevent over pressure damage to the pump. If the pumpage becomes blocked, hydraulic fluid shall be discharged to the storage reservoir through the pressure regulating valve. The pump shall be provided with an air capped suction pulsation dampener and a nitrogen capped, bladder type, discharge pulsation dampener. The pump shall be provided with a 2-inch drain. All vents and drains on the pump shall be equipped with ball valves and piped to the nearest equipment drain. The pump shall be provided with a fabricated steel baseplate designed to accommodate the complete pump and drive unit. The base plate shall be galvanized after fabrication.

The internal gearbox components shall be force lubricated by a separate electrically driven oil pump. The constant speed oil pump shall provide adequate lubrication whenever the piston membrane pump is operated at any membrane speed. The oil pump shall start and shut off with the membrane pump and shall be driven by a 1800 rpm, 3 phase, 60 Hz, 460 volt motor.

B. **Motor**: All pumps shall be driven by continuous duty, high efficiency electric motors, complying with the requirements of Section 16040. Motors shall be provided with winding over-temperature protection. [Provide heaters in motor enclosures.] The pump manufacturer shall verify that the motor and drives are capable of handling the high torque loads.

C. **Piping**: High pressure piping shall comply with ASME B31.1.

D. **Controls**: Each pump shall be controlled by [an adjustable frequency drive specified in Section 11032].

[E. **Accessories**: A complete nitrogen recharging kit shall be supplied that consists of a [40] cubic foot, 2,200 psi steel cylinder, 50 to 750 psi pressure regulating set, pressure gauge valves, fittings, and hoses as required to recharge the discharge accumulator.]

2.5 TOOLS AND SPARE PARTS

A. Any special tools shall be provided in accordance with Section 11000.

B. The following spare parts shall be provided for each pump:

1. One set of piston rod packings.
2. One set of plunger packings.
3. One complete set [8] of ball valves.
4. One complete set [8] of valve seats.
5. [Eight] membranes.
6. One set of all gaskets and O-rings.
7. One set of motor bearings.

2.6 MANUFACTURER

A. Pumps shall be manufactured by the following (or equal):

1. Abel Pump, model [ ]

PART 3 -- EXECUTION

3.1 INSTALLATION AND TESTING

A. The CONTRACTOR shall install, align, and test the pumps [in conjunction with the variable frequency drive units and] in strict accordance with the instructions and recommendations of the manufacturers. As a minimum, the testing of the pump and drives shall include operation of each unit under various [speed and] load conditions. The CONTRACTOR is responsible for all instrumentation, piping, and valving as required to demonstrate that the pump meets the performance requirements.

In addition to the operational test, the CONTRACTOR shall conduct performance tests, in the presence of the CONSTRUCTION MANAGER, with the actual sludge [up to 3 percent solids]. After testing is complete, the CONTRACTOR shall clean the lines by pigging and flushing until all lines associated with these pumps are free of solids.

** END OF SECTION **