

**SECTION 11100  
HYDROPNEUMATIC SURGE TANKS**

**PART I – GENERAL**

1.01 DESCRIPTION

A. Scope

1. Hydropneumatic surge tanks.
2. Automatic level control system.
3. Air compressors.
4. Miscellaneous instruments and valves.

The Manufacturer shall provide all materials, equipment and incidentals required to furnish, transport, and place into operation the Hydropneumatic Surge Tanks. The system must be complete and operational with motors, base plates, control equipment and accessories as shown on the contract drawings and specified in this section.

1.02 QUALITY ASSURANCE

A. Reference Standards

Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

1. American Society of Mechanical Engineers (ASME) Section VIII, Division 1, Boiler and Pressure Vessel Code.
2. National Electrical Manufacturers Association (NEMA) 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
3. National Fire Protection Association (NFPA) 70, National Electric Code (NEC).
4. International Building Code and associated standards, 2018 Edition including all amendments, referred to herein as Building Code.

B. Miscellaneous

1. Pressure vessels shall be in accordance with the latest revision of the ASME Code for Unfired Pressure Vessels, Section VIII, Division 1.
2. The NEC shall be used for all wiring.
3. All local Plumbing Codes shall be met.
4. The system and anchorage of the tank shall conform to the Building Code.

1.03 SUBMITTALS

A. Shop Drawings

1. See Section 01300 for requirements for the mechanics and administration of the submittal process. Show all taps, location of control equipment, supports and other appurtenant devices. Drawings shall include dimensions and cross-sectional views of all equipment showing detail of construction. Instrumentation description sheets verifying controls as specified herein including pump level, sight glass, air pressure gage. Source quality control test reports.

- B. Operation and Maintenance Data
  - 1. See Specification Section 01730 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

#### 1.04 QUALIFICATIONS

- A. Tank Supplier: Provide a minimum of five references for a comparable installation.
- B. Tank Welders: ASME certified.

### **PART 2 – PRODUCTS**

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. AA Tanks
  - 2. Wessel Company
  - 3. Approved equal

#### 2.02 GENERAL REQUIREMENTS

- A. The hydropneumatic surge control system shall include a surge tank, air compressor assembly, and automatic water level control system.
- B. The surge tank must be designed to match the dynamics of the pumping station.
- C. There shall be no less than 10% reserve water in the tank at the maximum outflow conditions.

#### 2.03 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Provide hydropneumatic surge control system. Major components shall include:
  - 1. Hydropneumatic Surge Tanks.
  - 2. Air compressor Packages.
  - 3. Automatic Level Control System.
  - 4. Miscellaneous instruments and valves.
- B. The pressure transients in the pipeline system following pump shutdown/start-up from design operating conditions must not cause cavitation nor water column separation at any point in the pipeline system and must not exceed the pressure rating of the piping at any point in the pipeline system.
- C. Surge tanks shall be designed to limit maximum pressure increase in the piping systems due to surge wave to less than the total pressure specified and to limit the minimum system pressures so that no liquid column separation occurs.
  - 1. The tank shall be designed to protect the systems at the flow rate specified.
  - 2. Surge tank performance will be verified by operational field tests at pumping rates defined above for piping system.
  - 3. The surge tank supplier shall provide a chart recorder and pressure transducer system to develop a permanent record for each system test.
- D. The manufacturer shall conduct a surge analysis of the pumping station and piping system, utilizing the specified data. Results of the analysis shall clearly indicate that the design and size of the tank provided will adequately protect the system from excessive pressure surges.

## 2.04 COMPONENTS

- A. Hydropneumatic Surge Tanks:
1. Surge tanks shall be constructed of carbon steel for a maximum allowable working pressure of 250 psig in accordance with the ASME Section VIII.
    - a. Surge tanks shall be provided with a flanged line connection, two support saddles, lifting lugs and couplings for air supply, drain, safety relief valve and level control systems.
    - b. Surge tanks shall be provided with an elliptical manway.
  2. Size of the surge tanks is to be determined and fixed by the supplier's surge analysis or one provided by the Owner.
    - a. Tanks must not have moving parts, vanes or elastomers and shall contain differential nozzles and vortex breakers.
    - b. Each tank shall have a minimum volume of 2600 gal.
    - c. Each tank shall have an outside diameter no greater than 6 ft.
- B. Air Compressors:
1. Air compressor package shall include two duplex (two air compressors mounted on one air receiver) air compressors.
    - a. Each air compressor shall be air-cooled, two-stage, oil lubricated reciprocating type mounted on one air receiver and piped and wired to the control panel.
    - b. Air compressors shall be the standard product of a manufacturer such as Ingersoll-Rand or approved equal, who is regularly engaged in the design and construction of fully automatic air compressor systems.
  2. A Totally Enclosed Fan Cooled (TEFC) motor shall drive each air compressor and shall be adequate to drive each air compressor continuously at full-rated output.
    - a. Motor shall be at least 10 HP.
    - b. Power supply shall be 480 V, 3 PH and 60 Hz.
  3. Compressor unit shall include a totally enclosed crankcase of cast iron, separate detachable deep finned cylinders, matched balanced pistons, separately removable valve housing, low oil switch and a direct reading pressure gage.
    - a. The low oil switch shall shut down the compressor if the oil level is too low.
    - b. The switch shall not reset without adding oil.
  4. Adjustable Pressure Switches:
    - a. Furnish and install adjustable pressure switch on the receiver tank.
      - i. The pressure switch shall use a Buna-N diaphragm and be housed in a NEMA 4X housing.
      - ii. The adjustable range shall be from 10 - 300 psi and be equipped with a 1/4 IN NPTF pressure connection.
      - iii. The contact closure shall be suitable for operation on either a 110 Vac circuit or a 24 Vdc circuit.
    - b. Alarms shall cause a contact closure signal to be transmitted to the central control system. Pressure switches shall be PSW - 100 Series pressure switches manufactured by the Omega, or approved equal.
  5. Control panel shall be provided with a power on light, HAND-OFF-AUTOMATIC (HOA) switch, run light, motor thermal overload alarm light and low oil level alarm light for each compressor.
    - a. Panel shall contain combination magnetic motor starter and circuit breaker for the air compressor.
  6. Air compressor shall start and stop based on pressure in the air receiver.
    - a. Dry contacts shall be provided in the panel for remote indication of running conditions for the compressor.
    - b. Dry contacts shall be provided for remote operation of low pressure alarm conditions.

- c. Compressor shall be shutdown by motor thermal overload, or low oil level.
- d. An alarm condition shall energize a local and remote alarm light.
- 7. Compressor shall start automatically, provided its HOA switch is in the AUTO position.
  - a. Compressor shall run continuously if its HOA switch is in the HAND position and shall shut down if its HOA switch is in the OFF position.
- 8. Hydropneumatic surge control system supplier shall select the compressor volumetric capacity and discharge pressure.
  - a. As a minimum, the capacity of each duplex unit shall be 50 cfm free air at 200 psig.
  - b. Ingersoll-Rand model 7T2 (duplex) or equal will provide the required capacity.
- 9. Air receiver shall be a minimum of 240 gal capacity, 30 in DIA, design pressure of 300 psig, horizontal, grasshopper type.
- 10. Air compressors shall be provided with all necessary air lines and fittings for a complete surge control system.
- 11. Air compressor package shall be coated with the standard factory coating.

C. Level Control System:

- 1. The purpose of the level control system is to control the water level in the pressure vessel within the designed range depending on the number of pumps in operation and the associated dynamic heads.
- 2. Level control device shall consist of a single RF probe suitable for use with potable water, associated electronic unit and control panel.
  - a. Mount probe in a probe well connected to the surge tank.
  - b. When water level is above the normal operating range, air shall be added through a solenoid valve from the air compressor.
  - c. When water is below the normal operating range, air shall be vented from the surge tank through a separate solenoid valve.
  - d. High and Low alarm signals shall be generated when the water level is out of range for a time period exceeding the time delays.
- 3. Time delays shall be used to prevent false alarms and adding or venting air during minor fluctuations that last a short period of time.
- 4. Level control panel shall house all relays, time delays, and alarm contacts.
  - a. Panel shall be NEMA 12 and operate on 120 V, 60 Hz, 20 amp electrical service.
  - b. Electronic unit associated with the sensing RF probe should be mounted inside the level control panel.

D. Miscellaneous Components:

- 1. One each per surge tank.
  - a. 1 IN safety relief valve.
  - b. 3/4 IN solenoid valves, one for adding air and one for venting air.
  - c. 3/4 IN air muffler.
  - d. 3/4 IN check valve for air line.
  - e. 1 IN and 3/4 IN valves for isolation/bypass of solenoid valves, probe well and for probe well drain.
  - f. Sight glass assembly including 3/4 IN ball check isolation valves, 3/4 IN glass and plexiglass gage glass protector for visually checking tank water level.
  - g. Sight glass to cover the normal operating range in the surge tank.
  - h. Probe well and probe assembly.
  - i. Air lines and fitting suitable for the pressures expected in this system. Piping shall be galvanized steel with 300 LB fittings.

## 2.05 SOURCE QUALITY CONTROL

- A. Hydrostatic test the hydropneumatic surge tank in accordance with ASME Code for Unfired Pressure Vessels.

- B. Submissions shall include Form U-1A "Manufacturers' Data Report for Unfired Pressure Vessels" prepared by the tank manufacturer to certify that the tank was built in accordance with ASME Code Rules for the Construction of Unfired Pressure Vessels and inspected by a certified inspector.
  - 1. Include copies of this form in the Operation and Maintenance Manual.

## **PART 3 – EXECUTION**

### **3.01 INSTALLATION**

- A. Cast anchor bolts in concrete foundation as embedded items.
  - 1. Use rigid template for each set of bolts.
- B. Contractor shall furnish and install the surge tank to include, all necessary piping, valves, and other related appurtenances.
- C. Surge tank shall be installed in accordance with manufactures recommendations.

### **3.02 FIELD QUALITY CONTROL**

- A. Testing shall be performed by the Contractor in the presence of the Engineer and a representative of the manufacturer.
  - 1. Testing shall consist of functional test of the level control system and a simulated power failure when pumps are running at maximum operating flow conditions.
- B. Employ and pay for services of equipment manufacturer's field service representative(s) to:
  - 1. Inspect equipment covered by these Specifications.
  - 2. Supervise any adjustments and installation checks.
  - 3. Conduct startup of equipment and perform operational checks.
  - 4. Provide Owner, through the Contractor, with a written statement that manufacturer's equipment has been installed properly, started up, and is ready for operation by Owner's personnel.
  - 5. Instruct Owner's personnel at jobsite per Section 01800 on operation and maintenance of the piece of equipment.

**END OF SECTION**