

61-58.4

Finished Water Pumping, Storage, and Distribution Facilities

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Table of Contents

- A. Applicability..... 102
- B. Pumping Facilities..... 102
- C. Finished Water Storage 105
- D. Distribution Systems 109
- E. Public Buildings..... 114
- F. Lead Ban..... 115
- G. Aquifer Storage and Recovery (ASR) 115

A. Applicability.

This regulation applies to all new construction and all expansions or modifications of existing public water systems. If the Department can reasonably demonstrate that safe delivery of potable water to the public is jeopardized, a system may have to upgrade its existing facilities in order for an expansion or modification to meet the requirements of this regulation. This regulation prescribes minimum design standards for the construction of finish water pumping, storage, and distribution facilities.

B. Pumping Facilities.

(1) Requirements for Pump Stations - Pumping facilities shall be designed to maintain the sanitary quality of pumped water.

(a) Location -

(i) The pumping station shall be located so that the site will meet the requirements for sanitary protection of water quality, hydraulics of the system and protection against interruption of service by fire, flood or any other hazard.

(ii) The station shall be elevated to a minimum of one (1) foot above the one hundred (100) year flood elevation, or protected to such elevation, shall be readily accessible at all times unless permitted to be out of service for the period of inaccessibility, shall be graded around the station so as to lead surface drainage away from the station, and shall be protected to prevent vandalism and entrance by animals and unauthorized persons.

(b) General Design Considerations - Pump stations shall be of durable construction, fire and weather resistant and with outward-opening doors. The floor elevation of pump stations shall be at least six (6) inches above finished grade, have waterproofed underground structure, and have all floors drained in such a manner that the quality of the potable water will not be endangered. All floors shall slope to a suitable drain and provide a suitable outlet for drainage from pump glands without discharging onto the floor.

(c) Pumping Equipment -

(i) At least two (2) pumping units shall be provided. The pumping station shall be sized adequately to supply the maximum daily demand with any pump out of service. The pumping units shall:

(A) Be driven by a prime mover able to operate against the maximum head and air temperature which may be encountered;

(B) Have spare parts and tools readily available;

(C) Be equipped with elapsed time hour meters for each pump or another acceptable mechanism to monitor run times; and

(D) Be sized to operate from minimum to maximum pumping conditions without overloading the motor.

(ii) Prime water must not be of lesser sanitary quality than that of the water being pumped. Means shall be provided to prevent back-siphonage. When an air-operated ejector is used, the screened intake shall draw clean air from a point at least ten (10) feet above the ground or other source of possible contamination, unless the air is filtered by an apparatus approved by the Department. Vacuum priming may be used.

(iii) For pumps designed so that bearing lubrication fluids come into contact with the water being pumped, only water lubricated pumps may be used unless otherwise approved by the Department.

(d) Equipment Servicing - Pump stations shall be designed so that proper maintenance of the equipment can be provided.

(e) Operator Access - Pump stations shall be designed for easy access by stairs or ladders when necessary.

(f) Heating - In pump houses not occupied by personnel, only enough heat need be provided to prevent freezing of equipment or treatment process.

(g) Ventilation - Ventilation shall conform to existing local, federal, and/or state codes. Adequate ventilation shall be provided for all pumping stations.

(h) Lighting - Pump stations shall be adequately lighted throughout. All electrical work shall conform to the requirements of the National Electric Code or applicable state and local codes.

(i) Auxiliary Power - Where elevated storage equals less than one half maximum daily demand, portable or in-place auxiliary power shall be provided for all systems serving three hundred (300) or more service connections. An air quality permit may be required for the air emissions from the auxiliary generators. Auxiliary power requirements may be waived if one or more of the following are applicable:

(i) a verifiable history of worst case power outages and verification that the available elevated storage can provide for a similar time period of outage;

(ii) two (2) or more independent sources from the serving electrical utility are available; or,

(iii) an alternate water source is available via connections with other systems.

Auxiliary power shall be sized to provide for sufficient pumping capacity to meet the one half ($\frac{1}{2}$) of the maximum daily demand or to supplement the existing storage to meet one half ($\frac{1}{2}$) of the maximum daily demand.

(j) Protection From Trespassers - Fencing, locks on doors, and other necessary precautions shall be provided to prevent trespassing, vandalism, and sabotage.

(2) Booster Pump Stations - Booster pump stations shall meet all applicable portions of R.61-58.4(B)(1)Paragraph in addition to the requirements below.

(a) Booster pumps shall be located or controlled so that they will not produce less than twenty-five (25) pounds per square inch anywhere in the affected distribution system when the pump is in normal operation. An automatic cutoff switch or throttling valve shall be installed to prevent the pressure anywhere in the affected distribution system from dropping below twenty (20) pounds per square inch. Automatic or remote control devices shall have a range between the start and cutoff pressure which will prevent excessive cycling, and a bypass line shall be provided. Fire booster pumps must have a device to monitor suction pressure and throttle the output of the pump to maintain the suction pressure above twenty (20) pounds per square inch anywhere in the affected distribution system, but, not shut the pump off.

(b) In-line booster pumps shall be accessible for servicing and repairs.

(3) Automatic Pump Stations - All automatic pump stations shall be provided with a warning light or telemetry system which will report when the station is out of service. All remote controlled stations shall be electrically operated and controlled and shall have signaling apparatus of proven performance. Installation of electrical equipment shall conform with the applicable state and local electrical codes and the National Electrical Code. A sign with a twenty-four (24) hour telephone number for emergencies shall be displayed on the outside of the station in a visible location, unless the system has twenty-four (24) hour monitoring.

(4) Appurtenances -

(a) Valves - Pumps shall be adequately valved to permit satisfactory operation, maintenance and repair of the equipment. Each pump shall have a positive-acting check valve on the discharge side between the pump and the shut-off valve.

(b) Piping - In general, suction and discharge piping shall:

(i) be designed so that the friction losses will be minimized;

(ii) not be subject to contamination;

(iii) be sloped in one direction to drain;

(iv) have watertight joints;

(v) have adequate clean-outs;

(vi) be protected against surge or water hammer; and,

(vii) be manifolded or have an individual suction line to ensure similar hydraulic and operating conditions.

(c) Gauges - Each pump shall:

(i) Have a standard pressure gauge on its discharge line; and,

(ii) Have a compound gauge on its suction line;

(d) Water Seals - Water seals shall not be supplied with water of a lesser sanitary quality than that of the water being pumped. Where pumps are sealed with potable water and are pumping water of lesser sanitary quality the seal shall be provided with a back-flow preventer appropriate for the degree of hazard in question.

(e) Controls - Pumps, their prime movers and accessories, shall be controlled in such a manner that they will operate at rated capacity without dangerous overload. Where two or more pumps are installed, provision shall be made for alternation. Provision shall be made to prevent energizing the motor in the event of a backspin cycle. Electrical controls shall be located above grade.

(f) Water Pre-lubrication - When automatic pre-lubrication of pump bearings is necessary and an auxiliary power supply is provided, the pre-lubrication line shall be provided with a valved bypass around

the automatic control so that the bearings can, if necessary, be lubricated manually before the pump is started.

C. Finished Water Storage.

(1) General -

(a) Sizing - Where fire flows are provided, tanks shall be sized to provide two (2) hours of supply for a combined flow of peak hour domestic plus fire flow; or, the storage capacity (or equivalent capacity) shall equal one half ($\frac{1}{2}$) the maximum daily consumption, whichever is greater. Either requirement may be reduced when the source and treatment facilities have sufficient capacity with auxiliary power to supplement peak demands of the system.

(b) Isolation of Tank - Storage structures shall be designed so they can be isolated from the distribution system for the purpose of draining, maintenance and repair. A sample tap shall be provided on the tank or on the tank side of the isolation valve.

(c) Level controls - Adequate controls shall be provided to automatically maintain levels in distribution system storage structures. Where telemetry is not provided for water level measurement, a float type level gauge and visible target shall be provided. Altitude valves or equivalent controls may be required for a second and subsequent structures on the system.

(d) All tanks shall be readily accessible at all times for inspection and maintenance.

(2) Atmospheric Ground Storage, Elevated Tanks, and Standpipes.

(a) General - The materials and designs used for finished water storage structures shall provide stability and protection of the stored water. Steel structures shall be designed in accordance with current American Waterworks Association (AWWA) Standard D-100 concerning steel tanks, standpipes, reservoirs, and elevated tanks whenever they are applicable. Other materials of construction are acceptable when properly designed to meet the requirements of this Section.

(b) Location of ground-level reservoirs

(i) The bottom of reservoirs and standpipes shall be above the one hundred (100) year flood level.

(ii) When the bottom must be below normal ground surface, it shall be placed above the ground water table. Sewers, drains, standing water, and similar sources of possible contamination must be kept at least fifty (50) feet from the reservoir. Water main pipe, pressure tested in place to fifty (50) pounds per square inch without leakage, may be used for gravity sewers at distances greater than twenty (20) feet and less than fifty (50) feet.

(iii) The top of a reservoir shall not be less than two (2) feet above normal ground surface. Clearwells constructed under filters may be exempted from this requirement when the total design gives the same protection.

(c) Sanitary Protection - All finished ground level or elevated water storage structures shall have suitable watertight roofs which exclude birds, animals, insects, and excessive dust.

(d) Protection from trespassers - Fencing, locks on access manholes, and other necessary precautions shall be provided to prevent trespassing, vandalism, and sabotage.

(e) Drains - Adequately sized drains shall be provided. No drain on a water storage structure may have a direct connection to a sewer or storm drain. A flap valve or other means of covering the open outlet of the drain shall be provided.

(f) Overflow - The overflow pipe shall be of sufficient diameter to permit the discharge of water equal to or greater than the filling rate; but shall not be less than four (4) inches in diameter. All atmospheric storage structures shall be provided with an overflow which is brought down to an elevation between twelve (12) and twenty-four (24) inches above the ground surface, and discharges over a drainage inlet structure or a splash pad. A flap valve or number four (4) mesh non-corrodible screen shall be provided on the outlet. No overflow may be connected directly to a sewer or storm drain. All overflow pipes shall be located so that any discharge is visible.

(g) Access - Finished water storage structures shall be designed with reasonably convenient access to the interior for cleaning and maintenance. Manholes above the water-line shall:

(i) be framed at least four (4) inches above the surface of the roof at the opening on ground-level structures;

(ii) be fitted with a solid watertight cover which overlaps the framed opening and extends down around the frame at least two (2) inches; and,

(iii) have a locking device.

(h) Vents - Finished water atmospheric storage structures shall be vented. Overflows shall not be considered as vents. Open construction between the sidewall and roof is not permissible. Twenty-four (24) mesh non-corrodible screens, or equivalent, shall be used on all vents. Vents shall be constructed to:

(i) prevent the entrance of surface water and rainwater;

(ii) exclude birds and animals;

(iii) exclude insects and dust, as much as this function can be made compatible with effective venting; and

(iv) prevent imploding of the tank during a rapid discharge of water from the tank.

(i) Roof and sidewall - The roof and sidewalls of all structures must be watertight with no openings except properly constructed vents, manholes, overflows, risers, drains, pump mountings, control ports, or piping for inflow and outflow.

(i) Any pipes running through the roof or sidewall of a finished water storage structure must be welded, or properly gasketed in metal tanks. In concrete tanks, these pipes shall be connected to standard wall castings which were poured in place during the forming of the concrete. These wall castings should have seepage rings imbedded in the concrete.

(ii) Openings in a storage structure roof or top, designed to accommodate control apparatus or pump columns, shall be curbed and sleeved with proper additional shielding to prevent the access of surface or floor drainage water into the structure.

(iii) Valves and controls shall be located outside the storage structure so that the valve stems and similar projections will not pass through the roof or top of the reservoir.

(j) Drainage of roof - The roof of the storage structure shall be well drained. Downspout pipes shall not enter or pass through the reservoir. Parapets, or similar construction which would tend to hold water and snow on the roof, will not be approved unless adequate waterproofing and drainage are provided.

(k) Safety - The safety of employees must be considered in the design of the storage structure.

(i) Ladders, ladder guards, balcony railings, and safely located entrance hatches shall be provided where applicable.

(ii) A platform at the top of the ladder to provide a place for the climber to stand on while unhooking the safety harness shall be provided.

(iii) Elevated tanks with riser pipes over eight (8) inches in diameter shall have protective bars over the riser opening inside the tank.

(l) Freezing - All finished water storage structures and their appurtenances, especially the riser pipes, overflows, and vents, shall be designed to prevent freezing which will interfere with proper functioning.

(m) Internal catwalk - Every catwalk over finished water in a storage structure shall have a solid floor with raised edges so designed that shoe scrapings and dirt will not fall into the water.

(n) Silt stop - The discharge pipes from all reservoirs shall be located in a manner that will prevent the flow of sediment into the distribution system. Removable silt stops should be provided where feasible.

(o) Grading - The area surrounding a ground-level structure shall be graded in a manner that will prevent surface water from standing within a fifty (50) foot radius.

(p) Painting and/or cathodic protection - Proper protection shall be given to metal surfaces by paints or other protective coatings, by cathodic protective devices, or by both.

All paint coatings which come into contact with drinking water shall be certified as meeting the specifications of the American National Standard Institute/National Sanitation Foundation Standard 61, Drinking Water System Components - Health Effects. The certifying party shall be accredited by the American National Standards Institute. Hot applied wax, cold applied wax, grease, and coal tar coatings are not acceptable.

(q) Disinfection - Finished water storage structures shall be disinfected in accordance with current American Waterworks Association (AWWA) Standard for the disinfection of water storage facilities. Prior to sampling, the chlorine residual must be reduced to normal system residual levels or be non-detectable in those systems not chlorinating. A minimum of two (2) samples must be collected and analyzed for total coliform bacteria. These samples must be collected at least twenty-four (24) hours apart and the results must show the absence of total coliform bacteria. The chlorine residual must also be measured and reported. If the membrane filter method of analysis is used for the coliform analysis, non-coliform growth must also be reported. If the non-coliform growth is greater than eighty (80) colonies per one hundred (100) ml, the sample result is invalid and must be repeated. All samples must be analyzed by a certified laboratory. The Department may request that heterotrophic plate count analyses be conducted on a case-by-case basis where disinfection problems are suspected.

(3) Washwater Tanks - Washwater tanks shall be designed in accordance with R.61- 58.4(C)(1) and shall be sized, in conjunction with available pump units and finished water storage, to provide the backwash water required by R.61-58.3(D)(5)(a)(xi). Consideration must be given to the backwashing of several filters in rapid succession.

(4) Clearwell -

(a) Clearwell storage shall be sized, in conjunction with distribution system storage, to relieve the filters from having to follow fluctuations in water use.

(b) When finished water storage is used to provide the contact time for chlorine, special attention shall be given to size and baffling.

(c) An overflow shall be provided.

(d) Finished water must not be stored or conveyed in a compartment adjacent to unsafe water when the two compartments are separated by a single wall.

(5) Hydropneumatic (Pressure) tanks - Hydropneumatic (pressure) tanks, when provided as the only storage facility, are acceptable only in small water systems. For systems serving more than three hundred (300) taps or more than one thousand (1000) people, elevated storage shall be provided. Pressure tank storage shall not be considered for fire protection purposes, unless standby power is provided and the pumping capacity from wells or ground storage exceeds the fire flow demand with the largest well or pump out of service. Pressure tanks five hundred (500) gallons and larger shall meet the requirements of the American Society of Mechanical Engineers for the construction and installation of unfired pressure vessels and shall carry its approval stamp.

(a) The tank shall be located above normal ground surface and shall be fenced to protect it from vandalism.

(b) Sizing - For surface and ground water systems where the pump yield equals or exceeds the instantaneous demand, the tank shall be sized so the pump cycles a maximum of six (6) times per hour. Where the pump yield is less than the instantaneous demand the tank shall be sized to provide the difference for a minimum twenty (20) minute demand period based on the actual usable volume of the tank.

(c) Bypass Piping - A flow through arrangement is required for all hydropneumatic storage tanks. However, the tank shall also be equipped with bypass piping to permit the tank to be removed from service for repairs or painting without removing well(s) or booster pump(s) from service. Bypass piping is not required for tanks less than 500 gallons.

(d) Appurtenances - All hydropneumatic tanks shall be equipped with a drain, isolation valves, sample tap, pressure gauge, air make-up system (except for bladder tanks), pressure relief valve, and pressure operated start and stop controls for the pump. Each tank five hundred (500) gallons and larger shall have an access manhole, a minimum two (2) inch diameter drain, and a vacuum relief valve. An air compressor is required on tanks two thousand (2000) gallons and larger.

(e) Freezing - All hydropneumatic storage tanks and their appurtenances shall be designed to prevent freezing which will interfere with proper functioning.

(f) Painting and/or cathodic protection - Proper protection shall be given to metal surfaces by paints or other protective coatings, by cathodic protective devices, or by both. All paint coatings which come into

contact with drinking water shall be certified as meeting the specifications of the American National Standard Institute/National Sanitation Foundation Standard 61, Drinking Water System Components - Health Effects. The certifying party shall be accredited by the American National Standards Institute. Hot applied wax, cold applied wax, grease, and coal tar coatings are not acceptable.

(g) Disinfection - Hydropneumatic storage tanks shall be disinfected in accordance with current American Waterworks Association (AWWA) Standard for the disinfection of water storage facilities. Prior to sampling, the chlorine residual must be reduced to normal system residual levels or be non-detectable in those systems not chlorinating. A minimum of two (2) samples must be collected and analyzed for total coliform bacteria. These samples must be collected at least twenty-four (24) hours apart and results must show the absence of total coliform bacteria. The chlorine residual must also be measured and reported. If the membrane filter method of analysis is used for the coliform analysis, non-coliform growth must also be reported. If the non-coliform growth is greater than eighty (80) colonies per one hundred (100) ml, the sample result is invalid and must be repeated. All samples must be analyzed by a certified laboratory. The Department may request that heterotrophic plate count analyses be conducted on a case-by-case basis where disinfection problems are suspected.

(h) The pressure range of hydropneumatic tanks shall not exceed twenty (20) pounds per square inch.

D. Distribution Systems.

(1) Materials Standards - Pipe, fittings, packing, jointing materials, valves and fire hydrants shall conform to Section C of the American Water Works Association (AWWA) Standards. All materials or products which come into contact with drinking water shall be certified as meeting the specifications of the American National Standard Institute/National Sanitation Foundation Standard 61, Drinking Water System Components - Health Effects. The certifying party shall be accredited by the American National Standards Institute. In the absence of American Water Works Association (AWWA) Standards, materials meeting applicable Product Standards and acceptable to the Department may be selected. SD 26 Class 160 and SD 21 Class 200 PVC pipe meeting ASTM Standard D1785 or D2241 are acceptable in sizes twelve (12) inches and smaller. Asbestos cement pipe shall not be used in potable water systems except in the repair of existing asbestos cement lines. Metallic pipe and fittings shall be lead free in accordance with R.61-58.4(F). Thermoplastic pipe shall not be used above grade.

(2) Used Materials - Water mains which have been used previously for conveying potable water may be reused provided they meet the above standards and have been thoroughly cleaned and restored practically to their original condition.

(3) Gaskets and Joints - Gaskets, O-rings, and other products used for jointing pipes, setting meters or valves, or other appurtenances which will expose the material to the water shall comply with the requirements of R.61-58.4(D)(1) and shall not be made of natural rubber or any other material which will support microbiological growth. Lubricants which will support microbiological growth shall not be used for slip-on joints. The use of vegetable shortening to lubricate joints is prohibited. The use of solvent-weld PVC pipe and fittings in water mains four (4) inches and larger is prohibited.

(4) Line Sizing -

(a) Pressure - The minimum pressure in all public water mains under conditions of maximum instantaneous demand shall be twenty-five (25) pounds per square inch at every customer's tap. Twenty (20) pounds per square inch will be acceptable at any tap when fire flows or flushing flows are provided in excess of maximum peak hourly flow.

(b) Diameter - The minimum size of water mains for providing fire protection and serving fire hydrants shall be six (6) inches in diameter. Larger size mains will be required if necessary to allow the withdrawal of the required fire flow while maintaining the minimum residual pressure specified in R.61-58.4(D)(4)(a).

(5) No line extension shall be made of an existing line when the existing line does not meet the minimum pressure and flow requirements of this regulation.

(6) Dead ends -

(a) Dead ends shall be minimized by looping of all mains whenever practical.

(b) The lengths of small dead end lines shall not exceed the following:

- (i) One (1) inch diameter --- 150 ft.
- (ii) One and one quarter (1 ¼) inch --- 200 ft.
- (iii) One and one half (1 ½) inch --- 300 ft.
- (iv) Two inches (2) --- 1500 ft.

Conditions may warrant having less than the above maximum lengths in order to meet the twenty-five (25) pounds per square inch pressure requirement.

(7) Flushing - The design shall provide for a readily accessible means of flushing all water lines at a minimum velocity of 2.5 feet per second. This does not apply to service lines.

(a) Where dead-end lines occur they shall be provided with a fire hydrant if flow and pressure are sufficient, or with a post hydrant or readily accessible blow-off valve in a box for flushing purposes, except for the following cases:

(i) Lines one and one half (1-1/2) inches in diameter and smaller will not require blow-offs. Two inch lines shorter than two hundred (200) feet will not require a blow-off. However, a service connection shall be installed at the end of the line or another acceptable means of bleeding chlorine through the lines must be provided.

(b) Blow-offs shall be sized to provide a minimum velocity of 2.5 feet per second in the line and maintain a residual pressure of twenty-five (25) pounds per square inch.

(c) Post-type hydrants are acceptable for flushing purposes on lines four (4) inch through eight (8) inch and can be used on three (3) inch lines where the design flow is increased to one hundred (100) gallons per minute in excess of peak hourly flow.

(d) Design head loss calculations, including elevation changes shall show twenty- five (25) pounds per square inch minimum residual when instantaneous demand occurs or twenty (20) pounds per square inch minimum residual when either fire flow or flushing flow in excess of peak hourly flow occurs, whichever is greater.

(e) Lines ten (10) inches and larger require flows in excess of five hundred (500) gallons per minute to achieve a two and a half (2.5) feet per second scouring velocity. This would require a standard fire

hydrant or other approved blow-off, for flushing which must be designed to provide at least five hundred (500) gallons per minute in excess of peak hourly flow and a minimum residual pressure of twenty (20) pounds per square inch.

(f) No flushing device shall be directly connected to any sewer.

(8) Valves - Sufficient valves shall be provided on water mains so that customer inconvenience and sanitary hazards will be minimized during repairs.

(9) Hydrants -

(a) Where standard four (4) to six (6) inch diameter hydrants are proposed, the design flow shall not be less than five hundred (500) gallons per minute over and above peak hourly flow. Standard hydrants shall not be placed on systems using only hydropneumatic storage, unless standby power is provided and the pumping capacity from wells or ground storage exceeds the fire flow demand with the largest well or pump out of service. Standard hydrants shall not be connected to lines not designed to carry fire flows.

(i) Hydrant Leads - The hydrant leads shall be a minimum of six (6) inches in diameter. Auxiliary gate valves shall be installed in all hydrant leads.

(ii) Drainage - A gravel pocket or dry well shall be provided unless the natural soils will provide adequate drainage. Hydrant drains shall not be connected to or located within ten (10) feet of sanitary sewers.

(b) Where Post-type hydrants are proposed, they must meet the flow requirements for blow-offs in R.61-58.4.D(7). Post hydrants shall not be used on lines smaller than three (3) inches. Design calculations must be submitted when utilizing post hydrants on three (3) inch lines. These calculations must show one hundred (100) gallons per minute in excess of peak hourly flow can be maintained, and provide a residual pressure greater than or equal to twenty (20) pounds per square inch.

(10) Air Relief Valves, Valve, Meter and Blow-Off Chambers

(a) Air relief valves - Air relief valves shall be provided in accordance with sound engineering practice at high points in water mains as required. Automatic air relief valves shall not be used in situations where flooding of the manhole or chamber may occur.

(b) Air relief valve piping - The open end of an air relief pipe from automatic valves or from a manually operated valve shall be extended to the top of the pit and provided with a screened downward facing elbow.

(c) Chamber drainage - Chambers, pits or manholes containing valves, blow-off, meters, air release valves, or other such appurtenances to a distribution system, shall not be connected directly to any storm drain or sanitary sewer.

(11) Installation of Mains -

(a) Standards - Construction specifications shall incorporate the provisions of Section C of the American Waterworks Association (AWWA) Standards and/or manufacturer's recommended installation procedures.

(b) Bedding - A continuous and uniform bedding shall be provided in the trench for all buried pipe. Back-fill material shall be tamped in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe. Stones, other than crushed bedding, shall not come in contact with the pipe and shall not be within six (6) inches of the pipe.

(c) Cover - All water mains shall be provided with a minimum thirty (30) inches of cover. Where this is not possible, pipe shall be steel, concrete, ductile iron, or other approved material and method approved by the Department, and, when necessary, insulated to prevent freezing.

(d) Blocking - All tees, bends, plugs and hydrants on lines two and one half inches in diameter and larger shall be provided with reaction blocking, tie rods or other approved restraining methods to prevent movement.

(e) Pressure and leakage testing - All newly installed pipe shall be pressure tested and leakage tested in accordance with American Water Works Association (AWWA) Standard C600.

(f) Disinfection - Disinfection of all new water mains shall be in accordance with current American Water Works Association (AWWA) Standard C651 for the disinfection of water mains. In general one approved method referred to as "continuous feed method" is as follows: Before being placed in service, all new mains shall be thoroughly flushed then chlorinated with not less than twenty-five (25) milligrams per liter of available chlorine. Water from the existing distribution system or other source of supply shall be controlled so as to flow slowly into the newly laid pipeline during the application of chlorine. The solution shall be retained in the pipeline for not less than twenty-four (24) hours and then flushed thoroughly with a potable water of satisfactory bacteriological quality before starting the sampling program.

The contractor or owner shall collect a minimum of two (2) samples from each sampling site for total coliform analysis. The number of sites depends on the amount of new construction but must include all dead-end lines and be representative of the water in the newly constructed mains. Prior to sampling, the chlorine residual must be reduced to normal system residual levels or be non-detectable in those systems not chlorinating. These samples must be collected at least twenty-four (24) hours apart and must show the water line to be absent of total coliform bacteria. The chlorine residual must also be measured and reported. If the membrane filter method of analysis is used for the coliform analysis, non-coliform growth must also be reported. If the non-coliform growth is greater than eighty (80) colonies per one hundred (100) milliliters, the sample result is invalid and must be repeated. All samples must be analyzed by a certified laboratory. The Department may request that heterotrophic plate count analyses be conducted on a case-by-case basis where disinfection problems are suspected.

(g) Detection of mains - All mains shall be detectable within three (3) feet with electronic locating equipment. Non-metallic pipes shall be installed with copper wire or other means of detection.

(h) Contaminated Areas - All water mains shall be located out of all contaminated areas. If the main must run through a contaminated site, the main material must protect the water system from being contaminated (e.g. Ductile Iron Pipe with chemical resistant gaskets).

(12) Separation of Water Mains and Sewers -

(a) Parallel installation - Water mains shall be laid at least ten (10) feet horizontally from any existing or proposed sewer. The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten foot separation, the Department may allow deviation on a case-by-case basis, if supported by data from the design engineer. Such deviation may allow installation of the water main closer to a sewer, provided that the water main is laid in a separate trench or on an undisturbed earth shelf located on one side

of the sewer at such an elevation that the bottom of the water main is at least eighteen (18) inches above the top of the sewer.

(b) Crossings - Water mains crossing sewers shall be laid to provide a minimum vertical separation of eighteen (18) inches between the outside of the water main and the outside of the sewer. This shall be the case whether the water main is either above or below the sewer line. Whenever possible, the water main shall be located above the sewer line. Where a new water main crosses a new sewer line, a full length of pipe shall be used for both the water main and sewer line and the crossing shall be arranged so that the joints of each line will be as far as possible from the point of crossing and each other. Where a new water main crosses an existing sewer line, one full length of water pipe shall be located so both joints will be as far from the sewer line as possible. Where a water main crosses under a sewer, adequate structural support shall be provided for the sewer line to prevent damage to the water main.

(c) Special Conditions - When it is impossible to obtain the distances specified in R.61-58.4(D)(12)(a) and (b) the Department may allow an alternative design. Any alternative design shall:

- (i) maximize the distances between the water main and sewer line and the joints of each;
- (ii) use materials which meet the requirements R.61-58.4(D)(1) for the sewer line; and,
- (iii) allow enough distance to make repairs to one of the lines without damaging the other.

(d) Force mains - There shall be at least a ten (10) foot horizontal separation between water mains and sanitary sewer force mains. There shall be an eighteen (18) inch vertical separation at crossing as required in R.61-58.4(D)(12)(a) and (b).

(e) Sewer manholes - No water pipe shall pass through or come in contact with any part of a sewer manhole. Water lines may come in contact with storm sewers or catch basins if there is no other practical alternative, provided that ductile iron is used, no joints of the water line are within the storm sewer or catch basin and the joints are located as far as possible from the storm sewer or catch basin.

(f) Drain-fields and Spray-fields - Potable water lines shall not be laid less than twenty-five (25) feet horizontally from any portion of a waste-water tile-field or spray- field, or shall be otherwise protected by an acceptable method approved by the Department.

(13) Surface Water Crossings -

(a) Above-water crossings - The pipe shall be adequately supported and anchored, protected from damage and freezing, and accessible for repair or replacement.

(b) Underwater crossings - A minimum cover of two (2) feet shall be provided over the pipe. When crossing water courses which are greater than fifteen (15) feet in width, the following shall be provided:

- (i) The pipe material and joints shall be designed appropriately;
- (ii) Valves shall be located so that the section can be isolated for testing or repair; the valves shall be easily accessible, and not subject to flooding; and,
- (iii) A blow-off shall be provided on the side opposite the supply service, sized in accordance with R.61-58.4(D)(7).

(iv) Blow-offs shall not be directed toward creeks or other water bodies without proper precaution being taken to dechlorinate prior to discharge.

(14) Cross Connections and Interconnections -

(a) Cross connections - There shall be no connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contamination materials may be discharged or drawn into the system.

(b) Cooling water - Neither steam condensate nor cooling water from engine jackets or other heat exchange devices shall be returned to the potable water supply.

(c) Interconnections - The approval of the Department shall be obtained for interconnections between potable water supplies.

(15) Water Services and Plumbing -

(a) Plumbing - Water services and plumbing shall conform to relevant local plumbing codes or to the National Plumbing Code.

(b) Booster pumps - Individual home booster pumps shall not be allowed to meet the twenty-five (25) pounds per square inch minimum pressure at the service connection.

(16) Water Loading Stations - To prevent contamination of the public supply, the following criteria shall be met:

(a) Air Gap - A device shall be installed on the fill line to provide an air break and prevent a submerged discharge line.

(b) Hose length - The fill hose and cross connection control device must be constructed so that when hanging freely it will terminate at least two (2) feet above the ground surface.

(c) Fill line terminus - The discharge end of the fill line must be unthreaded and constructed to prevent the attachment of additional hose, piping or other appurtenances.

E. Public Buildings.

Water supply facilities in public buildings shall be designed to provide safe potable water to employees, customers, and guests.

(1) Source of Supply -

(a) Where a separate independent source is provided, it must be constructed in accordance with R.61-58.2 for groundwater systems or R.61-58.3 for surface water systems and treatment must be provided where necessary to meet the Water Quality Standards in R.61-58.5.

(b) Where an emergency or standby source is provided in addition to a service from a public water supply, it must be constructed in accordance with R.61-58.4(E)(1)(a) and maintained in operating condition. Where the main source of supply is from a public system, an approved double check assembly shall be installed after the meter in the main service line.

(c) Non-potable supplies shall not be connected to the potable water system.

(2) Quantity of Supply -

(a) The source of supply where service is provided from a public water system, shall be adequate to provide the instantaneous demand based on the number of fixtures to be provided.

(b) Where a separate source is provided, it must be designed to provide the maximum daily demand.

(3) On-Site Storage -

(a) On-site storage will be considered only where necessary to provide instantaneous demand or fire protection. In either case, the source of supply must be adequate to provide maximum daily demand.

(b) On-site storage, where used, must meet the requirements of R.61-58.4(C).

(4) Cross Connection Control - Public buildings shall be free of cross connections and be designed to meet applicable portions of R.61-58.7(F).

F. Lead Ban.

(1) Any pipe, solder, or flux which is used in the installation or repair of any public water system shall be lead free.

(2) Any pipe, solder, or flux which is used in any plumbing in a residential or nonresidential facility which provides water, through connection to a public water system, for human consumption shall be lead free.

(3) Lead free shall be defined, when used with respect to solders and flux, as those containing not more than two-tenths (0.2) percent lead.

(4) Lead free shall be defined, when used with respect to pipes and pipe fittings, as those containing not more than eight (8.0) percent lead.

(5) Leaded joints necessary for the repair of cast iron pipes shall be exempt from the lead free requirement.

(6) No person may import, manufacture, process, or distribute in commerce a new plumbing fitting or fixture, intended by the manufacturer to dispense water for human ingestion, that contains more than four (4) percent lead by dry weight.

G. Aquifer Storage and Recovery (ASR) – This section applies to the construction of new ASR wells and the modification of existing public water supply wells to allow its use as an ASR well.

(1) ASR Well Design, Construction, and Initial Development.

(a) All ASR wells must be designed, constructed and initially developed in accordance with all applicable sections of R.61-58.2.B.

(b) Underground Injection Control (UIC) Construction Permit: An UIC construction permit pursuant to State Regulation R.61-87 is required for all ASR wells.

(c) Preliminary Engineering Report (PER): A PER must be submitted and reviewed by the Department for all ASR wells in accordance with applicable portions of R.61-58.1.C prior to submission of the construction application.

(d) ASR Wellhead Piping must meet the following minimum requirements:

(i) A properly sized injection line must be provided.

(ii) The injection by-pass line, or main wellhead piping, must be provided with a means of recording instantaneous and totalized flows both in and out of the well.

(iii) A properly placed check valve must be provided in the injection by-pass line.

(iv) A means must be provided to manually isolate the injection line.

(v) Calculations must be provided to show the system can maintain pressure requirements at all services taps during injection.

(2) ASR Water Treatment: All ASR water treatment must be in accordance with all applicable portions of R.61-58.2.D. In addition, all water withdrawn from ASR wells must be properly disinfected in accordance with all applicable requirements of its source water (i.e., groundwater or surface water).

(3) ASR Well Final Development. An UIC permit for the operation of an ASR well must be obtained in accordance with R.61-87.

(a) Well Development Report: A well development report must be submitted and reviewed by the Department under R.61-87 which outlines the findings of the final ASR well development (e.g., injection and withdrawal rates, cycle testing, water quality data).

(b) Location of Discharge: All pumping discharge must be done in accordance with R.61-58.2.B(12)(c).