**R309. Environmental Quality, Drinking Water.**

**R309-540. Facility Design and Operation: Pump and Hydropneumatic Pressure Facilities.**

**R309-540-1. Purpose.**

The purpose of this rule is to provide specific requirements for pump stations utilized to deliver drinking water to facilities of public water systems. It is intended to be applied in conjunction with Rules R309-500 through R309-550. Collectively, these rules govern the design, construction, operation, and maintenance of public drinking water system facilities. These rules are intended to assure that facilities are reliably capable of supplying quantities of water which consistently meet applicable drinking water quality requirements of Rules R309-200 and R309-510 and do not pose a threat to general public health.

**R309-540-2. Authority.**

This rule is promulgated by the Drinking Water Board as authorized by Title 19, Chapter 4, Safe Drinking Water Act, Subsection 104(1)(a)(ii), and in accordance with Title 63G, Chapter 3 Utah Administrative Rulemaking Act.

**R309-540-3. Definitions.**

Definitions for certain terms used in this rule are given in Rule R309-110. Terms not defined in Rule R309-100 but used in Rule R309-540 include those defined in Subsections R309-540-3(1) through (8).

(1) "Air-Over-Water Hydropneumatic Tank" means a pressure tank with a single chamber in which air and water are in direct contact. Water pumped into the tank compresses the air above it.

(2) "Bladder Hydropneumatic Tank" means a pressure tank that has a bladder in the bottom section of the tank that holds water under pressure. Water pumped into the bladder compresses the air in the upper section of the tank.

(3) "Booster Pump" means a pump that increases pressure in a water distribution system or supplies water to an elevated storage tank. The water supplying a booster pump is provided by a water storage tank or a water distribution line.

(4) "Diaphragm Hydropneumatic Tank" means a pressure tank with a fixed, flexible diaphragm that separates water in the lower section of the tank from air in the upper section. Water pumped into the lower section compresses the air in the upper section of the tank.

(5) "NSF/ANSI 60" - the joint National Sanitation Foundation/American National Standards Institute 60, Drinking Water Treatment Chemicals - Health Effects

(6) "NSF/ANSI 61" - the joint National Sanitation Foundation/American National Standards Institute 60, Drinking Water System Components - Health Effects

(7) "Pump Station" means a structure housing pumps and associated piping, valves, and auxiliary equipment.

(8) "Service Factor" - A multiplier which, when applied to rated power, indicates a permissible power loading that may be carried under the conditions specified for the service factor.

**R309-540-4. Applicability.**

Rule R309-540 applies to a pump, other than a well pump, that pumps drinking water for distribution or storage by a public water system.

**R309-540-5. Pump Stations.**

(1) Location. The location for a pump station shall be compatible with the hydraulics of the water system.

(2) Flood Protection and Site Drainage.

(a) A pump station shall be located at, or protected from, flooding to an elevation of at least three feet above either the 100-year flood or highest recorded flood, whichever is higher.

(b) The site for a pump station shall be graded to direct surface water drainage away from the pump station.

(3) Pump Station Drainage and Flooding Prohibition. A pump station:

(a) may not be subject to flooding;

(b) shall be drained to prevent water from collecting on the floor; and

(c) shall provide an outlet for drainage from pump glands, air release valves, and other equipment without allowing water to flow across the floor to reach the outlet. See Subsection R309-550-6(6) for clearance requirements for air release vent pipes discharging to floor drains.

(4) Access.

(a) A pump station shall be accessible.

(b) Access to a pump station in an underground vault or compartment or between floors of a pump station shall be provided by a permanent stairway, ladder, or ramp.

(5) Construction, Security, and Layout. A pump station shall be:

(a) weatherproof;

(b) constructed and maintained to exclude animals;

(c) locked to prevent unauthorized entry and vandalism; and

(d) sized, configured, and equipped to allow for:

(i) operation and maintenance; and

(ii) installation and removal of pumps and other equipment.

(6) Heating. Heating shall be provided if needed:

(a) for the safe and efficient operation of equipment; and

(b) to prevent equipment from freezing.

(7) Lighting. Lighting shall be provided to allow for the operation and maintenance of equipment.

(8) Ventilation.

(a) Ventilation shall be provided for a pump station.

(b) Forced ventilation of at least six air-changes per hour shall be provided for a pump station:

(i) in a confined space;

(ii) in a subsurface compartment or vault;

(iii) if an unsafe atmosphere may develop.

(9) Wet Wells. A Finished water wet well at a pump station shall:

(a) be waterproof;

(b) allow for the removal of water and sediment;

(c) be covered to protect the water from contamination; and

(d) have an access opening and a lid that meet the requirements for a water storage tank in Section R309-545-14.

(10) Return of Used Water to the Drinking Water System Prohibited. Water withdrawn from a public drinking water system for any use may not be returned to the system.

(11) Automatic and Remote-Controlled Stations.

(a) An automatically operated pump station shall have an automatic signaling apparatus that immediately notifies a water system operator when the station is out of service.

(b) A remote-controlled pump station shall be:

(i) electrically operated and controlled; and

(ii) have an automatic signaling apparatus that immediately notifies a water system operator when the station is out of service.

**R309-540-6. Pumps.**

(1) Capacity and Minimum Distribution System Pressure. A pump used to provide minimum distribution system pressure shall:

(a) have the capacity to meet the maximum demand of the specific portion of the distribution system served; and

(b) be capable of providing the minimum pressures required by Section R309-105-9.

(2) Number of Pumps.

(a) A water supplier shall have at least two pumps installed and in operation at a booster pump facility that provides the only means available to meet the minimum distribution system pressure requirements of Section R309-105-9 for the water distribution pipeline served by the facility.

(b) A booster pump facility that requires at least two pumps shall meet the maximum demand of the water distribution pipeline served by the facility with the largest pump out of service.

(3) Booster Pumps.

(a) A booster pump shall be equipped with an automatic shutoff or low-pressure controller as recommended by the pump manufacturer.

(b) A booster pump withdrawing water from a distribution line shall maintain an intake pressure of at least 20 psi when the pump is in normal operation.

(c) A booster pump withdrawing water directly from a water storage tank shall be provided with net positive suction head.

(4) Pump Motor. A pump motor shall:

(a) be sized to meet operating conditions without overloading; and

(b) provide the maximum horsepower required by the pump without the use of a service factor.

(5) Certification of Drinking Water Treatment Chemicals and System Components.

(a) Chemicals added to drinking water at pump facilities shall be certified to meet NSF/ANSI 60.

(b) Products, components, and materials used in pump facilities that may impart chemical contaminants or impurities to drinking water shall be certified to meet NSF/ANSI 61.

(6) Suction Lift. When a pump provides suction lift:

(a) the maximum lift shall be within the pump manufacturer's recommended limits; and

(b) tanks priming shall be provided for the pump.

(7) Priming.

(a) When a pump requires priming, the priming system shall:

(i) use water of at least the same quality as the water being pumped; and

(ii) include a means to prevent back siphoning.

(b) When an air-operated ejector is used for vacuum priming, it shall draw clean air through a screened intake:

(i) at least ten feet above the ground; and

(ii) at least ten feet away from a point of contamination.

(8) Water Seal.

(a) Water used as a seal for a pump shall be of at least the same quality of the water being pumped.

(b) A water line supplying drinking water used as a seal for a pump that pumps non-potable water shall be protected from backflow.

(9) Individual Home Booster Pumps. Individual home booster pumps shall not be allowed for any individual service from the public water supply main. Exceptions may be granted by the Director if it can be shown that the granting of an exception will not jeopardize public health.

**R309-540-7. Pump Appurtenances.**

(1) Valves.

(a) Valves shall be provided to allow satisfactory operation and maintenance of a pump facility.

(b) Each pump shall have an isolation valve:

(i) on the intake side of the pump; and

(ii) on the discharge side of the pump.

(c) An air release valve shall:

(i) be provided where needed to allow the release of accumulated air in pump facility piping; and

(ii) meet the requirements of Subsection R309-550-6(6).

(d) If used, a foot valve shall be sized according to the manufacturer's recommendation.

(2) Piping. Piping for a pump shall:

(a) have watertight joints; and

(b) be protected against surge or water hammer

(3) Controls. Controls for a pump shall:

(a) be protected from flooding;

(b) allow a pump motor to operate at rated capacity without overloading;

(c) have proper overload protection for the air temperature encountered;

(d) provide for alternate operation of pumps where two or more pumps are installed;

(e) prevent the pump motor from starting during pump backspin;

(f) set start and cutoff pressures to prevent continuous on-off cycling;

(g) follow manufacturer's requirements for automatic cutoff pressure; and

(h) prevent surge pressures from activating controls that turn on pumps or other equipment outside the normal design cycle of operation.

(4) Water Pre-Lubrication of Pump Bearings. If water is used for automatic pre-lubrication of pump bearings, and an auxiliary direct-drive power supply is provided:

(a) the pre-lubrication line shall have a valved bypass around the automatic control so that the bearings can be lubricated manually before the pump is started; or

(b) the pre-lubrication controls shall be wired to the auxiliary power supply.

(5) Pressure Measurement. A pump or group of pumps operating together shall have a means of measuring pressure:

(a) on the discharge line; and

(b) on the intake line capable of indicating positive and negative pressure.

(6) Standby Power Supply.

(a) A community water system that relies solely on a pump facility to supply water to a service area shall be provided with standby power, power using a permanent or portable generator or electrical service from two independent substations.

(b) If a fuel-operated generator provides standby power:

(i) the water supply shall be protected from contamination from the fuel supply and fuel line; and

(ii) a carbon monoxide detector shall be installed if the generator is located indoors.

**R309-540-8. Hydropneumatic Facilities for Maintaining Distribution System Pressure.**

(1) Applicability.

(a) Section R309-540-8 applies to a hydropneumatic facility that maintains distribution system pressure for a public water system.

(b) Sections R309-540-5 through R309-540-7 apply to a pump, other than a well pump, that supplies water under pressure to a hydropneumatic pressure tank.

(c) Section R309-540-8 applies to air-over-water, diaphragm, and bladder hydropneumatic pressure tanks.

(d) Section R309-540-8 does not apply to:

(i) a surge protection tank;

(ii) pressure relief equipment; or

(iii) a pressure tank dedicated solely to fire suppression.

(2) Number of Pumps. A public water system using a hydropneumatic facility to meet the minimum distribution system pressure requirements of Section R309-105-9 shall have at least two pumps installed and in operation at the hydropneumatic facility, unless the hydropneumatic facility is supplied solely by a well pump.

(3) Pressure Tank Certification. A hydropneumatic pressure tank shall have:

(a) NSF/ANSI 61 certification; and

(b) ASME Boiler and Pressure Vessel Code certification.

(4) Use of Pressure Tank Volume for Water Storage Sizing. A community water system may not use the volume of a hydropneumatic pressure tank to meet the water storage sizing requirements in Section R309-510-8.

(5) Pressure Tank Located Below Ground.

(a) A below-ground location for a hydropneumatic pressure tank and appurtenances shall meet the requirements of:

(i) Subsection R309-540-5(2) for flood protection and site drainage;

(ii) Subsection R309-540-5(3) for pump station drainage and flooding prohibition;

(iii) Subsection R309-540-5(4)(b) for access; and

(iv) Subsection R309-540-5(8) for ventilation.

(b) Electrical controls for a hydropneumatic pressure tank located below ground shall be:

(i) located above grade; and

(ii) protected from flooding.

(6) Operating Pressure Measurement. A means to measure the operating pressures of a hydropneumatic facility shall be provided.

(7) Bypass Piping. Each hydropneumatic tank shall have bypass piping and isolation valves to allow the tank to be removed from service without disruption of water distribution.

(8) Pressure Tank Sizing. The minimum volume of a hydropneumatic tank shall be sized to avoid continuous pump cycling as recommended by the manufacturer.

(9) Air-Over-Water Pressure Tanks.

(a) An air-over-water pressure tank shall have:

(i) an access opening;

(ii) a drain;

(iii) a means to measure pressure;

(iv) a means to measure the water level in the tank;

(v) an automatic or manual air blow-off;

(vi) a means for adding air; and

(vii) pressure operated start-stop controls for a pump.

(b) Air delivered by a compressor to an air-over-water pressure tank shall be:

(i) drawn from a point above ground;

(ii) free of contamination;

(iii) filtered; and

(iv) oil free.

(c) The volume of water remaining in an air-over-water pressure tank at the lowest pressure setting shall provide a water seal at the water outlet to prevent the leakage of air.

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