

PENNICHUCK WATER WORKS, INC.
PITTSFIELD AQUEDUCT COMPANY, INC.
PENNICHUCK EAST UTILITIES, INC.
TECHNICAL SPECIFICATIONS
FOR
COMMUNITY WATER SYSTEM CONSTRUCTION



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CWS Standards of Construction

1. Develop wells with a NHDES approved capacity of at least 1.3 gallons per minute (gpm) per home in a minimum of 2 wells in order to provide domestic and odd/even irrigation service to the homes in the project. The wells shall be capable of producing at required gallons per minute continuously over a period of 72 hours, delivered into the storage tank with the pump test occurring between the last week in July and the end of the first week in September.
2. Provide atmospheric storage equal to the sum of the required fire protection (if supplied) plus 875 gallons per home in the form of a cast in place, split concrete reservoir, buried on grade or two precast concrete reservoirs, buried on grade or steel atmospheric storage tanks (two, each with 50% of the required capacity) with a two coat NSF61 approved epoxy paint system (both interior and exterior) located above grade inside the pump house. Provide storage with appropriately sized screened vents, emergency fill connections, overflows and a minimum of 1 24" diameter, water tight manway. Overflows to be piped to the ground and discharged to a pad designed to eliminate erosion during an overflow.
3. Provide and install an ion exchange softening system if the hardness of the wells exceeds 100 ppm of hardness as calcium during the first year of operation after the closing date.
4. Provide and install a green sand filtration system should the well water have iron or manganese levels that exceed the EPA/NHWSEB secondary standards during the first year of operation after the closing date.
5. Provide and Install a radon removal system to reduce radon levels below 300 pico curries per liter if the raw water radon levels exceed 1000 pico curries per liter during the first year of operation after the closing date.
6. Provide and install a water treatment system to remove any other contaminant detected during the first year of operation after the closing date that is regulated by the Safe Drinking Water Act and that exceeds the maximum allowed contaminant level for that contaminant as established by the Safe Drinking Water Act.
7. Acquire all necessary local, state and federal permits necessary to construct and operate the completed Community Water System.

8. Construct a pumping station meeting PWW specifications with the following components:
 - a. **Electrical and Controls**
 - i. 400 Amp, 240/120V, Single phase service entrance (Three Phase service is also acceptable). Final service size may be smaller subject to final station design and loads. Electrical entrance may be overhead or underground based on local codes and zoning. Underground service shall be via two 4 inch schedule 80 PVC conduit.
 - ii. Well starters and controls. Wells will be controlled with the following Allen-Bradley equipment:
 1. 5/03 Processor, Model #1747 L1531
 2. Analog Input Module #1746 NI8
 3. Analog Output Module #1746 NO4I
 4. Digital Input Module #1746 IB16
 5. Digital Input Module #1746 OW16
 - iii. Provide an Uninterruptible Power supply capable of operating the SCADA system and up to a 5 Watt radio for a minimum of 1 hour.
 - iv. Provide one two inch PVC conduit from the street to the station for purposes of providing phone service in the event that service to the station is underground.
 - v. Provide the station with a propane fired genset with an automatic transfer switch capable of operating the entire station load. The genset will be air cooled and may be located inside or outside the pump station. If the genset is located outside the station it shall be provided with a weather tight enclosure and shall be mounted on a concrete pad approved by the genset supplier. The genset shall be provided with a critical grade muffler. If the genset is located inside the station provide the pump station with adequate ventilation to operate and cool the genset.
 - vi. Install a pressure sensor meeting Pennichuck's specifications on the discharge side of the pumps capable of producing a 4-20 mA signal in accordance with the attached standard detail.

Install a pressure sensor meeting Pennichuck's specifications on the suction header capable of producing a 4-20 mA signal over a range of water depth of 0 to 20' in accordance with the attached standard detail.

- vi. Install a smoke, an intrusion, a low temperature, a high temperature and a float alarm at the station. The alarms will be tied into the PLC to create an alarm on the SCADA system.
- iv. Provide ¾" pump bypass line from discharge side of pumps back into storage reservoirs. Line to be controlled by ¾" solenoid valve. Solenoid valve to open if station flows drop below 5 gallons per minute for at least 30 seconds and to close once flows exceed 10 gallons per minute for at least 30 seconds. Tap for bypass line to be located before the station discharge meter. Tap to be provided with a ball valve shut off at the tap point into both the suction and discharge piping.
- v. Provide two bladder style hydropneumatic tanks with sufficient acceptance to absorb 150 gallons of water over a 10 psi swing at an average pressure of 75 psi.
- vi. Program the station PLC to operate in accordance with PWW standards for a CWS station. A sample operating narrative is attached.
- vii. Provide a station low temperature alarm that is triggered via an adjustable thermostat. The alarm shall be connected into the PLC.
- viii. Provide the station with a temperature controlled (activate on high temperature) ventilation system consisting of an exhaust fan with a screened fixed louver discharge and an automatic electric intake louver with a screened fixed louver intake.
- ix. Lighting to be twin tube moisture resistant fluorescent lighting with dust covers. Provide sufficient lighting to adequately light the interior of the booster station.
- x. Provide Duplex courtesy outlets with GFI protection, a minimum of one outlet per wall on the inside of the station.

b. Pumps

- i. The station shall be provided with a minimum of two variable frequency driven pumps each capable of producing the maximum expected flow rate at the desired operational pressure. The desired operational pressure shall result in the highest unit the Community Water System having a pressure no less than 45 psi. The pumps shall be controlled through the Allen-Bradley equipment listed in b. above. The pumps shall be called to start/stop based on flow out of the station and shall run at a speed necessary to maintain the desired operational pressure. If the flow signal from the meter to the PLC is lost or if the pressure drops to 5 psi less than the desired operational pressure for more than 30 seconds than pumps shall be operated based on the pressure settings established in the SCADA program..
- ii. Pumps to be provided with running time meters. The meters shall register in hours and tenths of hours up to 99999.9 hours.
- iii. Pumps shall be of cast iron and bronze construction per Appendix 1 - Pump materials of construction or as approved by Pennichuck.
- iv. Pumps shall be equipped with mechanical shaft seals and bronze impeller wear rings. Shaft seals shall be of the face type with Ni-resist stationary seat, carbon sealing washer, Buna rubber flexible members, stainless steel metal parts and stainless steel spring.
- v. Pump suction and discharge flanges to be tapped and provided with 1/4" brass nipples and brass/stainless steel ball valves. The ball valves shall be provided with a FIP outlet.
- vi. Provide the pumps with an 8" high concrete pad with a one inch chamfer on all edges.

Each pump shall be supplied with a non-overloading, 480/230 volt, three phase, 60 HZ, premium efficiency motor (min. efficiency shall equal or exceed 90.0%), inverter duty, ODP motor. The motor shall have a minimum service factor of 1.15. Motors shall be fitted with heavy lifting rings or eyes.

vii. Provide a minimum of 12" clear space between each pump.

c. Site Work

- i. Loam, seed and mulch completed building site with a minimum of 4" of loam.
- ii. Construct minimum 12' wide paved drive with 12" minimum of gravel. The pavement shall have a minimum thickness of 3", with two inches of base binder and 1" of finish coarse pavement.
- iii. Install 6" under drain around concrete reservoirs and periphery of building (if required) and discharge to daylight. Screen discharge with stainless steel bug screen.
- iv. Backfill inside of building with compacted sand/gravel and level for slab.
- v. Provide the station with a minimum of 1 floor drain located in the vicinity of the pumps. Connect building floor drain into building under drain (if a building under drain exists).
- vi. Place 6 mil poly barrier on sand under concrete slab.

d. Foundation

- i. Poured concrete. All concrete to be 3000 psi. Concrete for slab to contain fibermesh and be a minimum of 6" thick. Four foot high by 10" thick frost walls on 12" thick by 24" wide footers.
- ii. All concrete and all plain concrete block to receive two coats of a cementitious based waterproofing product such as "Thoroseal" or equal.

- iii. All concrete to have 2" of styrofoam attached to it with styrobond or equivalent product to at least 4' below finished grade. The styrofoam shall be covered above grade and to 12" below grade with a cementitious coating designed for covering styrofoam in order to protect its integrity.
- iv. Poured concrete for Reservoir walls shall to be 5000 psi, and water tight.

e. Superstructure

- i. The station will be constructed of split faced, insulated block constructed with "Korfil" block insulation or equivalent. The block shall be manufactured with "dry-block" additive. The block shall be constructed with 3/8" struck joints. The mortar shall be provided with "dry-block" additive. Block to be reinforced at 4' centers with 2 - #5 rebar from the foundation to the rafter sills. The cores containing the rebar shall be filled with cement. Reinforce the CMU horizontally with off-center ladder type reinforcement @ every other block coarse. Last coarse of block to be a CMU bond beam with 2 - #5's continuous around the perimeter of the building. Fill last coarse of block with cement.
- ii. The station will be shingled with 225# asphalt shingles rated for 25 years of service. The shingles shall be underlain by 15# felt paper. The first three feet of the roof shall be underlain by ice and water shield. Shingles must be nailed to the roof, no staples allowed. Provide 8" aluminum drip edge along all edges of the roof. Provide for continuous soffit and ridge vents.
- iii. The soffit and fascia shall be covered with aluminum or vinyl.
- iv. The roof shall be designed for an 80 psf snow load and shall be framed with 5/8" CDX plywood. Plywood clips are required between each rafter if the plywood span exceeds 16" between roof rafters. The roof rafters shall be attached to the building superstructure with hurricane clips.

- v. Insulate roof with R-38 unfaced fiberglass.
- vi. Provide continuous proper vent from soffit to ridge.
- vii. Cover all fiberglass on the walls with 4 mil poly vapor barrier.
- viii. Ceiling to be 3/8" AC plywood. The ceiling shall be attached to the ceiling joists with 1-5/8" drywall screws. The drywall screws shall be countersunk and the holes shall be spackled flush with the ceiling. The ceiling shall be painted with two coats of epoxy paint.
- ix. The station shall be provided with a six-foot wide by 6'8" high double leaf, steel insulated door. The door shall be mounted in a steel frame that is cast into the block wall as it is constructed. The Door and door frame shall be shipped with a factory coat of primer paint. Door to finish coated with one coat of epoxy paint. Hardware to be provided by Contractor, cylinder to be provided by Pennichuck Water Works. Provide door lock with dead bolt. Provide a locking pin on the right hand door. Provide a 6"x4"x1/2" steel lintel over the door. The lintel shall be primed and finish painted prior to installation.
- x. All interior surfaces of the building to be coated with two coats of epoxy based paint.
- xi. Provide station with automatic ventilation system. Intake louver and fan to be powered on by high building temperature or through manual switch. Fan to be capable of producing a minimum of one air change per hour. The automatic operation of the louver shall be controlled through an adjustable thermostat. Louvers to be aluminum and all aluminum surfaces in contact with concrete with bitumastic prior to installation. The station will be heated with two thermostatically controlled propane unit heaters. Thermostatic control shall be via remote mounted thermostats with temperature ranges from 40 to 80 degree Fahrenheit.

- xii. Provide station with propane, natural gas or electric heat. Provide a minimum of two heaters in the station each with the capability to heat the station to 60 degree Fahrenheit when the outside temperature is -20 degree Fahrenheit. Final selection of type of heat to be made by Pennichuck.

e. Piping

- i. All interior piping shall be either type "L" copper, brass or Class 52 cement lined ductile iron lined rated for a working pressure of 250 psi. Booster pump suction piping may be schedule 80 PVC.
- ii. Flanges shall be drilled with the standard 125-pound template.
- iii. Velocities through the station piping shall not exceed 7 feet per second for ductile iron or 4 feet per second for copper piping.
- iv. Velocities through the pump check valves shall not exceed 7 feet per second. The check valves shall be located on the discharge side of the pump and shall be Danfoss Flomatic Model 745 or American Flow Control Series 2100 flanged check valve.
- v. All pumps to be provided with isolation valves (resilient seat gate or brass ball valve) on both the suction and discharge side of the pumps.
- vi. All pumps to be provided with a minimum of one union or flanged dismantling joint on either the suction or discharge side of the pump.
- vii. All piping shall be supported from the floor or ceiling of the pumping station and shall allow for the removal of the pumps without the need to support the piping.
- viii. Install an appropriately sized turbine meter on the discharge side of the pumps. The meter shall produce a 4-20 mA signal and shall be used to control the pump operations in conjunction with station pressure. Provide a 2" bypass around the turbine meter so that the turbine meter can be removed without shutting the booster station down.

- ix. Provide ½” sample tap of the discharge side of the pumps.
- x. Provide ½” tap with ball valve and pressure gauge on the discharge side of the station. The pressure gauge shall be a minimum of 4” in diameter, it shall be oil filled and shall read from 0 to 150 psi in 2-pound increments.
- xi. Provide ¾” tap on discharge side of pumps with hose bib.
- xii. Ductile iron piping inside the station to be primed with epoxy based primer, or if the piping is coated with bitumastic, the bitumastic shall be sealed with a compatible primer that will bond to both the bitumastic paint and the finish coat of epoxy paint. All piping to receive a finish coat of epoxy paint over the primer. Finish color to be picked by Pennichuck.

f. Chemical Feed

- i. Provide for two chemical feed systems to be paced to well water flows complete with 35-gallon polyethylene storage tanks and paceable chemical feed pumps.
- ii. Install 1-1/2” meters on each of the incoming well lines. PWW to provide the meters with TriCon E heads. Wire meters into PLC analog in card. Use well flows to pace chlorine and corrosion control feed pumps.
- iii. Chemical Feed pumps to be LMI electronic metering pump with four-function valve. Pumps to be selected such that they will provide 14.4 gallon per day at a minimum of 75% of full stroke and a minimum of 50% of speed.
- iv. Provide each chemical feed pump with an appropriately sized calibration tube. Install pump, tank and calibration tube as detailed on the attached schematic.

g. Cast In Place Concrete Reservoir

- i. Each reservoir shall be provided with separate drain, fill and discharge lines. Each line will be individually valved.
- ii. The reservoirs shall be provided with 3'x3' Bilco aluminum hatches with 6" side skirts. An aluminum ladder shall extend from the roof hatch to the base of each reservoir cell.
- iii. The reservoir shall be provided with an overflow that discharges to a rip rapped swale. The overflow will be 6" in diameter and shall be screened.
- iv. There shall be an 8" connection between the two cells at the overflow level.
- v. Provide a 6" deep by 2' square sump in each reservoir.
- vi. All pipe penetrations into the reservoir shall be sealed with an appropriately sized link seal or equivalent wall seal. The seal shall provide a water tight penetration.

h. Sampling Stations

- i. The distribution system shall be designed and provided with sampling stations at locations determined by Pennichuck. The number of sampling stations required will be based on the number of sampling locations required by the NHDES regulations.
- ii. The sampling stations shall be an Eclipse No. 88 Sampling Station or equivalent.