

11.01 SCOPE OF WORK

The work covered by this section of the specifications consists of furnishing all plant, labor, materials and appliances and performing all operations for the installation of piping and equipment as shown on the drawings and hereinafter specified.

11.02 PIPING AND FITTINGS

This work consists of furnishing all plant, labor, equipment and materials in performing all operations necessary to install the piping within the well house building or room as shown on the plans. All work to be performed as shown on the drawings and specified.

- A. National Electrical Code:
All electrical work.

- B. American Society for Testing Materials:
 - A-72 Welded Wrought Iron Pipe.
 - A-120 Black and Hot-dipped Zinc-coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses.

- C. Materials

The following items of materials installed within the well house or room shall be furnished by the Contractor and shall conform to the various requirements as hereinafter specified.

- 1. Ductile Iron Pipe: Conform to the requirements of ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51, Class 150. Inside surfaces of pipe to be cement mortar lined per the requirements of ANSI/AWWA C104/A21.4. No exterior coating.

- 2. Ductile Iron Fittings: Standard fittings shall conform to the requirements of ANSI/AWWA C110/A21.10, Class 150. Compact or short body fittings shall conform to the requirements of ANSI/AWWA C153/A21.53, Class 150. All fittings to be cement mortar lined per ANSI/AWWA C104/A21.4. No exterior coatings.

- 3. Galvanized Steel Pipe: Conform to ASTM A538.

- 4. Gate Valves: Conform to AWWA C515, Class 150. All valves shall open right, or clockwise. All valves shall be equipped with hand wheel operators.

5. Butterfly Valves: Shall be so designed and fabricated that they will conform to AWWA Standard C504-00 for Class 150B valves. The rubber valve seat shall cover the entire interior surface of the valve body and the face of the body. The valve disc shall be streamlined, free of external ribs, keyed to the shaft, provided with suitable means for positioning and shall utilize wedge type closing against the rubber liner at a full close seating angle of 90° to the axis of the pipe. Valves shall be manufactured by Dresser Manufacturing Division Keystone International, Inc. or an approved equal.

6. Wafer Check Valves
 - a) Valves 3" and larger shall have a cast iron body with a minimum non-shock W.O.G. working pressure of 150 psi. Seats shall be Buna-N mounted on the disc and shall provide leak-proof closing. The disc shall consist of one bronze disc which is springloaded to prevent slam, pivoting at a stainless steel hinge pin. The spring shall be 316 S.S.

 - b) Valves shall be wafer type for mounting between ANSI 125 pound standard drill flat faced flanges unless otherwise specified or shown on the drawings.

7. Wall Castings and Sleeves shall be installed in all concrete work where pipes, wires, or other equipment pass through. Wall castings for 4-inch diameter or larger pipe shall be of cast iron having an anchor flange located in the center of the concrete wall or floor. Castings and sleeves shall be similar to those as manufactured by the East Jordan Iron Works or approved equal. Joint between pipe and sleeves shall be sealed with "Link-Seal" fittings or approved equal.

D. Installation of Piping Valves and Fittings

1. Cement Lined Ductile Iron Class 52 or Cast Iron Valves and Fittings shall be used for all piping 4-inch diameter and larger. Flanged piping, valves and fittings shall be used for all interior exposed piping unless otherwise approved by the Township Engineer. Pipe, valves and fittings shall be carefully laid to line and grade. Care shall be taken to keep the pipe clean and free from dirt and other foreign materials. "Victaulic" fittings shall be considered as an acceptable equivalent, subject to the approval of the Engineer.

Piping laid in the ground shall have bearing over its entire length. Piping along floors, walls, or ceiling shall be adequately supported by saddles, posts, wall brackets, pipe hangers, or other approved devices. The exact location, number and design thereof shall be subject to the approval of the Design Engineer. "Uni-Flange" type fittings shall be rodded.

2. Galvanized Steel Pipe shall be used for all interior piping less than 4 inches in diameter or as approved by the Township Engineer.

- E. Pipe Taps
Wherever indicated or required, pipe or fittings shall be tapped to receive a small pipe or special fittings.
- F. Disinfection
All piping and equipment shall be disinfected in accordance with AWWA C651, and Section 9.07 of these specifications.

11.03 PRESSURE TANKS

- A. General

The Contractor shall furnish and install pressure tanks as shown on the plans and as hereinafter specified.

- B. Pressurized Bladder Vessels

The Pressurized Bladder Vessels shall have a fiberglass-wound and epoxy resin sealed outer tank, one-piece high density polyethylene inner cell, heavy mil ethyl-vinyl-acetate (EVA) air cell, reinforced polypropylene upper and lower flanges, reinforced polypropylene base, stainless steel service steel, brass body, Schrader core assembly air valve, and high density polyethylene weather cap. The air cell shall be capable of being removed and replaced while the tank is installed.

- C. Hydro-Pneumatic Tank

The hydro-pneumatic tank shall be designed and constructed in accordance with "A.S.M.E. Code for Unfired Pressure Vessels" for 150 psi working pressure. The tank shall be enclosed within the well house or as approved by the Township Engineer.

The tank shall be equipped with a water level sight gauge mounted on the end of the tank as shown on the plans.

The tank shall also be equipped with a pressure gauge, air pressure relief valve and air volume control mechanism and all tank couplings required to install these items.

The tank shall be coated on the inside with enamel application as appropriate for potable water systems. Outside of tank shall be coated with factory primer prior to delivery.

D. Air Volume Control

The air volume control mechanism for the pressure tank shall utilize an air compressor, mounted within the well house, liquid level probe and pressure switches for operation. This unit shall operate automatically and independently from the pumps and shall maintain a constant air charge in the tank. See Section 11.06 for coordination with pump operating sequence.

11.04 FLOW METER

- A. Flow meter shall be a electromagnet flow meter (Mag-Meter) where Primary unit to be a minimum ANSI 150 carbon steel flange sized to match pipe diameter. Mag-Meter shall be supplied with two properly sized Hastalloy-C grounding rings.
1. Liner material shall be manufactured of Tefzel and to be compatible with Sodium Hypo Chlorite.
 2. Electrodes shall be manufactured of Titanium and to be compatible with Sodium Hypo Chlorite.
 3. Classification shall be non-hazardous NEMA 4X.
 4. Primary shall be rated for temporary submergence for a minimum of 30 minutes if installed above grade, and total submergence if installed below grade.
 5. Grounding rings shall be used on all applications and connected electrically to the Mag-Meter per manufactures specifications.
- B. Flow meter converter shall be a remotely mounted unit with the following specifications.
1. Converter shall be type rated NEMA 4X die-cast Aluminum enclosure.

2. Converter shall be UL or FM listed
 3. Converter shall operate on 120Volts AC 1Ø power.
 4. Converter shall supply a minimum of 2 dry contact outputs rated at a minimum of 3 VA. One for scaleable pulsed flow output, one for reverse flow.
 5. Converter shall supply one 4-20 ma signal output, scalable to current flow rate.
 6. Meter shall have a scalable display where current flow and total flow can be displayed simultaneously.
 7. Total flow display must be scalable so as to read in kgl while current flow can be read in gpm.
 8. Meters under 12 inches in diameter shall have an accuracy of 0.25% of rate from 0.67 feet per second to 30 feet per second.
- C. Meter shall be installed according to the manufactures specifications and in a direction so as to measure forward flow in the normal flow direction when water is moving through the line under normal flow conditions.
1. Converter shall be mounted in a location where meter production data can be easily accessed and seen.
 2. Electrical connections shall be made in accordance with manufactures specifications.
 3. Electrical connections shall be a minimum of NEMA 4 to the meter utilizing manufactures seals and compounds to form necessary water tight connections.
 4. Supplier shall provide proper start up and calibration services.
 5. Supplier shall provide a minimum of one year warranty on all parts and labor.
 6. Supplier shall provide a minimum of 50 feet of manufactures meter cable or as specified on drawings where there shall be no splices between converter and primary unit. All cable shall be protected in conduit unless specified differently by manufacture.

D. Acceptable Manufacture:

ABB Part Number 10DX3111 with 50XM1000 converter or approved equal.

11.05 PRESSURE RELIEF VALVE/SURGE ANTICIPATOR

A. The valve shall be hydraulically operated, single diaphragm-actuated and globe or angle pattern, flanged. The valve shall consist of three major components: the body with seat installed, the cover with bearings installed and the diaphragm assembly.

1. Diaphragm Assembly: The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve separating operating pressure from line pressure. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the main valve or pilot controls.
2. Main Valve Body: No separate chambers shall be allowed between the main valve cover and body. Valve body and cover shall be ductile iron. The valve shall contain a resilient, synthetic rubber disc, with a rectangular cross-section contained on three and onehalf sides by a disc retainer, forming a tight seal against a single removable seat insert. The main valve seat and the stem bearing in the valve cover shall be removable.
3. Pilot Control System: The pressure relief pilot shall be an adjustable, spring-loaded, normally closed diaphragm control designed to permit flow when upstream pressure exceeds the control setting. The low-pressure pilot shall be an adjustable, spring-loaded, normally open diaphragm control designed to open when the sensed pressure falls below the control setting and close when pressures are normal. The pilot system shall contain an adjustable hydraulic limiter to limit valve travel during low-pressure opening without affecting high-pressure relief valve travel. The contractor shall connect the sensing/pilot supply connection to the main discharge header with minimum 3/4" pipe or tubing.
4. Products: Subject to compliance with requirements, provide from the following manufacturer:
 - a. Cla-Val Model No. 52-03

11.06 PUMP OPERATIONAL CONTROLS

A. General

The Contractor shall furnish and install pressure switches, complete, as outlined herein. Pressure switches shall be mounted in the well house to operate the well pump based on the water pressure. The pressure switches shall be adjustable from ___ to ___ psi. The operation of the well pump(s) shall be controlled based on the pressure within the system and, in the case of a hydro-pneumatic tank, the water level within the tank. The operating sequence shall be as follows:

USING A PRESSURIZED BLADDER VESSEL

The lead pump shall operate until the pressure at the well house reaches PSIG. Should the pressure continue to drop with the lead pump operating, and the pressure reaches PSIG, the lag pump shall engage. Both pumps shall operate until the pressure at the well house reaches PSIG.

USING A HYDRO-PNEUMATIC TANK

The lead pump shall operate until one of two (2) conditions are met:

1. The pressure at the well house reaches PSIG.
2. The tank water level reaches the high water probe.

If the tank water reaches the high water probe prior to achieving a pressure of PSIG, the compressor will engage and operate until the pressure increases to PSIG and the pressure switch is reset.

Should the pressure continue to drop with the lead pump operating, and the pressure fall to PSIG, the lag pump shall engage. Both pumps shall operate until one of the two (2) conditions listed above are met.

The alternating sequence shall be accomplished by means of an alternator in the electrical circuitry at the well house. A selector switch shall be located at the well house pump panel to allow manual selection of the pumps to be included in the alternating sequence.

All pumps shall be capable of being operated manually as well as automatically by lever selection of a hand-off-automatic switch at the well house. If one (1) pump is switched off for repairs, the other pump(s) shall be able to operate normally in an automatic mode.

Each pump shall have its own completely independent control system so that the failure of any components in one (1) pump will not affect the automatic or manual operation of the other pump(s).

Each well pump shall be equipped with an hour run meter mounted in the pump control panel.

11.07 EQUIPMENT INSTALLATIONS AND START UP

A. General

All equipment shall be installed in a neat, workmanlike manner, acceptable to the Design Engineer with concurrence of the Township Engineer and in conformance with all applicable Local, State and Federal codes and requirements.

B. Factory Trained Start-Up Personnel

The Contractor shall furnish the services of an experienced factory trained field representative to start up all equipment. He shall be employed by the Contractor in such capacity to interpret the manufacturer's installation guide and instructions, to supervise the installation and start-up of such equipment and to instruct the operating and maintenance personnel for a reasonable period of time. (A minimum of four (4) hours of instruction.)

The representative of the equipment supplier shall be responsible to insure that all equipment, controls, alarms, wiring, flow meter and all associated components are properly installed and functioning properly.

C. Systems Start Up

It shall be the Contractor's responsibility to coordinate work between his subcontractors, equipment suppliers and utility companies to insure that all components of the system function properly as described herein.

When the system or a major component of the system is entirely installed and ready for testing, the Contractor shall notify the Township Engineer and operation/maintenance personnel, in writing, of the time and date the start-up testing will be done. The Contractor, subcontractor, and equipment supplier's representatives shall be present for final start-up

testing. During the start-up test, the Contractor shall operate all equipment in such a manner to demonstrate that all components are functioning properly.

If the equipment fails to perform, it will be the responsibility of the Contractor to arrange for repair or replacement of the defective parts and scheduling of a new start-up session.

Should the equipment pass its initial start-up testing but fails during the one-year guarantee period, the Contractor shall coordinate the necessary repairs or replacements with the subcontractors and suppliers.

11.08 SHOP DRAWINGS

The Contractor shall submit, as prescribed under "General Requirements" section, complete shop drawings and details of all equipment to be furnished under this section. These shop drawings shall be submitted and approved by the Design Engineer with concurrence of the Township Engineer prior to installation.

11.09 RECORD DRAWINGS

Any changes that are made in equipment, controls, wiring, etc. from that shown in the plans and specifications shall be made only by approved shop drawings. After such changes are made, the Contractor shall submit to the Design Engineer and Township Engineer, record drawings which show these changes in equipment installation. Contractor shall supply "record" electrical schematic drawing to Design Engineer to be included in final close-out package delivered to the Township.

11.10 GUARANTEE

The Contractor shall furnish a manufacturer's guarantee covering all material and equipment that he furnishes. He shall guarantee his workmanship and material for a period of one year from the date of acceptance. Such guarantee shall provide for the replacement of defective workmanship, together with the restoration of any related materials or workmanship that are disturbed as a result of such imperfections in the work. All such replacements or repairs shall be done without expense to the Owner. All guarantees shall be in written form and submitted to the Owner in triplicate.

11.11 PAINTING

All pipes, valves, flow meters, and any other portions of watermain or ferrous metals exposed inside of the well house shall be painted. If installed, the hydropneumatic tank shall be painted. If necessary, heat shall be provided to maintain good drying conditions. All items to be painted shall be dry and clean before application of the paint. Any rust or scale shall be removed by wire brushing or scraping. Painting system shall be:

- 1 coat (350 sf/g) Pug Primer
- 2 coats (500 sf/g) Rustamor 500

11.12 TELEMETRY

A dry contact strip shall be supplied within the wellhouse with the following inputs:

1. Well Pump No. 1 on.*
2. Well Pump No. 2 on.*
3. Low pressure.
4. High pressure.
5. Security.
6. Flow meter.

*Additional contacts shall be installed for additional wells.