



Catherine B. Templeton, Director

Promoting and protecting the health of the public and the environment

STATE WATER SYSTEM CONSTRUCTION PERMIT

Permission is Hereby Granted To: COLLETON COUNTY FIRE & RESCUE
113 MABLE T WILLIS BLVD
WALTERBORO SC 29488

for the construction of a potable water source, storage and/or distribution system as shown on the attached water system layout sketch and in accordance with requirements set forth in the special conditions and the construction specifications of this permit described below:

PROJECT NAME: IONS CROSSROADS FIRE & RESCUE SUBSTATION

COUNTY: Colleton

PROJECT DESCRIPTION: One 4", 10 gpm well with 30 gallons of usable storage and distribution system to serve a fire and rescue substation.

PERMIT NUMBER: 28550-WS

DATE OF ISSUE: July 25, 2012

EXPIRATION DATE: July 25, 2015

SPECIAL CONDITIONS: (see page 2 of this permit)

Once construction is complete, the Beaufort EQC Office must be contacted at 843-846-1030 in order to obtain a final permit to operate. Written Final approval must be obtained before the system is placed into operation.

Penny A Cornett, Program Manager
Region 8 EQC Office

cc: Bureau of Water Permitting File
Local Health Department
USGS, Stevenson Center, Suite 129, 720 Gracern Rd., Columbia, SC 29210-7651
A.W. Badr, SCDNR-Water Resources, PO Box 167, Columbia, SC 29202-0167

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

Region 8

Serving Beaufort, Colleton, Hampton and Jasper Counties

Beaufort EQC Office • 104 PARKER DR • BEAUFORT SC 29906 • Phone: 843-846-1030 •

www.scdhec.gov

SPECIAL CONDITIONS

1. Based on a well yield of ten (10) gallons per minute (gpm), the hydropneumatic storage tank(s) shall have a **total useable volume**** of 20 gallons for the operating pressure range. This required volume may be decreased by 20 gallons for every one (1) gpm over ten (10) gpm, however in no case shall the usable volume be less than two (2) times the yield of the well (i.e., for a 13 gpm well the usable storage of the tank shall equal or exceed 26 gallons. If the yield of the well is less than 10 gpm the usable tank volume must be increased by 20 gallons for every one gallon per minute less than 10 gpm. **However, for this particular small water system, the minimum well yield shall be 10 gpm. ** The total gross storage required is three (3) times the amount of usable storage specified above.**

2. In order to obtain approval to place the newly constructed facilities into operation the following information must be submitted to Penny A Cornett, Region 8 EQC Office, 104 PARKER DR, BEAUFORT, SC 29906 843-846-1030.
 - (a) The well record form, which must be completed by the well driller (form enclosed).
 - (b) Results of the yield/performance test and pump curve for pump installed.
 - (c) Copy of the water quality analyses required by this permit (i.e., total coliform, chlorine residual, nitrate, iron, and manganese). Refer to Page 7 additional analyses.
Note: chlorine residual must be zero.
 - (d) The enclosed certification of construction form completed and signed by the well driller and contractor.

A final construction inspection will need to be conducted once the above information is submitted.

3. If in the future a water main from a publicly owned water system is installed adjacent to your property, this well must be physically disconnected from the water line, and service must be established with the water system. The well may be maintained for irrigation purposes only; otherwise, it must be properly abandoned.

CONSTRUCTION SPECIFICATIONS

A. Wells

- (1) The well must be drilled by a certified well driller registered in South Carolina.
- (2) The location of the well must be at least 100 feet from all potential pollution sources. Potential pollution sources include but are not limited to the following: septic tank, tile field, sewer line, abandoned unprotected well, waste treatment lagoon, storage lagoon, animal feed lot, chemical handling area, chemical storage area, petroleum storage area, waste disposal area, mine.
- (3) The location of the well must be at least 50 feet from all surface water bodies (lake, stream, river, pond, or drainage ditch which normally holds water).
- (4) The well must draw water from an aquifer a minimum of 50 feet deep.
- (5) Hand dug wells and wells constructed with casing materials of concrete or ceramic pipe shall not be used as a source of water for a public water system.
- (6) Wells or well pump stations in pits are prohibited.
- (7) The casing for rock wells must be galvanized iron or black steel and driven to refusal into firm bedrock. A drive shoe is recommended to be used on the end of the casing being driven into the firm bedrock. The top of the casing must extend at least twelve (12) inches above the concrete pad.
- (8) Screens, if used, can be either wire wound stainless steel or manufactured PVC. "Homemade" PVC screens shall not be used.
- (9) Where artificial filter packing is used, the gravel shall be free of foreign material and sterilized before being placed around the screen.
- (10) Grouting is required on all wells. The materials used for grouting shall be sand-cement, bentonite-cement mixture, or neat cement. Grouting for all wells shall be a minimum of 1.5 inches thick when using forced injection and 3 inches for gravity feed.
- (11) The annular space between the outside surface of the well casing and the bore hole shall be grouted with a sand-cement mixture, bentonite-cement mixture or neat cement. The sand cement or neat cement mixture shall be composed of not more than two (2) parts by weight of sand to one (1) part of cement with not more than seven (7) gallons of clean water per bag (one cubic foot or 94 pounds) of cement. The bentonite-cement mixture shall be composed of three (3) to five (5) pounds of bentonite mixed with seven (7) gallons of clean water per bag (one cubic foot or 94 pounds) of cement.

- (12) The minimum length of grout for sanitary protection shall be as follows:
- (a) For open hole wells into bedrock aquifers the length of grout shall be to at least fifty (50) feet or firm bedrock, whichever is less. However, where bedrock is encountered at less than twenty (20) feet, at least twenty (20) feet of casing shall be used and the entire length of the casing shall be grouted.
 - (b) For screened, natural filter wells and artificial filter (gravel pack) wells in to unconsolidated aquifers the length of grout shall be to fifty (50) feet or the first low permeability stratum (clay, marl, etc.), or to within ten (10) feet of the upper most screen when no low permeability stratum is encountered, whichever is greater.
 - (c) For open hole wells into limestone aquifers the length of grout shall be to fifty (50) feet or firm limestone or firm marl, whichever is less. However, where limestone or firm marl is encountered at less than twenty (20) feet, at least 20 feet of casing shall be used and the entire length of the casing shall be grouted.

The Department may require an additional length of grout where warranted by site, geological and/or water quality conditions. See the special conditions of this permit for any special requirements concerning the length of grout.

- (13) The grout material shall be placed by tremie pipe, either by pouring or forced injection, after water or other drilling fluid has been circulated in the annular space sufficiently to clear all obstructions. There shall be a minimum annular space of three (3) inches for gravity feed and one and one-half (1.5) inches for forced injection between the outside surface of the casing and the formation. The minimum size tremie pipe shall be two (2) inches inside diameter for gravity feed and one (1) inch inside diameter for forced injection. When placing the grouting material, the tremie pipe shall be lowered to the bottom of the zone to be grouted and raised slowly as the grout material is introduced. The tremie pipe shall be kept full continuously from start to finish of the grouting procedure, with the discharge end of the tremie pipe being continuously submerged in the grout until the zone to be grouted is completely filled. The grout shall be allowed to properly cure before construction may be resumed. Other methods of installing the grout may be used if prior approval is given by the Department.
- (14) The casing shall be sealed with a suitable flanged, threaded, or welded cap or compression seal. The outside casing shall be sealed to, and centered in, a reinforced concrete pad. The concrete pad must be at least six (6) feet by six (6) feet by four (4) inches thick and sloped so that water will drain away from the casing.
- (15) A screened vent must be provided for the casing (except on packer jet wells). The vent must extend a minimum of eighteen (18) inches above the concrete pad. The vent can be the gooseneck type with twenty-four (24) mesh screen over the opening or manufactured slotted pipe with effective opening of .024 inches or smaller.

- (16) A well identification plate must be securely attached to the casing or embedded into the concrete pad. The plate must be made of a durable, weather-proof, material and contain the following information:
- (a) Driller name and registration number;
 - (b) Date well completed;
 - (c) Total depth of well (in feet);
 - (d) Casing: Depth (in feet), Inside diameter (in inches);
 - (e) Screened intervals (of screened wells);
 - (f) Filter-pack interval (of wells with artificial filter-pack);
 - (g) Yield expressed in gallons per minute (gpm), or specific capacity expressed in gallons per minute per foot of drawdown (gpm/ft.-dd); and
 - (h) Static water level and date measured
- (17) If a submersible pump is installed, the well head piping must include a check valve followed by a sample tap or hose bibb, a gated blow-off valve, and an in-line gate valve, all of which must be prior to any storage tank. A flow meter is also recommended. If a flow meter is installed it must be prior to the blow-off. Please refer to the attached diagram for an illustration of a typical well and tank installation when a submersible pump is used.
- (18) If a jet pump is installed, the well head piping must include a sample tap or hose bibb followed by a gated blow-off and an in-line gate valve, all of which must be prior to any storage tank. A flow meter is also recommended. If a flow meter is installed it must be prior to the blow-off. No check valve is required in the main line of the well head piping for a jet pump; however, a check valve must be provided on the sample tap or hose bibb and the discharge of the blow-off must be a minimum of 12 inches above the concrete pad. A check valve must be installed on the down-stream side of the storage tank. The purpose of not installing a check valve between the pump and the tank is so that the tank will help keep the pump primed. Please refer to the attached diagram for an illustration of a typical well and tank installation when a jet well pump is used.
- (19) A pressure relief valve shall be installed on the well head piping if the pump installed is capable of discharging at a greater pressure than the pressure rating of the storage tank. The pressure relief valve must be set at a pressure equal to or less than the pressure rating of the tank. This valve must also be sized to discharge the rated capacity of the pump.
- (20) All electrical wiring must be in rigid or flexible conduit.
- (21) The well head must be provided with a well house for protection from weather and vandalism. A lock must be installed on the door or cover. Well houses shall be constructed in a manner and of material that will allow one person easy access to the sampling taps and the well head piping for inspection, maintenance and sampling.

- (22) A yield/performance test must be performed for a period of at least 6 hours. Measurements must be recorded at least hourly for yield (gallons per minute) and water level. It is recommended that a test pump be used to perform this test so as to optimize the sizing and selection of the permanent pump. However, if the permanent pump is used, the test should be performed against the average system pressure (i.e., for a 30/50 operating pressure range the pressure should be 40 psi). This may be accomplished by partially closing the gate valve on the blow-off until the desired pressure is obtained. The gate valve may need to be adjusted further during the test in order to maintain the desired pressure. If the test is not performed against the average system pressure, the well yield will be what the pump is rated for at the average system pressure. The pump rating must come from the manufacturer's pump curve for the selected pump.
- (23) Any well abandonment shall be conducted by a certified well driller and in accordance with R.61-58.(B)(15) of the State Primary Drinking Water Regulations.

B. **Storage**

- (1) The pressure rating of the hydropneumatic storage tank(s) must be at least seventy-five (75) psi.
- (2) The hydropneumatic storage tank(s) must have adequate support and reaction blocking to prevent breaks in the lines connected to the tank.
- (3) The hydropneumatic storage tank(s) must be equipped with a means to sample the tank, an isolation valve, and pressure gauge.
- (4) Except for a captive air storage tank, the hydropneumatic storage tank must also be equipped with a drain, separate inlet and outlet piping arranged so that water flows through the tank, and an automatic air make-up system. If an air compressor is used in the air make-up system, a pressure relief valve must also be installed on the tank.
- (5) If the tank is five hundred (500) gallons or larger an access manhole, a minimum two (2) inch diameter drain, and a vacuum relief valve must be provided. An air compressor shall be installed if the hydropneumatic storage tank two thousand (2000) gallons or larger.
- (6) Hydropneumatic storage tanks five hundred (500) gallons and larger must meet the requirements of the American Society of Mechanical Engineers for construction and installation of unfired pressure vessels and must carry its approval stamp.
- (7) Controls for operating the pump must be by pressure switch or other automatic means and set to operate on at least thirty (30) psi on /fifty (50) psi off range. A greater operating pressure may be required to assure that a minimum of 25 psi is maintained throughout the distribution system at all times. The maximum pressure range between the on/off operating pressures shall be a maximum of twenty (20) psi.
- (8) All paint coatings which come into contact with drinking water shall be certified as meeting the specifications of the American National Standards Institute/National Sanitation Foundation Standard 61.

C. Distribution System

- (1) PVC, polyethylene, galvanized iron, or copper piping is acceptable. All piping must be certified as meeting the specifications of the American National Standards Institute/National Sanitation Foundation Standard 61, Drinking Water System Components - Health Effects. Any pipe material, solder or flux used in a potable water system must be lead free. "Lead free" is defined to mean that solder and flux can contain no more than 0.2% lead; pipes and fittings not more than 8.0% lead. If polyethylene pipe is used, water tight compression fittings must be used. Radiator or pipe clamps shall not be used on any underground piping.
- (2) All external distribution piping shall be installed at least thirty (30) inches below grade. All single service water lines shall be at least eighteen (18) inches below grade. Where this is not possible, pipe shall be steel, ductile iron, or other approved material and method approved by the Department, and, when necessary, insulated from freezing.
- (3) Reaction blocking of poured concrete must be placed at all bends, tees, valves, etc. for all lines two and one half (2 1/2) inches and larger.
- (4) No water line shall be placed within 10 feet of a septic tank, sewer line, or manhole or within 25 feet of a drain field. Where a water line must cross a sewer line (not a drain field), there shall be a minimum of 18 inch vertical separation with the water line crossing over the top of the sewer line.
- (5) Adequate blow-offs shall be provided for periodic flushing of the system. If a dead end water line is greater than one and one half (1 1/2) inches in diameter and longer than two hundred (200) feet in length, installation of a blow-off is required. Please refer to the attached diagram for an illustration of a typical blow-off.
- (6) Upon completion, the distribution system must be pressure tested at a pressure equal to or exceeding the maximum working pressure. The pressure test must be held for at least two (2) hours without a drop in pressure.

D. Disinfection/Testing

- (1) Upon completion and setting of the permanent pump and following the pressure test, the well, storage tanks, and all piping must be disinfected by adding calcium hypochlorite or sodium hypochlorite to the well in sufficient amounts to produce at least a 50 milligram per liter concentration. (See Table #1) The pump must be run long enough to get the chlorine solution throughout the well head piping, tank, and distribution line. This solution must be retained for 24 hours then completely flushed from the system. The water must be tested for chlorine to insure that the chlorine solution has been completely flushed from the well and distribution system prior to sampling for total coliform bacteria. Once the chlorine solution has been removed, at least one sample must be collected from a point farthest from the well or metered connection and analyzed for total coliform bacteria by a DHEC certified laboratory. If the analysis indicates the presence of total coliform bacteria, the disinfection and sampling procedure must be repeated until the analysis indicates the absence of total coliform bacteria. A separate sample for total coliform analysis must be collected and analyzed from all tanks five hundred (500) gallons or larger.

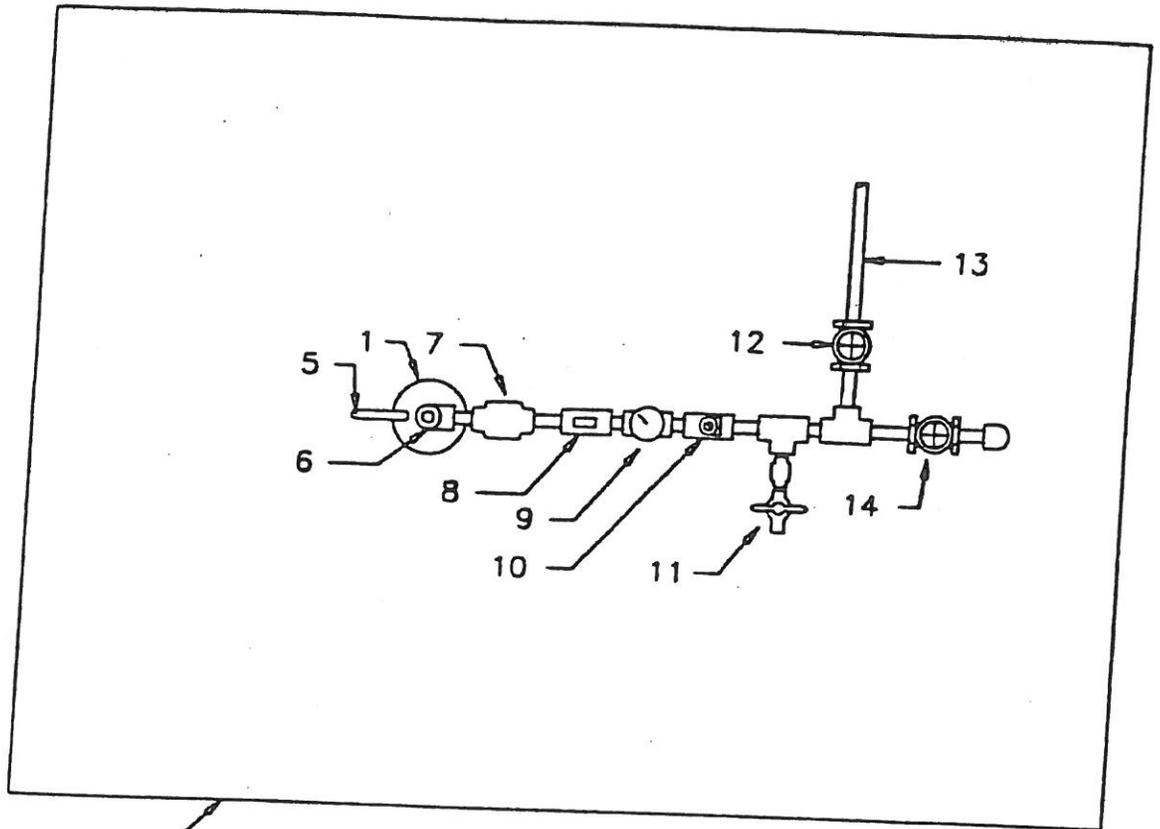
- (2) In addition to the total coliform sample, a water sample must be collected from the well and tested for **nitrate, iron, and manganese**. The water sample must also be tested for **fluoride** if the well is located in one of the following counties: Horry, Georgetown, Charleston, Colleton, Beaufort, Jasper, Dorchester, Berkeley. The water sample must also be tested for **total uranium** if the well is located in one of the following counties: Greenville, Pickens. The water sample must also be tested for **radium** if the well is located in one of the following counties: Richland, Lexington, Aiken. These analyses must be performed by a DHEC certified laboratory.

Diagram Key for Jet Pump and Submersible Pump Systems

Diagrams 1 and 2.

1. **Well Casing:** the top of the well casing shall extend at least twelve (12) inches above the concrete pad or pump house floor.
2. **Concrete Pad:** a minimum radius of three (3) feet from the center of the well casing and a minimum thickness of four (4) inches.
3. **Well Identification Plate:** must be permanently installed immediately after completion of drilling.
4. **Grout:** well must be grouted in accordance with the construction specifications of this permit.
5. **Screened Vent:** must face downward with the opening located a minimum of eighteen (18) inches above the concrete pad or well house floor. Screen must have an effective opening of .024 inches or smaller. *This item is not required on packer type jet pumps.*
6. **Air Relief Valve (optional):** design of the system may require this valve. This item is not needed on a jet pump system.
7. **Check Valve**
8. **Pressure Gauge**
9. **Flow Meter:** must be located down stream of the check valve and before the blow-off. This item is required on any public water supply well where the yield of the well cannot be easily measure from the blow-off using a bucket and stopwatch or by other means acceptable to the Department. The flow meter must be capable of measuring both instantaneous and totalized flow.
10. **Pressure Relief Valve (optional):** may be installed anywhere along the well head piping prior to the gate valve (#14) and must be sized to discharge the total flow of the pump at a pressure less than or equal to the working pressure of the storage tank. This item is required whenever the pump is capable of operating at a pressure greater than the working pressure of the storage tank.
11. **Sample Tap:** must be located down stream of the check valve and before the gate valve isolating the well from the system (#14).
12. **Gate valve:** for blow-off.
13. **Blow-off:** must be located down stream of the meter (#9) and before the gate valve (#14) for isolating the well from the system.
14. **Gate Valve:** for isolating the well from the system.
15. **Sanitary Well Seal:** all openings other than the screened vent (#5) shall be effectively sealed against the entrance of water under all conditions.
16. **Electric Cable:** must be enclosed in conduit and meet the requirements of the National Electric Code.
17. **Jet Pump and Motor:** shown with pressure switch mounted on motor housing.
18. **Gate valve:** for isolating the tank from the distribution system.
19. **Bladder Tank:** this type of tank may be used on either jet pump or submersible pump systems although it is not shown on the Submersible Pump Well Head Diagram.
20. **Well Head Protection:** the well head must be protected from freezing and from vandalism by a lockable protective cover or pump house.

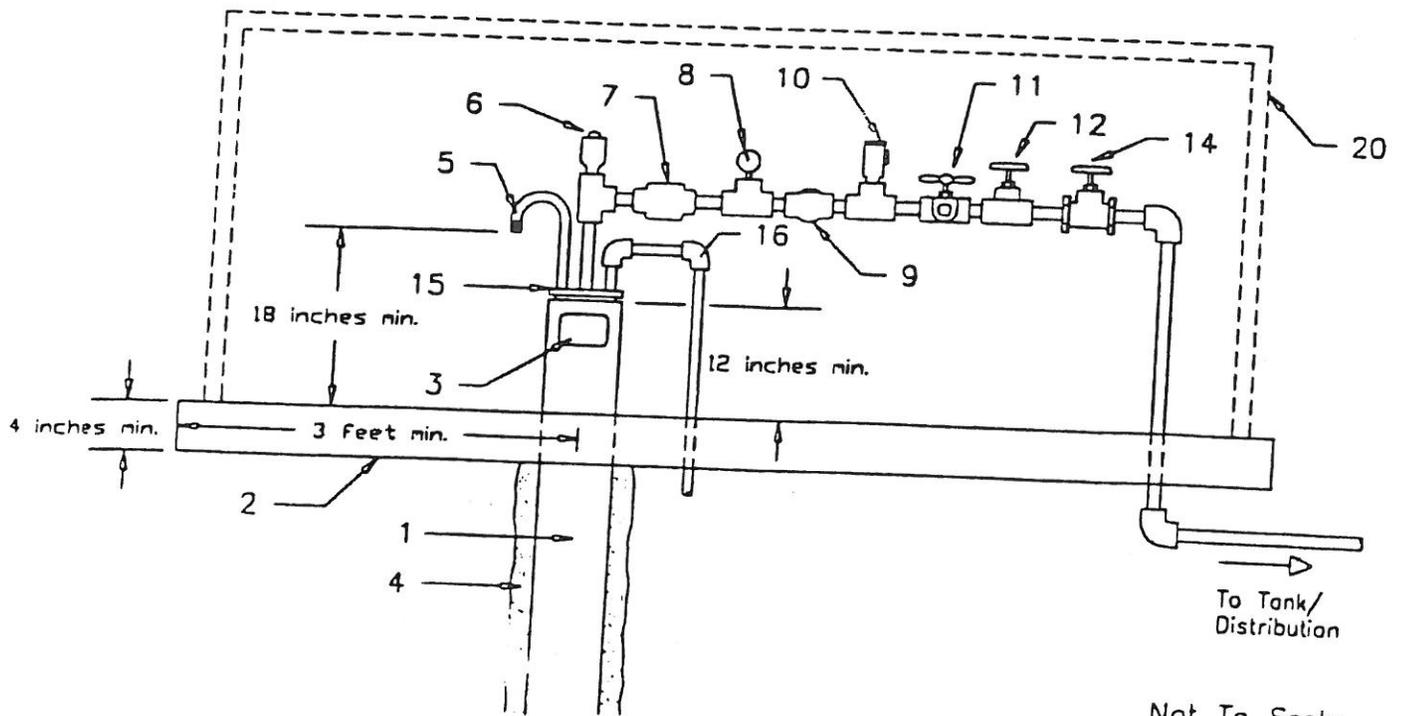
Plan View



2

Not To Scale

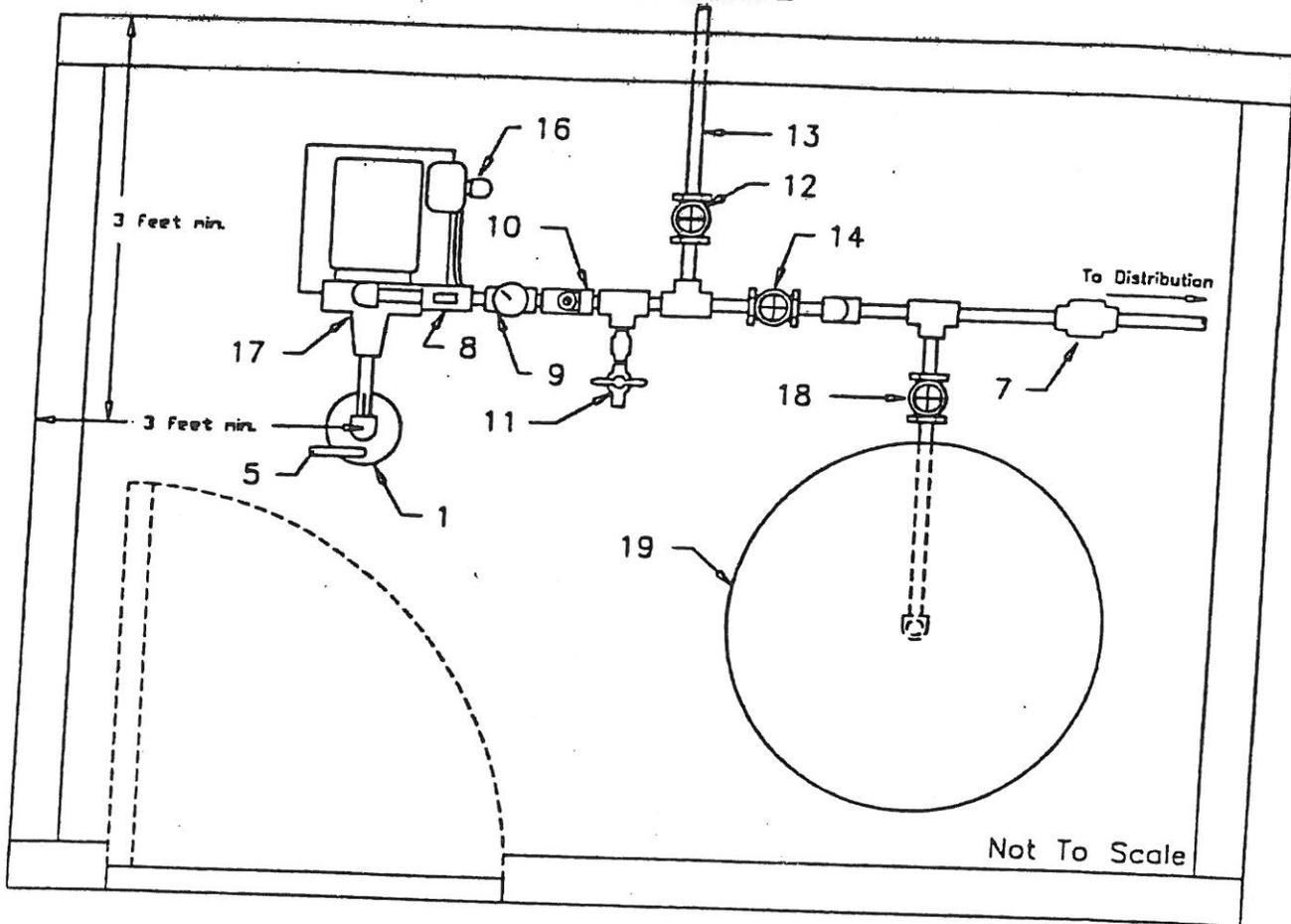
Profile View



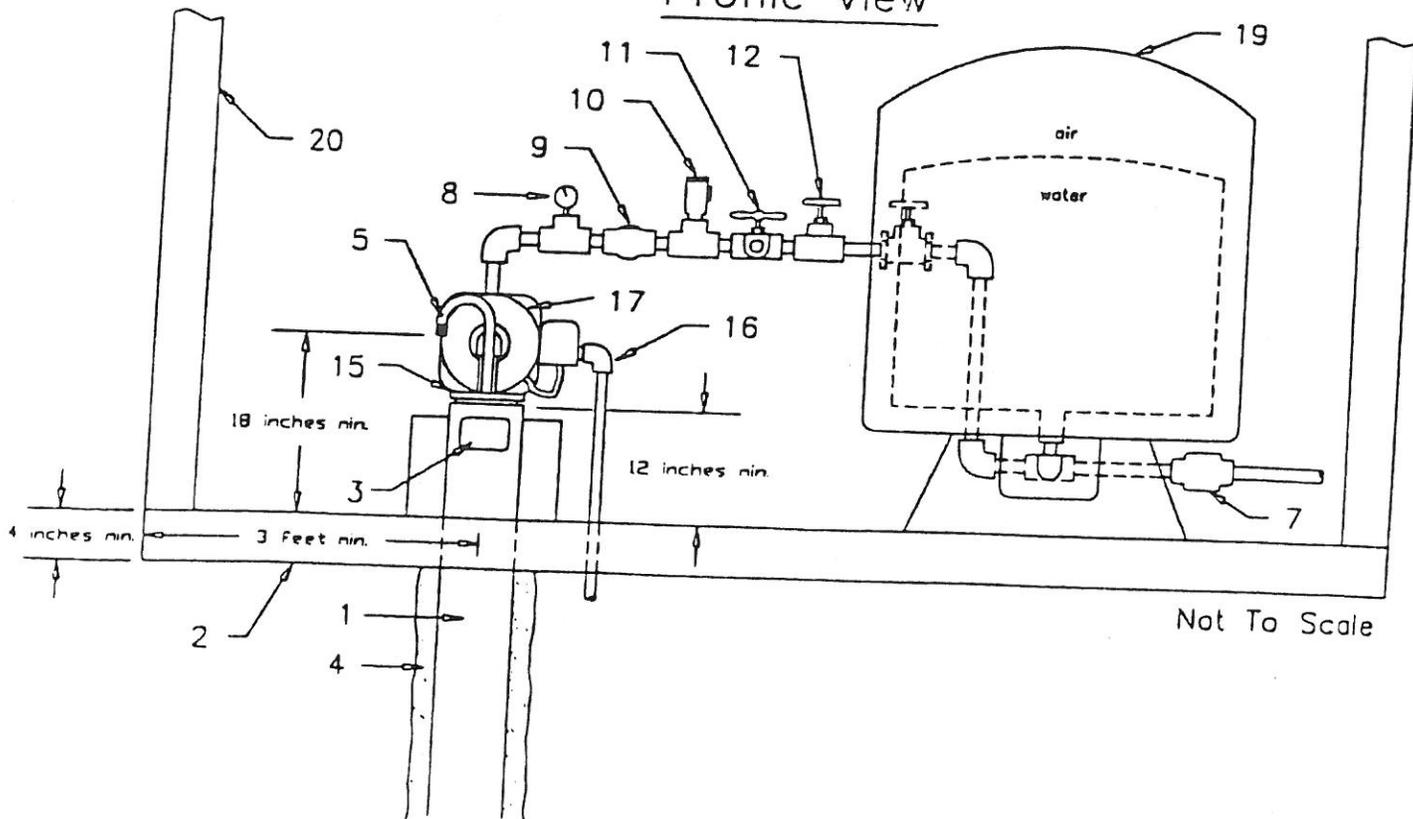
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for Small Water Systems

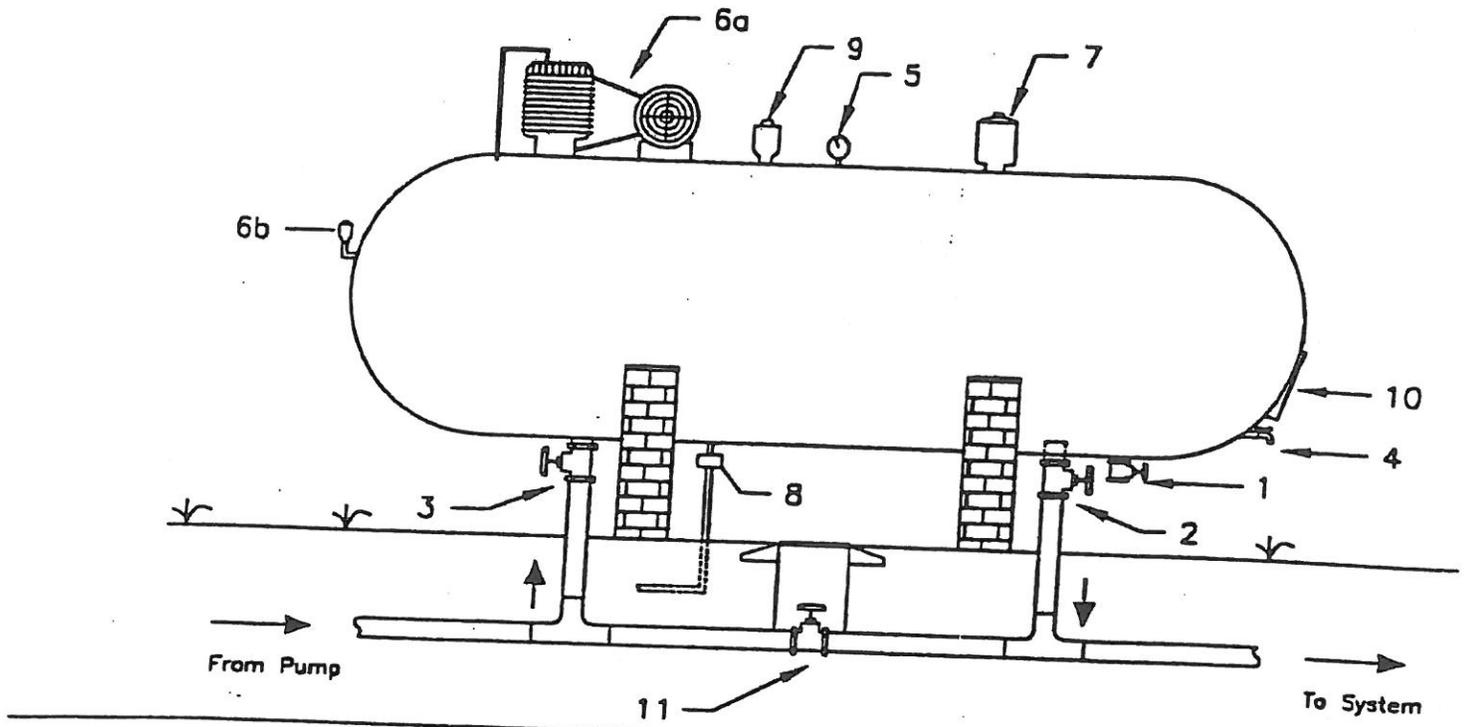
Plan View



Profile View



Standard Hydro-pneumatic Tank



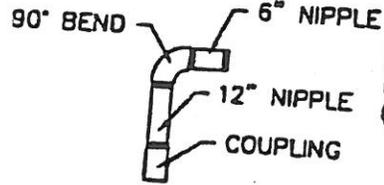
Key

1. **Drain valve:** required on all standard (non-bladder) tanks. The drain must be a minimum of two (2) inches in diameter on tanks 500 gallons and larger.
2. **Outlet w/ isolation valve:** a flow through arrangement is required on all standard (non-bladder) tanks. The outlet must be located on the opposite end of the tank from the inlet. An isolation valve is required on the outlet. Notice that the outlet piping extends slightly above the bottom of the tank to prevent sediment from entering the distribution system.
3. **Inlet w/ isolation valve:** a flow through arrangement is required on all standard (non-bladder) tanks. The inlet must be located on the opposite end of the tank from the outlet. An isolation valve is required on the inlet.
4. **Sample tap:** required on all storage tanks. Can be located on the discharge side of tank or outlet pipe.
5. **Pressure gauge:** required on all storage tanks. Can be located in the inlet or outlet piping on the tank side of the isolation valve.
6. **Air makeup system:** required on all standard (non-bladder) tanks. The system shown is an air compressor (6a) and air volume control valve (6b). This type of system is required on tanks 2000 gallons and larger. A snifter valve (dry pipe) arrangement may be used on smaller tanks.
7. **Pressure relief valve:** required on any tank which is provided with an air compressor. This valve must be adjusted to fully open at or below the maximum working pressure of the tank.
8. **Pressure switch:** may be located on the inlet piping or on the tank itself. If located in the inlet piping, it must be close enough to the tank so that the pump will not short cycle due to friction loss.
9. **Vacuum relief valve:** required on tanks 500 gallons and larger.
10. **Access manhole:** required on tanks 500 gallons and larger.
11. **Bypass piping:** required on tanks 500 gallons and larger. The purpose of this arrangement is to allow the tank to be repaired without removing the associated well or booster pump from service.

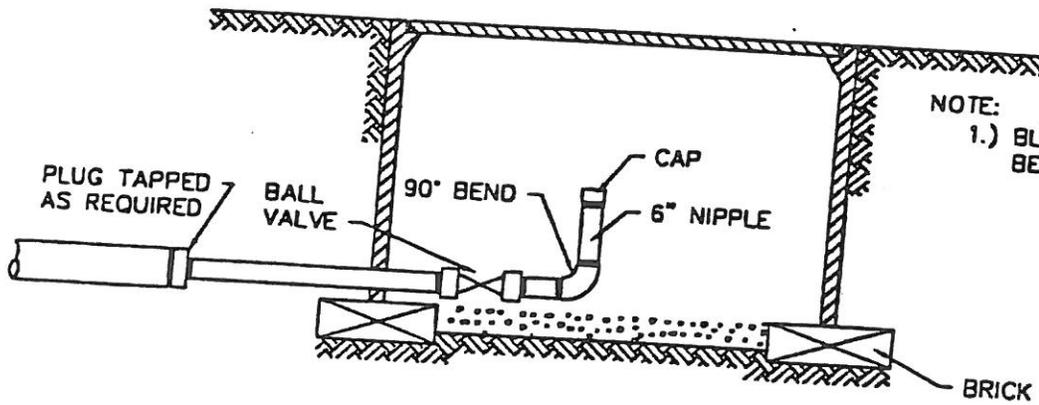
Diagram 4:

Blowoff Detail

WATER MAIN SIZE	BLOWOFF PIPING SIZE
2"	3/4"
2 1/2"	1"
3"	1 1/4"
4"	1 1/2"
6"	2"
8"	2 1/2"



FURNISH ONE ASSEMBLY PER BLOWOFF & STORE IN BOX (SIZE AS REQUIRED)



NOTE:
1.) BLOWOFF PIPING SHAL BE GALVANIZED.

NOT TO SCALE

Table 1: Quantity of Substance Required to Produce a 50 Part Per Million Concentration of Chlorine

Well Diameter (inches)	Ounces of Compound For Each 10-ft Depth of Water		
	Dry - 70% Calcium Hypochlorite* or Liquid - 12% Sodium Hypochlorite		Household Bleach
	Dry Measure	Liquid Measure	Liquid Measure
2	0.02	0.09 fl oz	0.21 fl oz
4	0.06	0.35 fl oz	0.81 fl oz
6	0.14	0.78 fl oz	1.88 fl oz
8	0.25	1.39 fl oz	3.33 fl oz
10	0.39	2.2 fl oz	5.21 fl oz
12	0.56	3.2 fl oz	7.51 fl oz
24	2.24	12.8 fl oz	30.0 fl oz
36	5.03	28.2 fl oz	67.51 fl oz
<p>All quantities may be rounded to the nearest half-ounce for convenience of measurements. 128 fl oz = 8 pt = 4 qt = 1 gal * 1 heaping teaspoon of 70% hypochlorite is approximately ½ ounce.</p>			
EXAMPLE:	6-inch diameter, 100 feet deep well with the water level 20 feet below ground level contains 80 feet of water		
To disinfect with household bleach, you would use 1.88 ounces for each 10 feet of depth or (8 x 1.77) = 15.04 ounces.			
If the well depth or water level is not known, one (1) gallon of liquid household bleach may be used instead of the above amounts.			

