CHAPTER 12

Design and Construction Standards for Public Water Supplies

Section 1. Authority.

These standards are promulgated pursuant to the Wyoming Environmental Quality Act, specifically, § 35-11-302.

Section 2. Applicability.

(a) This Chapter contains the minimum standards for the design and construction of public water supplies that are required to obtain a permit under Wyoming Statute (W.S.) § 35-11-301(a)(iii) and Water Quality Rules Chapter 3.

(i) All applicants for a Water Quality Rules Chapter 3 permit to construct, install, modify, or operate a public water supply facility shall comply with all minimum standards of this Chapter.

(ii) No permit to construct, install, modify, or operate a public water supply facility shall be issued to a facility that does not comply with the minimum standards of this Chapter.

(iii) All public water supply facilities shall be constructed, installed, and operated in accordance with permits issued pursuant to this Chapter.

(b) The construction, installation, or modification of any component of a public water supply facility requires a permit to construct.

Section 3. Timing of Compliance with These Regulations.

Any facility covered by an individual or general permit issued pursuant to Water Quality Rules, Chapter 3, prior to the effective date of this Chapter shall remain covered under that permit. New construction or modification of existing permitted facilities must obtain authorization under a new permit, in accordance with Water Quality Rules Chapter 3, Section 4(d) or Section 5(e), subject to the requirements of this Chapter.

Section 4. Incorporation By Reference of Recommended Standards for Water Works 2018 Edition.

(a) This Chapter incorporates sections of the Recommended Standards for Water Works, A Report of the Water Supply Committee of the Great Lakes--Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, 2018 Edition, referred to as "2018 TSS," as noted in Section 8(a), Section 9(a), Section 10(a), Section 11(a), Section 12(a), Section 13(a), Section 14(a), Section 15(a), Section 16(a), Section 17(a), and Section 19(a)(lviii) of this Chapter.

(b) The State term "Administrator" shall replace the term "reviewing authority" used in the Recommended Standards for Water Works 2018 Edition.

(c) The State term "shall" shall replace the term "should" used in the Recommended Standards for Water Works 2018 Edition.

Section 5. Definitions.

(a) The following definitions supplement those contained in W.S. § 35-11-103 of the Wyoming Environmental Quality Act.

(b) "Auxiliary source of supply" means any water supply on or available to the water user's system other than an approved public water supply acceptable to the water supplier. These auxiliary waters may include water from another supplier's public potable water supply or any natural source(s), such as a well, spring, river, stream, harbor, and so forth; used waters; or industrial fluids. These waters may be contaminated or polluted, they may be objectionable or they may be from a water source that the water supplier is uncertain of sanitary control.

(c) "Average daily demand" means the total annual water use divided by the number of days the system was in operation.

(d) "Backflow" means the undesirable reversal of flow of water or mixtures of water and other liquids, gases, or other substances into the distribution system of the public water supply from any other source or sources.

(e) "Backflow incident" means any identified backflow to a public water supply distribution system or to the potable water piping within the water user's system benefitting from a water service connection to the public water supply distribution system.

(f) "Back-pressure" means a form of backflow caused when the pressure of the water user's system is greater than that of the water supply system whether caused by a pump, elevated tank, elevated piping, boiler, pressurized process, pressurized irrigation system, or air pressure.

(g) "Back-siphonage" means a form of backflow caused by negative or reduced pressure in the water supply system whether caused by loss of pressure due to high water demands, a line break, or excessive firefighting flows.

(h) "Calculated Dose" means the reduction equivalent dose (RED) calculated using the dose-monitoring equation that was developed through validation testing.

(i) "Contamination" means an impairment of a public water supply by the introduction or admission of any foreign substance that degrades the quality of the potable water or creates a health hazard.

(j) "Cross-connection" means any actual or potential connection between a potable water supply and any other source or system through which it is possible to introduce contamination into the system.

(k) "Degree of hazard" means either a high or low hazard situation where a substance may be introduced into a public water supply through a cross-connection. The degree of hazard or threat to public health is determined by a hazard classification.

(l) "Domestic services" means services using potable water for ordinary living processes.

(m) "Dual check" means a device conforming to American Association of Sanitary Engineers (ASSE) Standard #1024 consisting of two independently acting check valves.

(n) "Groundwater source" includes all water obtained from dug, drilled, bored, jetted, or driven wells; springs that are developed so that the water does not flow on the ground and that are protected to preclude the entrance of surface contamination; and collection wells.

(o) "Hazard classification" means a determination by a Hazard Classification Surveyor as to high hazard or low hazard and the potential cause of backflow as either back-pressure or back-siphonage.

(p) "Hazard Classification Survey" means inspection of a premises to identify the potable water systems, the location of any potential cross-connections to the potable water systems, the hazard of the potential backflow, the physical identification of any backflow devices or methods present, and the inspection status of any backflow devices or methods recorded and certified by a qualified Hazard Classification Surveyor.

(q) "Hazard Classification Surveyor" means an individual certified by the USC-Foundation for Cross-Connection Control and Hydraulic Research as Cross Connection Control Specialist (USC-FCCCHR), the ASSE as a Cross-Connection Control Surveyor, or another state certification program submitted with the permit application and approved by the Administrator, or an individual who is a water distribution system operator also certified as a backflow device tester employed by the public water supplier for the service where the survey is being conducted.

(r) "High hazard" means a situation created when any substance that is or may be introduced into a public water supply poses a threat to public health through poisoning, the spread of disease or pathogenic organisms, or any other public health concern.

(s) "Isolated" when referring to cross-connections means the properly approved backflow prevention devices have been installed at each point of cross-connection within the water user's system.

(t) "Low hazard" means a situation created when any substance that is or may be introduced into a public water supply does not pose a threat to public health but that does adversely affect the aesthetic quality of the potable water.

(u) "Maximum daily demand" means the demand for water exerted on the system over a period of 24 consecutive hours, for the period during which such demand is greatest.

(v) "Maximum hourly demand" means the highest single-hour demand exerted on the system. This may or may not occur on the maximum day.

(w) "Mechanical sludge equipment" means the equipment used to physically remove solids from a water treatment process. This may include mechanical drives that use scrapers or differential water levels to collect the sludge.

(x) "Mineralized water" means any water containing more than 500 mg/L total dissolved solids.

(y) "Minor field change" means any in-field adjustment due to previously unknown physical constraints of the project site that do not affect the project's scope. Minor field changes still allow full compliance with the requirements of this Chapter and are shown on the submitted, post-construction as-built plan set for the Division in red.

(zz) "Primary disinfection" means disinfection that kills or inactivates bacteria, viruses, and other potentially hamful organisms in drinking water.

(aa) "Reduction Equivalent Dose" means the ultraviolet (UV) dose derived by entering the log inactivation measured during full-scale reactor testing into the UV dose-response curve that was derived through collimated beam testing. RED values are always specific to the challenge microorganism used during experimental testing and the validation test conditions for full-scale reactor testing.

(bb) "Required Dose" means the UV dose in units of mJ/cm2 req needed to achieve the target log inactivation for the target pathogen.

(cc) "Secondary disinfection" means disinfection that provides longer lasting water treatment as the water moves through pipes to consumers.

(dd) "Stabilized drawdown" means a water level that has not fluctuated by more than plus or minus 0.5 foot for each 100 feet of water in the well over at least a six-hour period of constant pumping flow rate. The water column is measured from pre-test static water level to the top of the deepest water bearing fracture that contributes at least 10 percent of total well yield, and plotted measurements that have not shown a trend of decreasing water level.

(ee) "Surface water source" includes all tributary streams and drainage basins, natural lakes, and artificial reservoirs or impoundments upstream from the point of the water supply intake.

(ff) "Validated Dose" means the UV dose in units of mJ/cm^2 delivered by the UV reactor as determined through validation testing that is compared to the required dose to determine log inactivation credit.

(gg) "Water service connection" means any water line or pipe connected to a distribution supply main or pipe for the purpose of conveying water to a water user's system.

(hh) "Water supplier" means any entity that owns or operates a public water supply, whether public or private.

(ii) "Water user" means any entity, whether public or private, with a water service connection to a public water supply and includes customers of a public water supplier.

(jj) "Water user's system" means that portion of the user's water system between the water service connection and the point of use. This system includes all pipes, conduits, tanks, fixtures, and appurtenances used to convey, store, or use water provided by the public water supply.

Section 6. Facilities and Systems not Specifically Covered by these Standards.

(a) Each application for a permit to construct a facility under this section shall be evaluated on a case-by-case basis using the best available technology. The Administrator may approve applications demonstrating the constructed facility can meet the purpose of the Wyoming Environmental Quality Act and this Chapter.

(b) The following information shall be included with the application for a permit to construct, install, modify, or operate a public water supply facility not specifically covered by these standards:

(i) Data obtained from:

(A) A full scale, comparable installation that demonstrates the acceptability of the design; or

(B) A pilot plant operated under the design condition for a sufficient length of time to demonstrate the acceptability of the design; or

(C) A theoretical evaluation of the design that demonstrates a reasonable probability the facility will meet the design objectives.

(ii) An evaluation of the flexibility of making corrective changes to the constructed facility in the event it does not function as planned.

(c) If an applicant wishes to construct a pilot plant to provide the data necessary to meet the requirements of this Section, the applicant must obtain a permit to construct.

Section 7. Permits, Permit Application, and Recordkeeping Requirements.

(a) Applications for a permit to construct, install, modify, or operate a public water supply shall comply with the requirements of Water Quality Rules Chapter 3, Section 6.

(b) The application shall include the following components:

(i) An engineering design report that meets the requirements of Section 9 of this Chapter;

(ii) A construction plan that meets the applicable requirements of Sections 8, 10, 11, 12, 13, 14, 15, 16, and 17 of this Chapter;

(iii) An operation and maintenance plan that meets the requirements of Section 18 of this Chapter; and

(iv) Any additional information required by the Administrator.

(c) The application and components required by this Chapter shall be submitted to the Division in a format required by the Administrator.

(d) The application shall include certification under penalty of perjury that the applicant has secured and will maintain permission for Department personnel and their invitees to access the facility, including permission to:

(i) Access the land where the facility is located;

(ii) Collect resource data as defined by W.S. § 6-3-414(e)(iv); and

(iii) Enter and cross all properties necessary to access the facility if the facility cannot be directly accessed from a public road.

(e) Sections of permit applications that represent engineering work shall be sealed, signed, and dated by a licensed professional engineer as required by W.S. § 33-29-601.

(f) Sections of permit applications that represent geologic work shall be sealed, signed, and dated by a licensed professional geologist as required by W.S. § 33-41-115.

(g) The Administrator may allow an alternative two-step permitting and application procedure for wells and water storage tank project applicants that meet the following requirements:

(ii) For applications that include wells, the Department will issue one permit with the following phased authorizations:

(A) The issued permit will authorize the well to be constructed, developed, and tested;

(B) Applicants shall then submit well test data and water quality data for Administrator review; and

(C) Upon the Administrator's approval of the well test data and water quality data, the Director-shall modify the issued permit to authorize connection of the distribution system to the well.

(iii) Applicants for water storage tanks may follow an alternative procedure when the final plans and specifications for the tank cannot be submitted with the initial permit application due to project bidding constraints. In these instances, the Department will issue a permit through the following phased authorizations:

(A) The issued permit will authorize the project to initiate the bidding process. Applicants shall ensure the project bidding documentation includes a requirement that the final water storage tank design complies with the requirements of this Chapter.

(B) Applicants shall then submit final documentation and specifications for the water storage tank that demonstrate the design is consistent with the requirements of this Chapter. Upon the Administrator's approval of the final tank documentation specifications, the Director shall modify the issued permit to authorize the construction of the water storage tank and foundation.

(iv) Applicants that use phased authorization procedures in this paragraph (g) shall request a pre-application meeting with the applicable Division district engineer prior to submission of the permit application package to ensure efficient coordination of the submittals of all reports, plans, and specifications, and Division review timelines.

Section 8. Plans and Specifications.

(a) 2018 TSS, part 1.2-1.2.2(r), plans; 1.3-1.3(e), specifications; 1.4-1.4(m), design criteria; 1.5, revisions to approved plans; and 1.6, additional information required; are herein incorporated by reference.

(b) All plans for waterworks and treatment facilities shall also include the name of the real estate owner, the owner of the project, and the location of the project.

(c) Plans for transmission and distribution lines shall include:

(i) The information required in paragraph (a) of this Section;

(ii) A detailed plan view at a legible scale of each reach of the water line showing all existing and proposed streets, adjacent structures, physical features, and existing locations of utilities that indicates:

(A) The location and size of all water lines, valves, access manholes, air-vacuum release stations, thrust blocking, and other appurtenances; and

(B) Pertinent elevations.

(iii) Profiles of all water lines that are shown on the same sheet as the plan view at legible horizontal and vertical scales and that show:

(A) Profiles of:

(I) Existing and finished surfaces;

(II) Pipe size and material; and

(III) Valve size, material, and type.

(B) The location of all special features such as access manholes, concrete encasements, casing pipes, blowoff valves, and air-vacuum relief valves.

(iv) Special detail drawings scaled and dimensioned to show the following:

(A) The bottom of the stream, the elevation of the high- and low-water levels, and other topographical features at points where the water line:

(I) Is located within 10 feet of streams or lakes; or

(II) Crosses streams or lakes.

(B) A cross-section drawing of the pipe bedding; and

(C) Additional features of the pipe or its installation that are not otherwise covered by specifications.

(v) The location of any sewer lines within 30 feet horizontally of water lines. Sewers that cross water lines shall be shown on the profile drawings.

(d) Plans for storage tanks, pumping stations, and water treatment facilities shall show the relation of the proposed project to the remainder of the system and shall include:

(i) The information required in paragraph (a) of this Section;

(ii) The seal and signature of the Wyoming Professional Engineer providing the design;

(iii) The site location and layout including:

(A) Topographic and physical features, including embankments;

(B) The proposed arrangement of pumping or treatment units;

(C) Existing facilities;

(D) Existing and proposed piping and valving arrangements;

(E) The route to access the facility;

(F) The power supply;

(G) Fencing; and

(H) The proposed location of clearwells, waste ponds, and sludge ponds.

(iv) Schematic flow diagram(s) and hydraulic profile(s) for facility-treated water;

(v) A flow diagram for sludge and wastewater flows; and

(vi) Plan(s) and section view(s) of each treatment facility process unit with specific construction details, features, and pertinent elevations including but not limited to the following:

(A) Inlet and outlet devices;

(B) Baffles;

(C) Valves;

(D) Arrangement of automatic control devices;

(E) Mixers;

(F) Motors;

(G) Chemical feeders;

(H) Sludge scrapers;

(I) Sludge disposal; or

(J) Other mechanical devices.

(e) Plans for well construction shall include:

(i) The information required in paragraph (a) of this Section;

(ii) Assembled order, size, and length of casing and liners;

(iii) The well test method and allowable tolerance;

(iv) The locations of all caisson construction joints and porthole assemblies on drawings, if a radial water collector is proposed;

(v) From the ground surface to the total depth of the drilled borehole, the elevation and designation of geological formations, water levels, formations penetrated, and other details to describe the proposed well completely;

(vi) Screen locations, size of screen openings, and screen intervals;

(vii) The location of any blast charges, if available; and

(viii) Existing well test data, including:

(A) Test pump capacity-head characteristics;

(B) Static water level;

(C) Depth of test pump setting;

(D) Time of starting and ending each test cycle;

(E) Pumping rate;

(F) Pumping water level;

(G) Drawdown; and

(H) Water recovery rate and levels.

(f) Plans for water lines, pump stations, treatment facilities, wells, storage, or additions/modifications to existing systems or facilities shall be accompanied by technical specifications that include:

(i) The information required in paragraph (a) of this Section;

(ii) Identification of construction materials;

(iii) When applicable, the type, size, strength, operating characteristics, rating or requirements for all mechanical and electrical equipment, including machinery, valves, piping, electrical apparatus, wiring, and meters; laboratory fixtures and equipment; operating tools; special appurtenances; and chemicals;

(iv) Construction and installation procedure for materials and equipment;

(v) Requirements and tests of materials and equipment to meet design standards;

(vi) Performance tests for the operation of completed works and component units;

(vii) Specialized requirements for tests, analyses, disinfection techniques, and other special needs;

(viii) A demonstration that all water service connections will be provided with backflow prevention devices in accordance with the requirements of Section 16(m) of this Chapter; and

(ix) If technical specifications have been independently permitted by the Department for statewide use, the title, date, and permit approval identification number in lieu of providing technical specifications.

Section 9 Engineering Design Report.

(a) 2018 TSS, parts 1.1.1-1.1.1(d), engineers report, general information; 1.1.2-1.1.2(c), engineers report, extent of water works system; 1.1.4-1.1.4(c), engineers report, soil, groundwater conditions, and foundation problems; 1.1.5-1.1.5(f), engineers report, water use data; 1.1.6-1.1.6(b), engineers report, flow requirements; 1.1.7.1-1.1.7.1(f), engineers report, surface water sources; 1.1.7.2-1.1.7.2(g), engineers report, groundwater; 1.1.8, engineers report, proposed treatment processes; 1.1.9, engineers report, sewerage system available; 1.1.10, engineers report, waste disposal; 1.1.15-1.1.15(d), engineers report, pumping facilities; 1.1.16-1.1.16(c), engineers report, storage facilities; and 1.1.17-1.1.17(d), engineers report, security, contingency planning, and emergency preparedness; are herein incorporated by reference.

(b) An engineering design report shall be submitted with each application and shall include the following required elements:

(i) The information required in paragraph (a) of this Section;

(ii) A description by narrative, analyses, and calculations of the project purpose and intent in order to support the project plans and specifications;

(iii) A description of known or suspected problems, needs, or requirements, and the reasoning used to arrive at the proposed solution;

(iv) An identification of problems and solutions related to but not limited to the following:

(A) Water quantity and quality;

(B) Compliance with the Safe Drinking Water Act, 42 U.S.C. §300f et seq.; and

(C) Operational requirements, redundancy, maintenance, and reliability.

(v) A determination of the degree of hazard of all known or anticipated water service connections to be connected to the proposed project. A hazard classification shall be identified for each connection and recommended mitigation measures shall be described for each hazard.

(c) The engineering design report for all new water distribution system extensions shall include the following required elements:

(i) The information required in paragraph (a) of this Section;

(ii) A description of the service area including scaled vicinity plan map(s) of the project with regard to adjacent and proposed development, elevations, and topographic features; and

(iii) Current and projected system water use data and flow requirements to include maximum hourly demand and per capita maximum daily flows;

(iv) Information on fire protection and fire flow capabilities of the proposed system.

(d) The engineering design report for all treatment facilities shall include the following required elements:

(i) The information required in paragraph (a) of this Section;

(ii) A description of the facility site and location, including a scaled site plan, and:

(A) Present and projected facility property boundaries;

(B) Flood protection indicating predicted elevation of 25- and 100-year flood stages;

(C) Present and proposed access for the purpose of operation, maintenance, and compliance inspection;

(D) Distances from:

(I) Current habitation;

(II) The closest major treated water transmission line;

(III) The closest treated water storage facility; and

(IV) The water source.

(E) Fencing and security;

(F) Topographic features and contours with indicated datum; and

(G) Soil and subsurface geological characteristics, including a soils investigation report of the proposed site suitable for structural design of the proposed facilities.

(iii) A description of the service area, including scaled vicinity plan map(s) of the project with regard to adjacent and proposed development, elevations, and topographic features;

(iv) A detailed description of the recycle flows and procedures for reclamation of recycle streams; and

(v) A detailed description of disposal techniques for settled solids, including a description of the ultimate disposal of sludge.

(e) Engineering design reports for new surface water sources shall include the following required elements:

(i) The information required in paragraph (a) of this Section;

(ii) A description of water quantity available during average and driest years of record that contains details of:

(A) Any diversion records; and

(B) Diversion dams, impoundments, or reservoirs that may impact design considerations or long-term water availability.

(iii) A tabulation of water quality data that describes the biological, radiological, and chemical water quality sufficient to determine necessary treatment processes that:

(A) For surface water source testing, include at least one sampling event during spring runoff and at least one sampling event during late summer or early fall low flow; and

(B) Includes data that are sufficient for the Division to determine that the processes safely and reliably comply with water quality standards required by 40 CFR Part 141.

(f) Engineering design reports for new groundwater sources shall include:

(i) The information required in paragraph (a) of this Section;

(ii) A description of the geology of the aquifer(s) and overlying strata;

(iii) Tabulated water quality testing data for biological, radiological, and chemical water quality sufficient to determine necessary treatment processes and sufficient for the Administrator to determine that the processes safely and reliably meet water quality standards required by 40 CFR Part 141;

(iv) If known, a summary of the likely drilling and completion challenges that will be faced, including a description of the engineering design, management, monitoring, and drilling and completion practices that will be used to successfully construct the well in accordance with this Chapter; and

(v) For wells that will be drilled through multiple aquifers, applicants shall request a pre-application meeting with the applicable Division district engineer to discuss:

(A) The boring advancement, well sealing, well development, and methods used to determine the adequacy of the well seal; and

(B) The methods that will be used to overcome lost circulation, bore instability, and deviations from vertical alignment.

(g) Engineering design reports for conversion of an existing well into a public water supply well shall include the following required elements:

(i) The information required in paragraph (a) of this Section;

(ii) The information required in paragraph (f) of this Section;

(iii) The submission of the State Engineer’s Office (SEO) Statement of Completion and Description of Well; and

(iv) A video log of the well inspection accompanied by a written description of the location, shape, and estimated size of any holes, breaches, corroded areas in the casing, if any, that includes:

(A) If any damage to the casing is found, a descripition of how defective areas will be repaired and if there is a need for additional well bond logging; or

(B) If well bond logging is not recommended, a descripition of the technical justification and an alternative means of certifying the adequacy of the well seal to protect the water source.

(h) Engineering design reports for new water treatment facilities shall include the following required elements:

(i) The information required in paragraph (a) of this Section;

(ii) A description of all water treatment chemical requirements, including dosage and feed rates, delivery, handling, and storage;

(iii) A description of automatic operation and control systems, including basic operation, manual override operation, and maintenance requirements; and

(iv) A description of the on-site laboratory facilities and a summary of those tests to be conducted on-site. If no on-site laboratory is provided, a description of plant control and water quality testing requirements, and where the testing will be conducted shall be included.

(i) Engineering design reports for water treatment facility modifications shall describe:

(i) The information required in paragraph (a) of this Section;

(ii) The purpose of the facility modification;

(iii) All proposed new equipment, tankage, and chemical treatment processes, including a description of the modification’s effect on treatment system reliability, water quantity and quality; and

(iv) A listing of the new equipment design criteria and the associated chemicals.

(j) Engineering design reports for water main upsizing or looping projects shall describe the purpose of the water main upsizing or looping project and shall include the following required elements:

(i) The information required in paragraph (a) of this Section;

(ii) Hydraulic analysis that demonstrates how peak hour, average day, maximum day, and maximum day plus fire flows, if fire flows are available, will be improved by upsizing; and

(iii) A table that summarizes the hydraulic model results.

(k) Engineering design reports for water main removal and replacements shall describe the purpose of the replacement and identify the existing main size, material type, and condition, and shall include the following required elements:

(i) The information required in paragraph (a) of this Section;

(ii) For any main replacement(s), the replacement main size, material type, and dimension ratio;

(iii) For projects that consist of main replacements in multiple discrete locations, an aerial image that shows all replacement pipeline segments, including new valves, with called-out pipe diameters and lengths;

(iv) A description of the protective measures that will be taken at locations where the new water main will cross a sewer or storm sewer when standard horizontal and vertical separations cannot be met; and

(v) For projects where asbestos cement may be encountered, a discussion of the disposal, or abandonment method to be used.

(l) Engineering design reports for new water mains shall describe the purpose of the new water main and shall include the information required in paragraph (a) of this Section. If the water main will provide service to a new development the engineering design report shall include the following required elements:

(i) The modeling result from a hydraulic analysis that demonstrates that the design will meet the requirements of Section 16(d)(i-ii) of this Chapter;

(ii) A demonstration that the hydraulic model was calibrated based on existing fire hydrant test flow data, when available, or based on modeling; and

(iii) Identification of any impacts the new fire flow demand will have on finished storage and pumping systems over the required fire flow duration.

Section 10. Design Requirements for Preliminary Treatment and Redundancy.

(a) 2018 TSS, parts 2.9-2.9(c), monitoring equipment; 2.10, sample taps; 2.11, facility water supply; and 2.14, piping color code are herein incorporated by reference.

(b) The proposed design shall demonstrate that the capacity of the water treatment or water production system is designed for the maximum daily demand at the design year based on historical usage records.

(i) Where water use records are not available to establish water use, the design shall include an equivalent per capita water use of at least 125 gallons per day (gpd) for average daily water demand and 340 gpd for maximum daily water demand.

(ii) The plant capacity design shall demonstrate consideration of:

(A) Maximum daily water demand;

(B) Agricultural water use;

(C) Industrial water use; and

(D) Filter backwash quantities. In the absence of data, filter backwash quantity shall be five percent of the maximum daily demand.

(c) The structural design shall demonstrate consideration of:

(i) The seismic zone;

(ii) Groundwater; and

(iii) Soil support that demonstrates:

(A) The applicant has conducted soils investigations or has included documentation of adequate previous soils investigations used to develop the structural design;

(B) Basin slabs have been designed to successfully resist the hydrostatic uplift pressure or include an area dewatering system; and

(C) Consideration of long-span breakage in basins designed to resist uplift.

(d) Proposed treatment facilities locations shall demonstrate that:

(i) No sources of pollution will affect the quality of the water supply or treatment system;

(ii) The facility location is not within 500 feet of landfills, garbage dumps, or wastewater treatment systems; and

(iii) All treatment process structures, mechanical equipment, and electrical equipment will be protected, accessible, and remain fully operational during the maximum flood of record or the 100-year flood, whichever is greater.

(e) Proposed treatment shall demonstrate that the facility will produce potable water that is bacteriologically, chemically, radiologically, and physically safe, as required by 40 CFR Part 141.

(f) Designs for proposed treatment facilities with 100,000 gpd capacity and over shall include duplicate units, as a minimum, for chemical feed, flocculation, clarification, sedimentation, filtration, and disinfection.

(g) Designs for proposed treatment facilities under 100,000 gpd capacity shall include:

(i) Duplicate units as described in paragraph (f) of this Section; or

(ii) Finished water system storage equal to twice the maximum daily demand; and

(iii) Demonstration of consideration of plant design flexibility to account for future changes in source water quality, unexpected need to modify process piping, service area expansion, changing treatment technologies, and equipment life cycles and upgrades.

(h) All treatment facility pumping shall provide the maximum daily demand flow with the largest single-unit not in service. Finished water pumping in combination with finished water storage that floats on the distribution systems shall provide the maximum hourly demand with the largest single-unit not in service. For designs that include fire protection, pumping, and finished water storage that floats on the system shall provide the fire demand plus the maximum daily demand, or the maximum hourly demand, whichever is greater.

(i) Where the finished water storage volume that floats on the distribution system is not capable of supplying the maximum daily demand, the proposed design shall include alternative power for the finished water pumps that demonstrates:

(i) The combined finished water storage volume and pumping capacity supplied by alternative power will be at least adequate to provide the maximum daily demand; and

(ii) The alternative power source will include engine generators, engine drive pumps, or a second independent electrical supply that will provide sufficient power to run the system.

(j) Process equipment, filters and appurtenances, disinfection, chemical feed and storage, electrical and controls, and pipe galleries shall be located in suitable structures.

(k) All equipment not required to be in or on open basins, such as clarifier drives and flocculators, shall be located in heated, lighted, and ventilated structures.

(l) Piping shall be buried below frost level, placed in heated structures, or provided with heat and insulated.

(m) Structure entrances shall be above grade.

(n) Selected construction materials shall provide water tightness, corrosion protection, and resistance to weather variations.

(o) NSF/ANSI/CAN 61-2020/NSF/ANSI/CAN 600-2021 certified coatings used to protect structures, equipment, and piping shall be suitable for atmospheres containing moisture and low concentrations of chlorine.

(p) Surfaces exposed in chemical areas shall be protected from chemical attack.

(q) Paints shall not contain lead, mercury, or other toxic metals or chemicals.

(r) All enclosed spaces shall be provided with forced ventilation, except pumping station wetwells or clearwells that meet the following requirements:

(i) In areas where there are open treatment units exposed to the room, ventilation shall be provided to limit relative humidity to less than 85 percent but not less than six air changes per hour; and

(ii) Ventilation in electrical and equipment rooms shall limit the temperature rise in the room to less than 15 degrees Fahrenheit above ambient with at least six air changes per hour.

(s) Service transformers and other critical electrical equipment shall be located above the 100-year flood and above grade. Transformers shall be located so that they are remote or protected by substantial barriers from traffic. Motor controls shall be located in superstructures and in rooms that do not contain corrosive atmospheres.

(t) All treatment facilities shall have a flow-measuring device provided for raw water influent and clear well effluent and each shall provide totalized flow. The accuracy of the device shall be at least plus or minus two percent of span and shall meet the following requirements:

(i) Automatic controls shall be designed to permit manual override; and

(ii) The meter shall also record the instantaneous flow rate.

(u) Water treatment plants with a capacity of 500,000 gpd or more shall be provided with continuous water turbidimeters (including recorders) that demonstrate compliance with the

Guidance Manual for Compliance with the Surface Water Treatment Rules, Turbidity Provisions.

Section 11. Source Development.

(a) 2018 TSS, parts 3.1.4.1-3.1.4.1(i), surface water, structures, design of intake structures; 3.1.4.3-3.1.4.3(f) surface water, structures, offstream raw water storage reservoir; 3.1.6-3.1.6.3, surface water, impoundments and reservoirs; 3.2.3.2, groundwater, location, continued sanitary protection; 3.2.4-3.2.4.14(b)(4), groundwater, general well construction; 3.2.5-3.2.5.4, groundwater, testing and records; 3.2.6.1-3.2.6.1(c), groundwater, aquifer types and construction methods--special conditions, sand or gravel wells; 3.2.6.2-3.2.6.2(b)(7), groundwater, aquifer types and construction methods--special conditions, gravel pack material; 3.2.6.4-3.2.6.4(d),groundwater, aquifer types and construction methods--special conditions, infiltration lines; 3.2.6.5-3.2.6.5(b), groundwater, aquifer types and construction methods--special conditions, limestone or sandstone wells; 3.2.7.3-3.2.7.3(c)(3), groundwater, well pumps, discharge piping and appurtenances, discharge piping; 3.2.7.4-3.2.7.4(d), groundwater, well pumps, discharge piping and appurtenances, pitless well units; 3.2.7.6, groundwater, well pumps, discharge piping and appurtenances, casing vent; 3.2.7.7-3.2.7.7(b), groundwater, well pumps, discharge piping and appurtenances, water level measurement; 3.2.7.8-3.2.7.8(b), groundwater, well pumps, discharge piping and appurtenances, observation wells; are herein incorporated by reference.

(b) Surface water intake structures that operate in the winter shall be capable of minimizing the formation of ice on the intake.

(c) Transmission lines and interconnecting process piping shall be capable of withstanding the forces and conditions they will be subject to and comply with the following specifications for water service, as applicable:

(i) AWWA C200;

(ii) AWWA C207;

(iii) AWWA C208;

(iv) AWWA C220;

(v) AWWA C228;

(vi) AWWA C300;

(vii) AWWA C301;

(viii) AWWA C302;

(ix) AWWA C303;

(x) AWWA C304;

(xi) AWWA C900;

(xii) AWWA C901;

(xiii) AWWA C903;

(xiv) AWWA C904;

(xv) AWWA C906;

(xvi) AWWA C907;

(xvii) AWWA C909;

(xviii) AWWA C950;

(xix) ASTM A53;

(xx) ASTM A134;

(xxi) ASTM A135;

(xxii) ASTM A139;

(xxiii) ASTM D2846;

(xxiv) ASTM F480;

(xxv) ASTM F645;

(xxvi) ASTM F877;

(xxvii) ASTM F23891;

(xxviii) ASTM F2806;

(xxix) ASTM F2855;

(xxx) ASTM F2969;

(xxxi) API 5L:

(A) Grade B;

(B) Grade X42;

(C) Grade X46;

(D) Grade X52;

(E) Grade X56;

(F) Grade X60;

(G) Grade X65;

(H) Grade X70; or

(I) Grade X80.

(d) Designs shall not include any customer service connection from the raw water transmission line to the treatment plant unless there are provisions to treat the water to meet the requirements of this Chapter, or the sole purpose of the service is for irrigation or agricultural water use. For irrigation agricultural services, applicants shall conduct a hazard classification and implement appropriate backflow prevention.

(e) Designs that include groundwater source development shall comply with the following requirements:

(i) Proposed designs shall include a minimum of:

(A) Two wells that are each capable of supplying the average daily demand with the largest producing well out of service;

(B) One well and finished water storage that together equal twice the maximum daily demand; or

(C) For public water supplies that are not community water systems or nontransient noncommunity water systems, as determined by the Administrator, one well that is capable of supplying the maximum daily demand.

(ii) Wells shall maintain the following minimum isolation distances:

(A) If domestic wastewater is the only wastewater present and the design domestic sewage flow is less than 2,000 gpd, the following minimum isolation distance shall be maintained:

Table 1. Isolation Distances for Domestic Sewage Flows Less than 2,000 gpd

Source of Domestic Wastewater	*Minimum Distance to Well*
Storm and Sanitary Sewer Collection Systems	50 feet
Septic tank	100 feet
Absorption system	200 feet

(B) If domestic wastewater is the only wastewater present and the design domestic sewage flow is greater than 2,000 gpd but less than 10,000 gpd, the following minimum isolation distances shall be maintained:

Table 2. Isolation Distances for Domestic Sewage Flows Greater than 2,000 gpd

Source of Domestic Wastewater	*Minimum Distance to Well*
Storm and Sanitary Sewer Collection Systems	50 feet
Septic tank	100 feet
Absorption system	500 feet

(C) If domestic wastewater is the only wastewater present and the design domestic sewage flow is greater than 10,000 gallons per day or non-domestic wastewater is present the required isolation distance shall be determined by a subsurface study, in accordance with the requirements of Water Quality Rules Chapter 3, Section 17(b), but shall not be less than those required in Tables 1 and 2 of this Section.

(iii) Wells shall maintain the following minimum isolation distances from buildings and property lines:

(A) When a well is outside of a building, the well shall be located so that the the surface casing has a clearance radius of a minimum of 10 feet horizontally and will clear any projection from the building;

(B) When a well is located inside a building:

(I) The top of the casing and any other well opening shall not terminate in the basement of the building, or in any pit or space that is below natural ground surface unless the well is completed with a properly protected submersible pump or provided with provisions for drainage to the ground surface that is not subject to flooding by surface water;

(II) Wells located in a structure shall be accessible to pull the casing, pipe, or pump; and

(III) The structure shall have overhead access.

(C) Wells shall be located at least 50 feet from any property line.

(iv) Applicants for wells shall complete testing and maintain records as follows:

(A) Yield and drawdown tests shall be performed on every production well after construction or subsequent treatment and prior to placement of the permanent pump. The test methods shall be clearly indicated in the specifications. The test pump capacity, at maximum anticipated drawdown, shall be at least 1.5 times the design rate anticipated. The well shall be test pumped at the desired yield (design capacity) of the well for at least 24 consecutive hours after stabilized drawdown. Alternatively, the well may be pumped at a rate of 150 percent of the desired yield for at least six continuous hours after stabilized drawdown.

(B) Every well shall be tested for plumbness and alignment in accordance with AWWA A100.

(v) In addition to meeting the requirements of Section 8 of this Chapter, plans for wells developed through acidizing activities shall also include the following elements:

(A) Information on the geology of the area that contains descriptions of:

(I) Known or potential faults, fractures, springs, karst features (such as sinkholes and other similar features) within a one-mile radius of the proposed well; and

(II) Faults and fractures that may extend from the acidized zone into overlying and underlying geologic formations and a description of any measures that will be taken to ensure that the acidized solution does not migrate into any of those geologic formations.

(B) For wells developed within a radius of one mile of existing wells, applicants shall submit plans that analyze the risk and mitigation measures to be taken to prevent impacts to those wells and the risk and mitigation measures for any potential effects to each existing well;

(C) Existing information on the location of other wells (such as water supply, oil and gas, mineral development wells) within a one-mile radius of the proposed well, including any wells that intercept the acidized zone, and for wells that intercept the acidized zone:

(I) An analysis of whether or not those wells that intercept the acidized zone have been properly plugged and abandoned;

(II) An analysis of whether or not those wells have been properly cased and cemented; and

(III) A description of what measures will be or have been taken to prevent the acidized solution from migrating vertically in the annular space or casing of the existing wells into overlying or underlying geologic formations.

(D) A description of the borehole drilling phase and what measures will be taken to minimize the introduction of lost circulation materials into aquifers when encountering under-pressured geologic formations or other factors that may lead to a loss of circulation;

(E) A description of the acid injection process and the measures that will be taken to ensure that injection pressures do not create fractures in the overlying and underlying geologic formations and through which the acidized solution may migrate;

(F) A description of the volume and content of the acid and any other chemical compounds to be used during acidizing activities, including the management of the acid and chemical compounds prior to acidizing and final disposition of any acid, water, or chemical mixtures recovered from the well after acidizing activities are completed;

(G) A description of the measures that will be or have been taken to ensure that the recovery of the acidized solution is of sufficient duration and volume to eliminate the potential for acidic impacts to other wells completed within the injection zone; and

(H) A description of the methods to be performed to establish the placement and integrity of the annular seal and casing prior to acidization of the well.

(vi) During any well construction or modification, the well and surrounding area shall be adequately protected to prevent any groundwater contamination. Surface water shall be diverted away from the construction area.

(vii) All wells shall comply with the following construction standards:

(A) Dug wells shall be constructed according to the State Engineer's standards;

(B) Drilled, driven, jetted, or bored wells shall have an unperforated casing that extends from a minimum of 12 inches above the concrete surface and 18 inches above natural ground surface and the design shall demonstrate compliance with Water Quality Rules, Chapter 26, Section 8;

(C) In gravel-packed wells or artificial filter-packed wells, aquifers containing inferior quality water shall be sealed by pressure grouting, or with special packers or seals, to prevent such water from moving vertically in gravel-packed portions of the well. Gravel-packed wells shall meet the following sealing requirements:

(I) If a permanent surface casing is not installed, the annular opening between the casing and the drill hole shall be sealed in the top 10 feet with concrete or cement grout; or

(II) If a permanent surface casing is installed, it shall extend to a depth of at least 10 feet. The annular opening between this outer casing and the inner casing shall be covered with a metal or cement seal.

(D) When naturally flowing water is encountered in a well, unperforated casing shall extend into the confining layer overlying the water-bearing zone. This casing shall be adequately sealed with cement grout into the confining zone and shall extend at least 10 feet into the target aquifer to prevent both surface and subsurface leakage from the water-bearing zone. The method of construction shall be such that during the placing of the grout and the time required for it to set, no water shall flow through or around the annular space outside the casing, and no water pressure sufficient to disturb the grout prior to final set shall occur. Drilling operations shall not be continued into the water-bearing zone until the grout has set completely. If leakage occurs around the well casing or adjacent to the well, the well shall be recompleted with any seals, packers, or casing necessary to eliminate the leakage completely.

(I) Flowing wells shall be constructed to control the flow of water from the well. The well grouting shall be engineered to prevent the movement of water along the well casing and to prevent the migration of pressurized water into upper aquifers. A flow control device shall be installed into the wellhead to control the flow of water from the well. The well discharge or overflow line installations must connect to the well casing at least 12 inches above ground and be valved. The size of the air gap between the overflow line from the well to drainage structure shall be twice the diameter of the well overflow pipe. Overflow water must be drained and diverted to prevent ponding around the well casing.

(II) There shall be no direct connection between any discharge pipe and a sewer or other source of pollution.

(E) If mineralized water or water known to be polluted is encountered during the construction of a well, the aquifer or aquifers containing such inferior quality of water shall be adequately cased or sealed off to prevent water from entering the well and to prevent water from moving up or down the annular space.

(I) For wells that penetrate multiple aquifers, mineralized water shall be excluded from the well if water is taken from other, non-mineralized aquifers.

(II) Applicants that propose to use mineralized water as a public water supply shall demonstrate that any necessary treatment will comply with the drinking water quality standards required by 40 CFR Part 141.

(F) Existing oil or gas wells, private water wells, or exploration test holes that can be completed to conform to all minimum construction standards required by this

Chapter may be converted for use as a public water supply well. The permit application shall identify all actions to be completed to achieve compliance with this Chapter.

(viii) The minimum grout thickness for public water supply wells shall be determined in accordance with AWWA Standard A100, part 4.7.8.3.

(ix) Well seals shall meet the following requirements:

(A) The annular space shall be sealed to protect against contamination or pollution by the entrance of surface or shallow subsurface waters; and

(B) Annular seals shall be installed to provide protection for the casing against corrosion, to ensure the structural integrity of the casing, and to stabilize the upper formation.

(x) Upper terminal well designs that include a concrete floor shall demonstrate a slope of one inch per foot away from the casing.

(xi) Well pumps shall be located at a point above the top of the well screen.

(xii) An accessible check valve that is not located in the pump column shall be installed in the discharge line of each well between the pump and the shut-off valve. Additional check valves shall be located in the pump column as necessary to prevent negative pressures on the discharge piping.

(xiii) A pitless adaptor or well house shall be used where needed to protect the water system from freezing.

(xiv) A frost pit may be used only in conjunction with a properly protected pitless adaptor.

(xv) Wells with diameters that are greater than four inches shall be equipped with an air line for water level measurements or, in the case of a flowing artesian well, with a pressure gauge that will indicate pressure.

(xvi) An instantaneous and totalizing flow meter equipped with nonvolatile memory shall be installed on the discharge line of each well in accordance with the manufacturer's specifications. Meters installed on systems with variable frequency drives shall be capable of accurately reading the full range of flow rates.

(xvii) Test wells and groundwater sources that are sealed for plugging and abandonment in accordance with requirements of Water Quality Rules Chapter 26, Section 11 shall be sealed by filling with neat cement grout. The filling materials shall be applied to the well hole through a pipe, or tremie.

(xviii) Designs for groundwater sources that are subject to 40 CFR 141.402(a)(1)(i) and either 40 CFR 141.402(a)(1)(ii) or 40 CFR 141.402(a)(1)(iii) shall demonstrate compliance with 40 CFR 141.402(e).

(f) Facilities that include spring development shall meet the following requirements:

(i) Spring collection systems shall be constructed to collect spring water while preventing contamination of the source from the ground surface or other contaminant sources.

(ii) Seepage springs shall have a trench for the collection site that extends at least six inches into the impervious layer, but not entirely through the impervious layer. Concentrated springs shall be developed down to bedrock.

(iii) A bed of clean and disinfected rock that extends the width of the spring from which water is being collected shall be installed at the collection site.

(iv) The collection site shall:

(A) Be covered with 60 mil plastic sheeting or an equivalent puncture-proof and water-proof barrier; and

(B) Be protected from damage during back-fill and re-grading of the site to the original surface elevation with protective fabric or sand.

(v) Collecting walls shall be:

(A) Constructed immediately downstream of the collection site; and

(B) Made of concrete, or other material that meets the requirements of Section 15(b)(ii) of this Chapter;

(vi) The spring water collection pipe shall be installed in accordance with the USDA NRCS Part 631 National Engineering Handbook, Chapter 32, part 631.3201(b)(iii) for delivery pipes and shall meet the following requirements:

(A) The size of the collection pipe shall be sufficient to convey the flow of the spring; and

(B) Pipe material and appurtenances shall comply with allowable well construction material for water distribution in accordance with the standards listed in paragraph (c) of this Section.

(vii) Appropriate bedding and cover material shall protect the spring collection system from damage and freezing.

(viii) The Administrator shall determine the spring protection area, based on the information submitted in the engineering design report required by Section 8 of this Chapter, which shall be no less than the isolation distances in (e)(ii) of this Section. The Administrator may require additional setback distances if the engineering design report demonstrates the additional distance is required to prevent contamination of the source from the ground surface or other contaminant sources.

(ix) All potential sources of contamination shall be removed from the spring protection area.

(x) The spring collection site shall include fencing or other protective features that are constructed and secured to exclude large animals and unauthorized persons from entering the protection area.

(A) Fencing shall be designed to withstand animals and snow loading. Other protective systems may be proposed.

(B) Fencing shall include an entry point to allow access by authorized persons for inspection and maintenance activities.

(xi) The spring collection site shall include a diversion ditch that is constructed on the upstream side of the spring collection site to route surface water flows away from the collection area. The diversion ditch shall be located a minimum of 10 feet away from the collection wall.

(xii) The spring collection site shall be equipped to disinfect water prior to distribution and shall include sampling ports before and after the disinfection application point. The equipment shall be maintained and available to operate for its intended use.

(xiii) Spring box designs shall comply Section 15(a), (b), (f-j), and (l) of this Chapter. Combined spring box and finished water storage designs shall comply with Section 15 of this Chapter.

(xiv) All designs for the spring collector box and collecting walls shall be performed by a Wyoming registered professional engineer. The plans or contractor furnished information shall be signed and sealed by a Wyoming registered professional engineer.

Section 12. Treatment.

(a) 2018 TSS, parts 4.2.1(b), presedimentation, inlets; 4.2.1(c), presedimentation, bypass; 4.2.2, coagulation; 4.2.2(a), coagulation, mixing; 4.2.2(b), coagulation, equipment; 4.2.2(c), coagulation, location; 4.2.4(b), sedimentation, inlet devices: 4.2.4(c), sedimentation, velocity; 4.2.4(d)-4.2.4(d)(4), sedimentation, outlet devices; 4.3.1.1, rapid rate gravity filters, pretreatment; 4.3.1.4-4.3.1.4(o), rapid rate gravity filters, structural details and hydraulics; 4.3.1.6(a), filter material, total depth; 4.3.1.6(b), filter material, uniformity coefficient; 4.3.1.6(c), filter material, minimum; 4.3.1.6(d)(1)-4.3.1.6(d)(1)(f), filter material, types of filter media,

anthracite; 4.3.1.6(d)(2)-4.3.1.6(d)(2)(.d), filter material, types of filter media, sand filter; 4.3.1.6(d)(4)-4.3.1.6(d)(4)(.d), filter material, types of filter media, granular activated carbon (GAC); 4.3.1.6(e)(1)-4.3.1.6(e)(1)(.b), filter material, support media, topedo sand; 4.3.3.6-4.3.3.6(b), diatomaceous earth filtration, pre-coat; 4.3.3.7-4.3.3.7(c), diatomaceous earth filtration, body feed; 4.3.3.8-4.3.3.8(e), diatomaceous earth filtration, filtration; 4.3.3.10(a)(1), diatomaceous earth filtration, appurtenances, sampling taps; 4.3.3.10(a)(2), diatomaceous earth filtration, appurtenances, loss of head; 4.3.3.10(a)(3), diatomaceous earth filtration, appurtenances, rate of flow indicator; 4.3.3.10(a)(4), diatomaceous earth filtration, appurtenances, throttling valve; 4.3.4.2, slow sand filters, number; 4.3.4.4, slow sand filters, rates of filtration; 4.3.4.5, slow sand filters, underdrains; 4.3.4.6-4.3.4.6(e), slow sand filters, filter material; 4.3.4.7, slow sand filters, filter gravel; 4.3.4.8, slow sand filters, depth of water on filter beds; 4.3.4.9(b) and (e), slow sand filters, control appurtenances; 4.3.4.9(f), slow sand filters, control appurtenances; 4.4.1(a), disinfection, contact time, CT, and point(s) of application; 4.4.1(b), disinfection, contact time, CT, and point(s) of application; 4.4.3(a)-(d), disinfection, testing equipment; 4.4.4.3, chlorine, automatic switch-over; 4.4.4.7, chlorine, cross-connection protection; 4.4.4.8, chlorine, pipe material; 4.4.5, chloramines; 4.4.6.1, ozone, design considerations; 4.4.6.2, ozone, feed gas preparation; 4.4.6.3, ozone, ozone generator; 4.4.6.4, ozone, ozone contactors; 4.4.6.5, ozone, ozone destruction unit; 4.4.6.6, ozone, piping materials; 4.4.6.7, ozone, joints and connections; 4.4.6.8, ozone, instrumentation; 4.4.6.9, ozone, alarms; 4.4.6.11, ozone, construction considerations; 4.5.1, softening, lime or lime-soda process; 4.5.1.1, softening, lime or lime-soda process, hydraulics; 4.5.1.3, softening, lime or lime-soda process, chemical feed point; 4.5.1.4, softening, lime or lime-soda process, rapid mix; 4.5.1.5, softening, lime or lime-soda process, stabilization; 4.5.1.6-4.5.1.6(b), softening, lime or lime-soda process, sludge collection; 4.5.1.7, softening, lime or lime-soda process, sludge disposal; 4.5.1.8, softening, lime or lime-soda process, disinfection; 4.5.1.9, softening, lime or lime-soda process, plant start-up; 4.5.2.1, cation exchange process, pre-treatment requirements; 4.5.2.2, cation exchange process, design; 4.5.2.3, cation exchange process, design; 4.5.2.4, cation exchange process, depth of resin; 4.5.2.5, cation exchange process, flow rates; 4.5.2.7, cation exchange process, underdrains and supporting gravel; 4.5.2.8, cation exchange process, brine distribution; 4.5.2.9, cation exchange process, cross-connection control; 4.5.2.10, cation exchange process, bypass piping and equipment; 4.5.2.11, cation exchange process, additional limitations; 4.5.2.13(a)-4.5.2.13(f), cation exchange process, brine and salt storage tanks; 4.5.2.14, cation exchange process, salt and brine storage capacity; 4.5.2.15, cation exchange process, brine pump or eductor; 4.5.2.18, cation exchange process, construction materials; 4.5.2.19, cation exchange process, housing; 4.5.3, water quality test equipment; 4.6, anion exchange treatment; 4.6.1, anion exchange treatment, pre-treatment requirements; 4.6.2-4.6.2(b), anion exchange treatment, design; 4.6.3, anion exchange treatment, exchange capacity; 4.6.4, anion exchange treatment, number of units; 4.6.5, anion exchange treatment, type of resin; 4.6.6, anion exchange treatment, flow rates; 4.6.7, anion exchange treatment, free board; 4.6.8-4.6.8(b), anion exchange treatment, miscellaneous appurtenances; 4.6.9, anion exchange treatment, cross-connection control; 4.6.10, anion exchange treatment, construction materials; 4.6.11, anion exchange treatment, housing; 4.6.12, anion exchange treatment, pre-conditioning of the resin; 4.6.13, anion exchange treatment, waste disposal; 4.6.14, anion exchange treatment, water quality test equipment; 4.7, aeration; 4.7.1-4.7.1(i), aeration, natural draft aeration; 4.7.2-4.7.2(l), aeration, forced or induced draft aeration; 4.7.3-4.73.3(e), aeration, spray aeration; 4.7.4-4.7.4(b), aeration, pressure aeration; 4.7.5, aeration, packed tower aeration; 4.7.5.1-4.7.5.1(f), aeration, packed tower

aeration, process design; 4.7.5.2-4.7.5.2(b), aeration, packed tower aeration, materials of construction; 4.7.5.3-4.7.5.3(l), aeration, packed tower aeration, water flow system; 4.7.5.4-4.7.5.4(f), aeration, packed tower aeration, air flow system; 4.7.5.5-4.7.5.5(m), aeration, packed tower aeration, other features that shall be provided; 4.7.5.6-4.7.5.6(b), aeration, packed tower aeration, environmental factors; 4.7.6, aeration, other methods of aeration; 4.7.7, aeration, protection of aerators; 4.7.8, aeration, disinfection; 4.7.9, aeration, bypass; 4.7.10, aeration, corrosion control; 4.7.11, aeration, quality control; 4.8, iron and manganese control; 4.8.1, iron and manganese control, removal by oxidation, detention and filtration, oxidation; 4.8.1.2, iron and manganese control, removal by oxidation, detention and filtration, detention; 4.8.1.3, iron and manganese control, removal by oxidation, detention and filtration, filtration; 4.8.2, iron and manganese control, removal by the lime-soda softening process; 4.8.3-4.8.3(f), iron and manganese control, removal by manganese coated media filtration; 4.8.4, iron and manganese control, removal by ion exchange; 4.8.6-4.8.6(d), iron and manganese control, sequestration by polyphosphates; 4.8.7-4.8.7(e), iron and manganese control, sequestration by sodium silicates; 4.8.8, iron and manganese control, sampling taps; 4.9.3-4.9.3(e), stabilization and corrosion control, carbon dioxide addition; 4.9.5(c)-4.9.5(c)(9), stabilization and corrosion control, phosphates, design; 4.9.6, stabilization and corrosion control, pH/alkalinity adjustment; 4.9.6.1, stabilization and corrosion control, pH/alkalinity adjustment; 4.9.6.1(a), stabilization and corrosion control, pH/alkalinity adjustment, chemicals; 4.9.6.1(a)(1.), stabilization and corrosion control, pH/alkalinity adjustment, chemicals, caustic soda; 4.9.6.1(a)(2.), stabilization and corrosion control, pH/alkalinity adjustment, chemicals, soda ash; 4.9.6.1(a)(3.), stabilization and corrosion control, pH/alkalinity adjustment, chemicals, lime; 4.9.6.1(a)(4.), stabilization and corrosion control, pH/alkalinity adjustment, chemicals, sodium bicarbonate; 4.9.6.1(b)-4.9.6.1(b)(4.), stabilization and corrosion control, pH/alkalinity adjustment, simultaneous compliance; 4.9.6.1(c)-4.9.6.1(c)(4.), stabilization and corrosion control, pH/alkalinity adjustment, alkalinity/pH adjustment systems; 4.10, taste and odor control; 4.10.1, taste and odor control, flexibility; 4.10.2, taste and odor control, cholorination; 4.10.3, taste and odor control, chlorine dioxide; 4.10.4-4.10.4(f), taste and odor control, powdered activated carbon; 4.10.8, taste and odor control, potassium permanganate; 4.11, membrane technologies for public water supplies; 4.11.1-4.11.1(c), membrane technologies for public water supplies, pilot study/preliminary investigations; 4.11.2, membrane technologies for public water supplies, general design considerations; 4.11.2(a), membrane technologies for public water supplies, general design considerations, pretreatment; 4.11.2(b), membrane technologies for public water supplies, general design considerations, materials; 4.11.2(c), membrane technologies for public water supplies, general design considerations, useful life of membranes; 4.11.2(d), membrane technologies for public water supplies, general design considerations, membrane integrity and finished water monitoring; 4.11.2(e), membrane technologies for public water supplies, general design considerations, bypass water; 4.11.2(f)-4.11.2(f)(6.), membrane technologies for public water supplies, general design considerations, membrane cleaning; 4.11.2(g), membrane technologies for public water supplies, general design considerations, controls; 4.11.2(h)-4.11.2(h)(13.), membrane technologies for public water supplies, general design considerations, alarms; 4.11.2(i), membrane technologies for public water supplies, general design considerations, compressed air; 4.11.2(j), membrane technologies for public water supplies, general design considerations, operation frequency; 4.11.2(k), membrane technologies for public water supplies, general design considerations, cross connection control; 4.11.2(l)-4.11.2(l)(4.), membrane technologies for public water supplies, general design considerations, redundancy of

critical components; 4.11.3-4.11.3(h), membrane technologies for public water supplies, systems treating surface water or GWUDI; 5.4.7-5.4.7(f), specific chemicals, fluoride; 5.4.8, specific chemicals, activated carbon; 9.3, precipitative softening sludge; 9.3(a)-9.3(a)(2.), precipitative softening sludge, lagoons; 9.4.1-9.4.1(h), alum sludge, lagoons; 9.5, red water waste; 9.5.1-9.5.1(k), red water waste, sand filters; 9.5.2-9.5.2(g), red water waste, lagoons; 9.5.3, red water waste, discharge to community sanitary sewer; are herein incorporated by reference.

(b) The capacity of the water treatment or water production system shall be designed for the maximum daily demand at the design year.

(c) Presedimentation shall be required for raw waters that have episodes of turbidity in excess of 1,000 Nephelometric turbidity units (NTU) for a period of one week or longer.

(d) Basins shall meet the following requirements:

(i) Basins without mechanical sludge collection equipment shall have a minimum detention time of three days;

(ii) Basins with mechanical sludge collection equipment shall have a minimum detention time of three hours;

(iii) Basins shall have a bottom slope to drain of ¼ inch per foot without mechanical sludge collection equipment and two inches per foot with mechanical sludge collection equipment; and

(iv) Basins shall have a minimum of one, eight-inch drain line to completely dewater the facility.

(e) Rapid dispersal of chemicals throughout the water shall be accomplished by mechanical mixers, jet mixers, static mixers, or hydraulic jump and shall meet the following requirements:

(i) For mechanical mixers, the minimum Gt (velocity gradient (sec-1) x t (sec)) provided at maximum daily flow shall be 27,000;

(ii) The detention time in a flash mixing chamber shall not exceed 30 seconds at maximum daily flow conditions; and

(iii) The basin shall have a drain.

(f) Flocculation shall comply with the following requirements:

(i) Mechanical flocculators shall be used for low-velocity agitation of chemically treated water.

(ii) The minimum detention time of 10 minutes shall be provided.

(iii) Basins shall have a minimum of one drain line to dewater the facility.

(iv) The velocity gradient (G value) shall be adjustable through the use of variable speed drives. The velocity gradient for single basin systems shall be 30 sec-1, 20 sec-1 in the final basin of a two-stage system, and 10 sec-1 in the final basin of a three-stage system.

(v) The tip speed for a single-speed drive system shall not exceed 3 feet per second (ft/sec). Variable speed drives shall provide tip speeds between 0.5 and 3.0 ft/sec.

(vi) The velocity of flocculated water through pipes or conduits to settling basins shall not be less than 0.5 ft/sec or greater than 1.5 ft/sec.

(g) Sedimentation basins shall comply with the following requirements:

(i) The maximum diameter in circular basins shall be 80 feet.

(ii) The minimum basin side water depth shall be eight feet if mechanical sludge collection equipment is provided or basin sludge hopper segments are less than 100 square feet in surface area and 15 feet if basins are manually cleaned.

(iii) The outer walls of the settling basin shall extend at least 12 inches above the surrounding ground and provide at least 12 inches of freeboard to the water surface. Where the basin walls are less than four feet above the surrounding ground, a fence or other debris barrier shall be provided on the wall.

(iv) Basin bottoms shall slope toward the drain at not less than one inch per foot where mechanical sludge collection equipment is provided and ¼ inch per foot where no mechanical sludge collection equipment is provided.

(v) The basin overflow rate shall not exceed 1,000 gpd/ft^2 at design conditions.

(vi) Mechanical sludge collection shall be provided if settleable organics are present in the water or the source water exceeds secondary maximum contaminant levels identified at 40 CFR 143.3.

(vii) Pipes for removing sludge shall not be less than six inches in diameter and arranged to facilitate cleaning. Valves on sludge lines shall be located outside the tank.

(h) Facilities with softening sedimentation or clarification for softened groundwater sources shall meet the following requirements:

(i) The basin overflow rate shall not exceed 21,000 gpd/ft^2 at the design flow; and

(ii) Mechanical sludge removal shall be provided and shall be designed to handle a load of 40 lbs/ft of collector scraper arm length.

(i) Solids contact units are acceptable for combined softening and clarification of well water where water quality characteristics are not variable and flow rates are uniform and consistent. Solids contact units shall meet the requirements of paragraphs (c) and (e) of this Section and may be considered under the following circumstances:

(i) Solids contact units may be considered for use as clarifiers without softening when they are designed as conventional sedimentation units; and

(ii) Solids contact units may be used for other treatment processes such as rapid mixing or flocculation when the individual components of the units are designed for that specific treatment process.

(j) Tube clarifiers that are horizontal or steeply inclined may be used when designed as follows:

(i) The maximum flow rate shall be less than 2.0 gpm/ft^2 based on the surface area of the basin covered by the tubes;

(ii) The top of the tubes shall be more than 12 inches from the underside of the launder and more than 18 inches from the water surface and the spacing of the effluent launder shall not be more than three times the distance from the water surface to the top of the tube modules;

(iii) Sludge shall be removed using 45-degree or steeper hoppered bottoms, mechanical devices that move the sludge to hoppers, or devices that remove settled sludge from the basin floor using differential hydraulic level; and

(iv) A method of tube cleaning shall be provided that may include provisions for a rapid reduction in clarifier water surface elevation, a water jet spray system, or an air scour system. If cleaning is automatic, controls shall cease clarifier operation during tube cleaning and a 20-minute rest period.

(k) Filtration systems shall comply with the following requirements:

(i) Vertical or horizontal pressure filters shall not be used on surface waters. Pressure filters may be used for groundwater filtration, including iron and manganese removal;

(A) Slow rate sand filters may be used when maximum turbidity is less than 50 NTU and the turbidity present is not caused by colloidal clay; and

(B) Maximum color shall not exceed 30 units.

(ii) Washwater troughs shall comply with the following requirements:

(A) Washwater troughs shall not cover more than 25 percent of the filter area;

(B) The minimum distance between the bottom of the trough and the top of the unexpanded media shall be 12 inches;

(C) The minimum distance between the weir of the trough and the unexpanded media shall be 30 inches;

(D) There shall be no more than six feet clear distance between troughs;

(E) The trough and wastewater line shall be sized for a filter backwash rate of 20 gpm/ft^2 plus a surface wash rate of 2 gpm/ft^2;

(F) The backwash system shall be sized to provide a minimum backwash flowrate of 20 gpm/ft^2 or a rate necessary to provide a 50 percent expansion of the filter bed;

(G) The system and wash water storage shall be designed to provide two, 20-minute washes in rapid succession and shall meet the following requirements:

(I) If only one filter is provided, the backwash system needs to provide only one 20-minute backwash; and

(II) If pumps are used to convey water to the filter(s) or to the wash water tank, two equivalent pumps shall be provided.

(H) Washwater shall be filtered and disinfected;

(I) The washwater rate shall be controlled on the main wash water line and the flowrates shall be metered and indicated;

(J) Air-assisted backwash systems may be used when the design precludes disturbing the gravel support and the minimum flowrate for air-assisted backwash shall be 12 gpm/ft^2;

(K) A surface wash system shall be provided and shall meet the following requirements:

(I) The system shall be capable of supplying 0.5 gpm/ft^2 for a system with rotating arms and 2 gpm/ft^2 for fixed nozzles, at a minimum pressure of 50 psi; and

(II) The surface wash can be air-assisted.

(L) Both backwash and surface wash supply systems shall be provided with adequate backflow prevention;

(iii) Single media beds shall use either clean crushed anthracite or a sand and anthracite mixture, the media shall have an effective size of 0.45 – 0.55 mm and a uniformity coefficient not greater than 1.65, and shall meet the following requirements:

(A) When gravel is used as supporting media, it shall consist of coarse aggregate in which most of it is round and of similar size and shape;

(B) Gravel as supporting media shall have sufficient strength and hardness to resist degradation during handling and use, be free of harmful materials and exceed the minimum density requirements; and

(C) The gravel shall also comply with AWWA B100 specifications.

(iv) Dual media coal sand filters shall consist of a coarse layer of coal not less than 15 inches deep above a layer of fine sand not less than eight inches deep on a torpedo sand or garnet layer of support not less than three inches on gravel support.

(v) Filter bottoms and strainer systems shall be limited to pipe, perforated pipe laterals, tile block, and perforated tile block. Perforated plate bottoms or plastic nozzles shall not be used.

(vi) Every filter shall have:

(A) Influent and effluent taps;

(B) A head loss gauge;

(C) An indicating effluent turbidimeter;

(D) A waste drain for draining the filter component to waste;

(E) A filter rate flow meter;

(F) Polymer feed facilities including polymer mixing, storage tank and at least one feed pump for each filter compartment; and

(G) Recorders on the turbidimeters if the facility has a capacity in excess of 0.5 MGD.

(vii) Filter rate control shall be such that the filter is not surged. The filter rate of flow shall not change more than 0.3gpm/ft^2 per minute. A filter that stops and restarts during a cycle shall have a filter-to-waste system installed. Declining flow rate filters shall not be used

unless the flow rate for each filter is controlled to a rate less than allowed in paragraph (j)(iii) of this Section and there are four more individual filters.

(viii) A filter to waste cycle shall be provided after the filter backwash operation. The filter to waste cycle shall be at least 10 minutes.

(ix) Multi-media filter beds shall contain a depth of fine media made up of anthracite (specific gravity 1.5), silica sand (specific gravity 2.6), and garnet sand or ilemite (specific gravity 4.2-4.5). The bed depths and distribution shall be determined by the water quality and shall meet the following requirements:

(A) There shall not be less than 10 inches of fine sand and 24 inches of anthracite;

(B) The relative size of the media shall be such that the hydraulic grading of the material during backwash will result in a pore space that progressively goes from coarse to fine in the direction of flow;

(C) The multi-media shall be supported on two layers of special high-density gravel placed above the conventional silica gravel supporting bed;

(D) The special gravel shall have a specific gravity not less than 4.2;

(E) The bottom layer shall consist of particles passing U.S. Standard 5 mesh sieves and retained in U.S. Standard 12 mesh sieves and shall be 1 ½ inches thick; and

(F) The top layer shall consist of particles passing U.S. Standard 12 mesh sieves and retained in U.S. Standard 20 mesh sieves and shall be 1 ½ inches thick.

(x) Diatomaceous earth filtration shall comply with the following requirements:

(A) Diatomaceous earth filters may be used under the following circumstances:

(I) To remove turbidity from surface waters where turbidities entering the filters do not exceed 10 NTU and where total raw water coliforms do not exceed 100 organisms/100 mL;

(II) Where the raw water quality exceeds the previously mentioned limits when flocculation and sedimentation are used preceding the filters; and

(III) To remove iron from groundwaters.

(B) The proposed diatomaceous earth filtration shall include pressure or vacuum type units; and

(C) A precoating system shall be provided.

(D) The proposed diatomaceous earth filtration shall include a continuous monitoring turbidimeter with recorder on each filter effluent for plants treating surface water.

(l) All designs that propose supplies of surface water, groundwater under the direct influence of surface water, and groundwater that does not meet 40 CFR Part 141 or where other treatment is provided, shall include disinfection via one of the following methods:

(i) Chlorine;

(ii) Chloramines, recommended only for secondary disinfection;

(iii) Chlorine dioxide;

(iv) Ozone;

(v) Ultraviolet light; or

(vi) Other disinfecting agencts that demonstrate reliable application equipment is available and that include testing procedures for a residual that is recognized in Standard Methods for the Examination of Water and Wastewater 2018.

(m) All designs that require disinfection shall demonstrate that:

(i) The system will maintain a detectable residual throughout the distribution system; and

(ii) The applicant has considered the formation of disinfection byproducts when selecting the disinfection.

(n) Disinfection equipment shall comply with the following requirements:

(i) Chlorination equipment shall comply with NSF/ANSI/CAN 61-2020/NSF/ANSI/CAN 600-2021 and the following requirements:

(A) Positive displacement pumps shall be provided for solution feed gas chlorinators or hypochlorite feeders;

(B) The chlorine solution injector/diffuser shall provide a rapid and thorough mix with all the water being treated;

(C) If the application point is to a pipeline discharging to a clearwell, the chlorine shall be added to the center of the pipe at least 10 pipe diameters upstream of the discharge into the clearwell;

(D) Gas chlorinators shall comply with the following requirements:

(I) The injector/eductor shall be selected based on solution pressure, injector water flowrate, feed point backpressure, and chlorine solution line length and size;

(II) The maximum feed point backpressure shall not exceed 110 psi unless a chlorine solution pump is used; and

(III) Gauges shall be provided for chlorine solution pressure, feed water pressure, and chlorine gas pressure or vacuum.

(E) Standby equipment of sufficient capacity shall be available to replace the largest chlorinator unit. Well systems providing no treatment other than disinfection are exempt from the requirements of this paragraph (E) and are not required to provide standby chlorination equipment.

(ii) Points of application and contact time shall comply with the following requirements:

(A) Filtration types shall comply with the contact time and minimum chlorine residuals required in Table 3 of this Section after the appropriate baffling factor has been applied to the reactor. Contact times assume a baffling factor of 0.1 unless documentation justifying the use of a higher baffling factor is provided. Contact time requirements are based on worst-case operating conditions of water temperature of 32.9 degrees Fahrenheit and pH of 9.

Table 3. Required Contact Time and Residual by Filtration Type

Filtration Type	**Required Contact Time (minutes), 0.4 mg/L minimum chlorine residual**	**Required Contact Time (minutes), 1.0 mg/L minimum chlorine residual**
Conventional Filtration	162.5	73
Direct Filtration, Bag or Cartridge Filtration, Slow Sand Filtration, Diatomaceous Earth Filtration	325	146
Membrane Filtration (MF or UF)	30	12

(B) When chlorine is applied to a groundwater source to maintain a residual, no contact time is required.

(o) Systems that propose disinfection via ultraviolet light shall comply with the following requirements:

(i) Proposed designs for ultraviolet light shall include the following information in the ultraviolet reactor influent water quality analysis:

(A) Influent temperature (degrees Fahrenheit);

(B) UV transmittance (UVT) at a reported wavelength of 254 nm and a pathlength of 1 cm;

(C) A description of the UVT range over a 12-month period;

(D) Total hardness (mg/L as $CaCO_3$);

(E) pH;

(F) Alkalinity (mg/L as $CaCO_3$);

(G) Total iron (mg/L) influent < 0.3mg/L;

(H) Calcium (mg/L); and

(I) Total manganese (mg/L) influent <0.03 mg/L

(ii) Proposed designs for ultraviolet disinfection systems shall include the following information:

(A) The maximum, average, and minimum flowrates;

(B) A matrix that idenfies paired flow and ultraviolet treatment values;

(C) A description of the organisms targeted for inactivation;

(D) Log inactivation requirements;

(E) Operating approach (UV intensity vs. calculated dose);

(F) Maximum and minimum operating pressures;

(G) Maximum pressure at the UV reactor;

(H) UV system redundancy;

(I) Lamp cleaning strategy;

(J) Mercury trap for broken UV lamps;

(K) Maximum headloss through the UV reactor;

(L) A demonstration that the UV reactor(s) shall be hydrostatically tested to 1.5 times the rated operating pressure;

(M) A demonstration that the UV reactor(s) shall be designed to ensure that plant personnel can change lamps and the UV intensity meter without draining the reactor; and

(N) A demonstration that the units shall meet NSF/ANSI/CAN Standard 61.

(iii) Ultraviolet treatment systems shall be designed to comply with the Ultraviolet Disinfection Guidance Manual for the Final LT2ESWTR and the following dose requirements:

(A) The UV disinfection system shall deliver a validated dose that meets or exceeds the required dose at the end of lamp life, with fouled sleeves.

(B) The minimum required validated dose used for system design shall incorporate a Combined Age and Fouling Factor (CAF), calculated as:

CAF = EOLL x FF.

EOLL is the ratio of the lamp output at the end of life relative to the new lamp output

FF is the fouling factor.

(C) The EOLL shall be 75 percent of the new lamp output.

(D) The FF shall be:

(I) 0.5 for UV systems with no sleeve wiping system;

(II) 0.75 for UV systems with mechanical wiping only; or

(III) 0.95 for UV systems with a combined online chemical and mechanical cleaning.

(E) The validated dose that meets or exceeds the required dose shall be delivered under maximum flow and design (UVT) condition, when the larger UV unit is out of service.

(iv) Ultraviolet disinfection shall comply with the following validation requirements:

(A) The applicant shall submit the manufacturer's bioassay validation report for the proposed UV reactor with the permit application;

(B) The bioassay testing and results shall demonstrate validation by an independent third party in full compliance with the Ultraviolet Disinfection Guidance Manual for the Final LT2ESWTR;

(C) The owner and engineer shall submit a certification to the Administrator if validation requirements are adjusted and identify each of the equipment and system modifications required to ensure that the appropriate dosage is provided for the inactivation requirements;

(D) Bioassay testing shall evaluate reactor performance over the range of:

(I) Flowrates (maximum, average, and minimum);

(II) UVT from 70 percent to 98 percent (measured at 254 nm, 1 cm path length); and

(III) RED at maximum flowrate and design UVT conditions.

(E) The bioassay testing shall incorporate the range of design and operating conditions described in paragraph (o)(i) of this Section for UV Light;

(F) Extrapolations to flowrates, UV transmittance values, or UV doses outside the range actually tested, are not permitted; and

(G) Bioassay testing shall also verify that the head loss generated by the proposed reactor is less than or equal to the specified limits.

(v) Ultraviolet disinfection hydraulics shall comply with the following requirements:

(A) The inlet and outlet piping configuration to the UV reactor shall result in a UV dose delivery that is equal to or greater than the dose delivered when the UV reactor was validated;

(B) If the UV reactor validation is performed off-site, the applicant shall refer to the validation report to determine the validated inlet and outlet conditions that apply to the site-specific requirements; and

(C) Ultraviolet hydraulic piping shall comply with at least one of the following requirements:

(I) The piping configuration shall consist of a minimum of 10 pipe diameters of straight pipe upstream and five pipe diameters of straight pipe downstream of the UV reactors, with additional pipe diameters above the minimum if required by the manufacturer's guidelines for electromagnetic or other flowmeter installation;

(II) The inlet and outlet piping configurations shall be identical to those constructed for the UV reactor validation; or

(III) If on-site validation or custom off-site validation is planned, the inlet and outlet piping hydraulics must be designed according to the manufacturer's recommendations and to accommodate any site-specific constraints.

(vi) Ultraviolet control and measurement instrumentation for each reactor shall comply with the following requirements:

(A) Each reactor shall be capable of measuring UV intensity and lamp status (on/off);

(B) For systems that use the calculated dose monitoring strategy, each reactor shall be capable of measuring or calculating the UV transmittance;

(C) Piping for each UV reactor shall be sized and configured in accordance with the validated operating conditions and maintain equal head loss through each reactor over the range of validated flowrates. Each UV reactor shall not be by-passed;

(D) Each UV reactor train shall have a dedicated flow meter to confirm the validated operating conditions;

(E) UV lamps in the UV reactor shall be submerged at all times during operation;

(F) The specific configuration of the UV reactor(s) within a facility will dictate the use of air release, air/vacuum, or combination air valves to prevent air pockets and negative pressure conditions and the design shall verify that the UV manufacturer was consulted to determine any equipment-specific air release and pressure control valve requirements;

(G) Each UV reactor shall have the piping configured so that it can be isolated and removed from service while the other UV reactor(s) remain in service; and

(H) A booster pump shall be used if the head loss constraints indicate that a pump is necessary. The UV reactor shall be sized accordingly.

(vii) The applicant shall describe the dose monitoring strategy and the operational approach for the UV reactor that complies with the approaches described in Ultraviolet Disinfection Guidance Manual for the Final LT2ESWTR, part 3.5.2.

(viii) The cleaning system for each UV reactor shall comply with the following requirements:

(A) Each UV reactor shall be equipped with an automatic online mechanical lamp sleeve cleaning system and may include optional chemical cleaning;

(B) The UV sensor shall include mechanical cleaning capabilities with an automatically initiated and controlled cleaning cycle; and

(C) The UV reactor(s) shall be fully operational and shall provide validated dose requirements during system cleaning.

(ix) The minimum spare parts kept at a facility shall include the following:

(A) 20 percent of the UV Lamps;

(B) Five percent of the lamp sleeves; and

(C) One UV intensity sensor.

(p) Facilities that propose disinfection via fluoridation and defluoridation shall comply with the following requirements:

(i) Fluoride storage designs shall demonstrate that:

(A) Fluoride storage tanks shall be covered;

(B) All other storage shall be inside a building; and

(C) Storage tanks of hydrofluorosilicic acid shall be vented to the atmosphere at a point outside the building.

(ii) Fluoride feed equipment shall meet the following requirements:

(A) There shall be scales or weight loss recorders for dry chemical feeds and the feeders shall be accurate to within five percent of any desired feed rate;

(B) The application of hydrofluorosilicic acid, if into a horizontal pipe, shall be in the lower half of the pipe;

(C) Fluoride compounds shall not be added before lime soda or ion exchange softening;

(D) A fluoride solution shall be applied by a positive displacement pump;

(E) The solution shall not be injected into a point of negative pressure;

(F) All fluoride feed lines and dilution water lines shall be isolated from the potable water supplies by either an air gap above the solution tank or a reduced pressure principal backflow preventer;

(G) Water used for sodium fluoride solution shall have a hardness not exceeding 45 mg/L; and

(H) Flow meters for treated water flow and fluoride solution water shall be provided.

(iii) Provisions shall be made to allow the transfer of dry fluoride compounds from shipping containers to storage bins or hoppers that minimize the quantity of fluoride dust that enters the room where the equipment is installed and shall meet the following requirements:

(A) The transfer system shall be equipped with an exhaust fan and dust filter that places the hopper or storage bin under negative pressure;

(B) Air exhausted from fluoride handling equipment shall discharge through a dust filter to the atmosphere outside the building and shall not discharge within 50 feet of a fresh air intake for the building; and

(C) A floor drain shall be provided for cleaning equipment and maintenance.

(iv) The following methods are acceptable for fluoride removal:

(A) Activated alumina may be used in open gravity filters or pressure filter tanks;

(B) The minimum media depth shall be five feet;

(C) The loading rate shall not exceed 4 gpm/ft^2;

(D) The mesh size for the alumina media shall be between #28 and #48;

(E) Media regeneration facilities shall be provided and shall include both weak caustic and weak acid systems; and

(F) Bone char filtration or lime softening with magnesium addition may be used.

(v) Water that is unstable due either to natural causes or to subsequent treatment shall be stabilized.

(vi) Facilities shall have the capability of feeding both acid and alkalinity.

(vii) Unstable water created by ion exchange softening shall be stabilized by an alkali feed.

(viii) Laboratory equipment shall be provided to determine the effectiveness of stabilization treatment. This shall include testing equipment for hardness, calcium, alkalinity, pH, and magnesium at a minimum.

(q) Taste and odor control equipment shall comply with the following requirements:

(i) Open or closed, granular activated carbon adsorption units may be used to absorb organics for taste and odor control, subject to the following requirements:

(A) The loading rate shall not exceed 10 gpm/ft^2;

(B) The minimum empty bed contact time shall be 20 minutes;

(C) The pH of the water shall be less than 9.0 with a turbidity of less than 2 NTU when using packed beds;

(D) There shall be provisions for moving the carbon to and from the contactors;

(E) Contactors may be upflow or downflow design. A single unit is acceptable for countercurrent upflow designs. Downflow designs shall have two or more parallel units;

(F) Contactors shall be designed as open gravity or pressure bed;

(G) Pressure contactors shall have an air-vacuum relief valve fitted with a stainless-steel screen to prevent plugging;

(H) The contactor materials of construction shall be concrete, steel, or fiberglass-reinforced plastic and shall meet the following requirements:

(I) Steel vessels shall be protected against corrosion; and

(II) Inlet and outlet screens shall be made of stainless steel or other suitable materials.

(I) There shall be provisions for flow reversal and bed expansion that meet the following requirements:

(I) Backwashing facilities shall provide up to 50 percent bed expansion; and

(II) Backwashing facilities shall meet the backwash criteria as rapid filters.

(ii) If ozone is used for taste and odor control, there shall be at least 10 minutes of contact time to complete all reactions and the minimum applied feed rate of ozone shall be 1 mg/L, or the design shall identify a contact time and feed rate that demonstrate the application of ozone will not cause an exceedance of the maximum contaminant levels identified at 40 CFR 143.3.

(r) Designs that include the addition of phosphates for stabilization and corrosion control shall demonstrate the evaluation of reactions with aluminum and impacts on wastewater treatment plants to overcome the secondary impacts of phosphates that may potentially limit their use.

(s) Designs that propose anion-exchange treatment shall include a pH/alkalinity feed system unless other wise approved by the Administrator.

(t) Microscreens shall comply with the following requirements:

(i) A microscreen shall be allowed as a supplement to treatment, but it shall not be used in place of filtration or coagulation;

(ii) The screen shall be capable of removing suspended matter from the water by straining;

(iii) Screens shall be made of corrosion-resistant material;

(iv) Bypass piping around the unit shall be provided;

(v) There shall be protection against back siphonage when potable water is used for washing the screen; and

(vi) Wash water shall be wasted and not recycled to the microscreen.

(u) Membrane technologies shall comply with the following requirements:

(i) Proposed membrane treatment processes shall comply with the requirements of Section 6 of this Chapter. Protocols for pilot plant testing shall incorporate guidance or procedures from the US EPA Membrane Filtration Guidance Manual, Chapter 6.

(ii) All proposed membrane filters shall demonstrate third-party validation for the removal of Giardia or Cryptosporidium. Removal efficiency shall be determined through challenge testing as outlined in the US EPA Membrane Filtration Guidance Manual and one of the following:

(A) Membranes that are used as final compliance filters of a multiple treatment barrier approach shall meet the requirements of 40 CFR Part 141; or

(B) All surface water or groundwater under direct influence (GWUDI) systems using membrane technology shall demonstrate minimum disinfection that meets 4.0-log virus inactivation.

(v) Facilities that propose bag and cartridge filters shall comply with the procedures identified in Section 6 of this Chapter and the following requirements:

(i) Filter performance will be based on Cryptosporidium oocyst removal;

(ii) The filter shall demonstrate at least a 3-log removal of particle size 1 micron and above with an associated log reduction credit of 2-logs for Giardia and Cryptosporidium;

(iii) Removal efficiency shall be determined through challenge testing as outlined in Toolbox Guidance Manual, Chapter 8 and NSF/ANSI 419-2018;

(iv) The performance demonstration shall be specific to the corresponding housing and type or model of filter. Any other combination of housing and filter that could be used for treatment shall also demonstrate filter efficiency;

(v) Applicants shall include documentation that the proposed bag or cartridge filter has received third-party validation for the removal of Giardia and Cryptosporidium;

(vi) Filter and housing specifications shall include a description of the materials of construction, surface area per filter, and the minimum and maximum operating pressure, and the specifications shall meet the requirements of NSF/ANSI 419-2018 and the Toolbox Guidance Manual, Chapter 8;

(vii) System components such as housing, bags, cartridges, gaskets, and O-rings shall comply with NSF/ANSI/CAN 61 for leaching of contaminants;

(viii) A means for monitoring the performance of the filter shall be provided and shall include at a minimum flow meters and valves, pressure gauges, and sample taps;

(ix) The proposed design shall specify chemical compatibility limitations;

(x) A minimum of two filter housings shall be provided;

(xi) Bag or cartridge filters that are used as final compliance filters of a multiple treatment barrier approach shall meet the requirements of 40 CFR Part 141; and

(xii) All surface water or GWUDI systems using bag or cartridge filter technology shall provide at minimum disinfection that meets 4.0-log virus inactivation and 1.0-log Giardia inactivation or shall demonstrate that combined filtration and disinfection will provide 3-log removal.

(w) Pre-engineered water treatment plants shall comply with the following requirements:

(i) Pre-engineered water treatment plants shall be permitted on a case-by-case basis for specific process applications and flow rates. Multiple units may be installed in parallel to accommodate flow rates;

(ii) Pre-engineered water treatment plant equipment shall be designed in accordance with NSF/ANSI/CAN 61 and NSF/ANSI/CAN 372;

(iv) Pre-engineered water treatment plants shall comply with the procedures in Section 6 of this Chapter to obtain data that demonstrates the treatment effectiveness of the treatment for the source water and the proposed application; and

(v) Each component and process of the pre-engineered water treatment plant shall demonstrate compliance with the applicable design criteria of the respective treatment processes of this Chapter.

(x) Wastes shall be handled and disposed of as follows:

(i) The sanitary and laboratory waste from water treatment plants, pumping stations, or well systems, shall not be recycled to any part of the water plant, and shall be discharged directly into a sanitary sewer when feasible or a permitted on-site disposal system;

(ii) Brine waste from ion exchange plants, demineralization plants, and other similar facilities may not be recycled to the water plant and shall meet the following requirements:

(A) Where discharging to a sanitary sewer, a holding tank shall be provided to prevent the overloading of the sewer and interference with the waste treatment process; and

(B) Where disposal to an off-site waste treatment system is proposed, the sewer and treatment facility shall have the required capacity and dilution capability.

(iii) Acceptable methods of treatment and disposal of lime softening sludge are:

(A) Sludge lagoons, provided that the design of sludge lagoons includes:

(I) The location of the lagoon shall be protected from the 100-year flood;

(II) A means of diverting surface water runoff so that it does not flow into the lagoon;

(III) The freeboard shall be a minimum of three feet;

(IV) An adjustable decanting device for recycling the overflow; and

(V) An accessible effluent sampling point.

(B) Land application of liquid lime softening sludge that demonstrates compliance with Water Quality Rules Chapter 11, Part E;

(C) Disposal at a landfill;

(D) Mechanical dewatering of sludge may be used;

(E) Recalcination of sludge may be used; and

(F) Lime sludge drying beds shall not be allowed.

(iv) Acceptable methods of treatment and disposal of alum sludge are as follows:

(A) Lagoons may be used as storage and interim disposal. Lagoons used for storage shall have a volume of at least 100,000 gallons for every 1,000,000 gpd of facility water treating capacity.

(B) Alum sludge may be discharged to the sanitary sewer only when the system is capable of handling the waste and with the approval of the owner of the sewer system.

(C) Mechanical dewatering may be used.

(D) Alum sludge drying beds may be used.

(E) Alum sludge may be acid-treated and recovered.

(F) Disposal at a landfill.

(v) Designs that propose disposal of waste filter wash water from iron and manganese removal plants that include sand filters shall demonstrate the inclusion of a separate structure, unless otherwise approved by the Administrator.

Section 13. Chemical Application.

(a) 2018 TSS, parts 5.0.2(f), chemical application, general, chemical application; 5.0.3-5.0.3(h), chemical application, general, general equipment design; 5.1.2-5.1.2(e)(4.), chemical application, feed equipment, control; 5.1.3-5.1.3(c), chemical application, feed equipment, dry chemical feeders; 5.1.4-5.1.4(d), chemical application, feed equipment, positive displacement solution feed pumps; 5.1.5-5.1.5(d), chemical application, feed equipment, liquid chemical feeders-siphon control; 5.1.6-5.1.6(d), chemical application, feed equipment, cross-connection control; 5.1.8-5.1.8(e), chemical application, feed equipment, in-plant water supply; 5.1.9(a)(1-3), (b), and (d), chemical application, feed equipment, storage of chemicals; 5.1.10-5.1.10(j), chemical application, feed equipment, bulk liquid storage tanks; 5.1.11-5.1.11(h), chemical application, feed equipment, day tanks; 5.1.12-5.1.12(e), chemical application, feed equipment, feed lines; 5.1.13-5.1.3(d); chemical application, feed equipment, handling; 5.1.14-5.1.14(b), chemical application, feed equipment, housing; 5.3.2, operator safety, respiratory protection equipment; 5.3.3, operator safety, chlorine gas leak detection; 5.4.1(d)(1-5) and (7-10), (f), and (h), specific chemicals, chlorine gas; 5.4.1(f) and (h), 5.4.2-5.4.2(b), specific chemicals, acids and caustics; 5.4.3-5.4.3(c)(5.), specific chemicals, sodium chlorite; 5.4.4-5.4.4(b)(5.), specific chemicals, sodium hypochlorite; are herein incorporated by reference.

(b) Chemical application facility designs shall comply with the following requirements:

(i) A separate feeder shall be used for each chemical applied; and

(ii) Chemical storage tanks shall be constructed of materials that are resistant to the chemicals stored. Tanks shall maintain structural integrity while in use.

(c) Chemical application facilities shall include an alarm for high effluent turbidity, low chlorine residual, and chlorine leaks when chlorine gas is used. The alarm shall be located at an attended location.

Section 14. Pumping Facilities

(a) 2018 TSS, parts 6.1-6.1.1(e), location; 6.2, 6.2(b-e), pumping stations; 6.2.1-6.2.1(d), pumping stations, suction well; 6.2.2, 6.2.2(a-b), pumping stations, equipment servicing; 6.3.2, pumps, pump priming; 6.6.1, appurtenances, valves; 6.6.3-6.6.3(d), appurtenances, gauges and meters; 6.6.4-6.6.4(b), appurtenances, water seals; 6.6.5, appurtenances, controls; 6.6.6, appurtenances, standby power; are herein incorporated by reference.

(b) Stairways or ladders shall be provided between all floors and in pits or compartments that must be entered.

(c) Pumping facilities shall be heated to maintain a minimum temperature of 40 degrees Fahrenheit if typically unoccupied and 50 degrees Fahrenheit if normally occupied.

(d) Pumping station ventilation designs shall demonstrate that:

(i) All areas of the pumping station that are accessible shall be ventilated;

(ii) Ventilation may be continuous or intermittent;

(iii) Drywell ventilation shall provide:

(A) At least six air changes per hour if continuous; and

(B) At least 30 air changes per hour if intermittent with an automatic start upon operator entry into the area.

(iv) Wetwell ventilation shall provide 12 continuous air changes per hour or 60 intermittent air changes per hour and be designed to permit the use of portable blowers that will exhaust the space and supply fresh air during the access periods.

(e) Dehumidification equipment shall be provided in below-ground pumping stations. The equipment shall be sized to maintain a dewpoint at least two degrees Fahrenheit below the coldest anticipated temperature of the water to be conveyed in the pipes.

(f) All pumping stations that are manned four or more hours per day shall be provided with potable water, lavatory, and toilet facilities. The waste shall be discharged to the sanitary sewer or an on-site waste treatment system.

(g) Pump design shall comply with the following requirements:

(i) At least two pumps shall be provided. With the largest pump out of service, the remaining pump or pumps shall be capable of providing the maximum pumping capacity of the system.

(ii) Pumps shall be selected such that the net positive suction head required (NPSHR) is less than the net positive suction head available (NPSHA) minus four feet based on hydraulic conditions and the altitude of the pump installation. If this condition cannot be satisfied, a means of priming shall be provided.

(iii) A surge analysis shall be provided to demonstrate if surge protection devices will be needed to protect the piping. Pressure relief valves are not acceptable as surge control.

(iv) The calculated total dynamic head for pumping units shall be based on pipe friction, pressure losses from pipe entrances, exits, appurtenances (such as valves and bends), and static head at the design flow.

(v) The station shall have a flow rate indicator and totalizing meter, and a method of recording the total water pumped.

(h) Booster pumps shall comply with the following requirements:

(i) Booster pumps shall not produce less than 5 psi in suction lines. If the suction line has service connections, the pressure shall be at least 35 psi during normal operation and shall have a low-pressure cutoff switch to maintain at least 20 psi.

(ii) For booster pumps used for fire suppression, no person shall install or maintain a water service connection to any premises where a fire pump has been installed on the service line to or within such premises unless the pump is equipped with one of the following:

(A) A low suction throttling valve or pilot-operated valve installed in the discharge piping that maintains positive pressure in the suction piping while monitoring pressure in the suction piping through a sensing line. The valve shall throttle the discharge of the pump when necessary so that suction pressure will not be reduced below 20 psi gauge when the pump is operating; or

(B) A variable-speed suction limiting control that is used to maintain a minimum positive suction pressure at the pump inlet by reducing the pump driver speed while monitoring pressure in the suction piping through a sensing line. The limiting control shall be set so that the suction pressure will not be reduced below 20 psi gauge while the pump is operating.

(iii) Automatic or remote-controlled pumps shall have a range between the start and cutoff pressure that will prevent the pump from cycling more than one start every 15 minutes.

(iv) In-line booster pumps shall be accessible for maintenance. There shall be access openings, as needed, to allow the removal of the pump.

(v) Individual home booster pumps shall not be allowed for any individual service from the public water supply main.

(vi) Un-manned or remotely controlled pump stations shall have an alarm at an operator attended location for any conditions that may affect the continuous delivery of water.

(i) Pumping facility valves shall comply with the following requirements:

(i) Air release valves shall be provided where the pipe crown is dropped in elevation. The discharge pipe from the valve shall have a minimum of an 8-inch air gap and shall be covered with a #24 mesh non-corrodible screen.

(ii) Each pump shall either have an individual suction line or the suction lines shall be manifolded such that they demonstrate similar hydraulic and operating conditions.

Section 15. Finished Water Storage

(a) 2018 TSS, parts 7.0.1-7.0.1(c), sizing; 7.0.2-7.0.2(b), location of finished water storage structures; 7.0.3, protection from contamination; 7.0.4, security; 7.0.5, drains; 7.0.6, stored water age; 7.0.10-7.0.10(f), roof and sidewall; 7.0.17-7.0.17(c), painting and/or cathodic protection; are herein incorporated by reference.

(b) Finished water storage structures shall comply with the following requirements:

(i) Water storage structures shall comply with the following standards for storage tanks, standpipes, ground storage reservoirs that are described in AWWA M42, clearwells, and elevated storage:

(A) AWWA D100;

(B) AWWA D102;

(C) AWWA D103;

(D) AWWA D104;

(E) AWWA D106;

(F) AWWA D107;

(G) AWWA D108;

(H) AWWA D110;

(I) AWWA D115;

(J) AWWA D120; and

(K) AWWA D121.

(ii) All tank and foundation design shall be performed by a Wyoming registered professional engineer. The plans or contractor-furnished information shall be signed and sealed by a Wyoming registered professional engineer.

(iii) All new or modified water storage tanks shall have the inlet and outlet connections separated from each other as much as is practical.

(c) Storage facility designs shall demonstrate:

(i) The average daily demand will require a daily fill of 20 percent of the total storage volume for surface water sources and 10 percent for groundwater sources.

(ii) For designs that demonstrate the storage tank has a small daily demand and a high fire water storage requirement, or the storage tank water age average is greater than two days, the design shall demonstrate that a volume equal to at least 20 percent of the tank volume will be delivered to the storage tank each time pumping is initiated.

(iii) For designs with well systems that provide a minimum of two wells that can supply either the maximum hourly demand or the fire demand, whichever is greater, storage is not required. These systems shall demonstrate that they will provide alternative power for the finished water pumps.

(d) Storage structure design shall eliminate short-circuiting.

(e) The minimum inlet velocity shall be 10 ft/sec unless demonstration of employed mixing system or lower inlet velocity addresses disinfection by-product formation, stratification, stagnation, freezing, and other water age issues.

(f) Overflow and drain lines shall:

(i) Be protected with a mechanical device such as:

(A) A sealed flapper valve or duckbill valve; or

(B) A #24 mesh non-corrodible screen.

(ii) For overflow lines that are protected with a mechanical device, include installation of a #4 mesh non-corrodible screen or finer to prevent the entrance of birds or rodents;

(iii) For overflow lines that are protected with #24 mesh non-corrodible screen, demonstrate prevention of screen clogging that would lead to structural storage tank damage;

(iv) Include installation of the screen within the overflow line at a location that is not susceptible to vandalism and that allows for the overflow line to be operational during an overflow event;

(v) Provide access to the screen with the smallest openings for replacement; and

(vi) Demonstrate that the screen with the smallest openings will be the outermost screen.

(g) Overflow designs shall demonstrate the provisions that will be included to prevent mechanical devices from freezing shut.

(h) Overflow lines shall not be considered as vents.

(i) Vents shall be designed to protect the tank from contaminants including but not limited to surface water, stormwater runoff, insects, rodents, and birds.

(i) All openings shall be protected with #24 mesh non-corrodible screen or a combination of #24 mesh and coarser mesh non-corrodible screen.

(ii) The design shall demonstrate consideration of site conditions, freezing, frosting, and provide justification including precautions for snow depth.

(A) The design shall demonstrate consideration of frost-free or frost-proof vents; and

(B) The design shall demonstrate consideration of pressure/vacuum, frost-proof release vents that will need to protect openings with #24 mesh non-corrodible screen.

(j) Down-turned vent openings shall be at least 24 inches above the nearest horizontal surface.

(k) Elevated tanks shall be designed to remove snow via tank geometry to prevent snow build-up clogging vents.

(l) Vent designs shall include calculations that verify the required volume of flow is achievable through the proposed vent pipe and screen combination.

(m) Finished water plant water storage shall comply with the following requirements:

(i) Clearwell storage shall be sized, in conjunction with distribution system storage, to relieve the filter of having to follow fluctuations in water use. Where water is pumped from clearwell storage to the system, an overflow shall be provided.

(ii) If unfinished water is stored in compartments adjacent to finished water, the unfinished and finished water shall be separated by double walls.

(iii) Receiving basins and wetwells shall be designed as finished water storage structures and shall comply with the requirements of this Section.

Section 16. Distribution Systems.

(a) 2018 TSS, parts 8.2-8.2.4(b), system design; 8.3, valves; 8.4-8.4.4(d), hydrants; 8.5-8.5.2(c), air relief valves; 8.6, valve, meter, and blow-off chambers; 8.7.3, installation of water mains, cover; 8.7.4, installation of water mains, blocking; 8.7.6, installation of water

mains, pressure and leakage testing; 8.7.7, installation of water mains, disinfection; 8.7.8, installation of water mains, external corrosion; 8.7.9, installation of water mains, separation from other utilities; 8.8.2-8.8.2(b), separation distances from contamination sources, parallel installation; 8.8.3-8.8.3(b), separation distances from contamination sources, crossings; 8.8.6, separation distances from contamination sources, sewer manholes, inlets, and structures; 8.9.1, surface water crossings, above-water crossings; 8.9.2-8.9.2(c); surface water crossings, under water crossings; 8.11.1, water services and plumbing, plumbing; 8.12, service meters; are herein incorporated by reference.

(b) Distribution systems shall be constructed of commercial pipe that conforms to the following standards:

(i) PVC pipe:

(A) Less than four inches diameter, ASTM D 2241; or

(B) Four inches and larger diameter, AWWA C900.

(ii) Ductile iron, AWWA C151;

(iii) Fiberglass pressure pipe, AWWA C950;

(iv) Polyethylene pipe:

(A) ¾ inch through three inches diameter, AWWA C901;

(B) Four inches through 65 inches diameter, AWWA C906; or

(v) Other material submitted with the permit application and approved by the Administrator.

(c) Flanged piping shall not be allowed for buried pipe except for connection to valves.

(d) New water mains shall be sized after the hydraulic analysis required by Section 9(l)(i) of this Chapter and the design shall demonstrate that:

(i) At maximum day demand plus current State of Wyoming-required fire flow, or the fire flow of an authority having jurisdiction, the pressure in the municipal distribution system will not fall below 20 pounds per square inch (psi); and

(ii) The normal system working pressure shall be greater than 35 psi.

(e) When fire protection is provided, the water main system shall be designed to also serve fire flows.

(f) Hydrants shall:

(i) Have hydrant leads that are a minimum of six inches in diameter;

(ii) Have valves installed;

(iii) Be protected from freezing at hydrant leads and barrels;

(iv) Where groundwater levels are above the gravel drain area, hydrants shall be pumped dry or otherwise dewatered and hydrant weep holes shall not be used; and

(v) Have drains that are not connected to or located within 10 feet of a sanitary sewer or storm drain.

(g) Fire hydrants or active service taps may be substituted for air relief in 6- and 8-inch lines.

(h) Where excavation is performed for distribution systems:

(i) The trench bottom shall be excavated for the bell of the pipe;

(ii) All rock shall be removed within six inches of the pipe; and

(iii) The trench shall be dewatered for all work.

(i) Distribution system bedding for rigid pipe shall be designed in accordance with ASTM C12 Classes A, B, or C. Flexible pipe bedding shall be designed in accordance with ASTM D2321 Class I, II, or III.

(j) Distribution system pipe shall be joined to ensure a watertight fitting and installed in accordance with the following standards, as applicable:

(i) For ductile iron pipe, AWWA C600;

(ii) For PVC pipe, AWWA M23; and

(iii) For HDPE pipe, AWWA M55.

(k) Backfill for distribution systems shall:

(i) Be performed without disturbing pipe alignment;

(ii) Not contain debris, frozen material, unstable material, or large clods;

(iii) Not contain rocks or stones that are greater than three inches in diameter within two feet of pipe; and

(iv) Be compacted to a density equal to or greater than the surrounding soil.

(l) Distribution systems shall meet the following requirements for separation of water mains from sanitary and storm sewers:

(i) Where the minimum vertical or horizontal separation distances required by incorporation by reference of 2018 TSS parts 8.8.2 and 8.8.3 of paragraph (a) of this Section cannot be met, the sewer or water line shall be placed in a separate conduit pipe or meet the flow-fill requirements of paragraphs (ii) and (iii) of this Paragraph (l);

(ii) Flow-fill for pipelines shall comply with the following:

(A) Cement-treated fill, non-shrink backfill, low-density concrete backfill, or structural backfill may be used as flow-fill when the material has a 28-day compressive strength of 30-60 psi;

(B) The pipe to be encased shall be laid on a four to six-inch of bed of washed gravel that has been widened, with the walls of the trench benched away from the center-line of the trench, so the pipe is uniformly supported over the length or supported on blocks no further than 10 feet apart;

(C) The flow-fill and washed gravel or blocks shall rest on an undisturbed trench bottom;

(D) The pipe shall not move laterally or float during placement of the flow-fill and the line and grade of the pipe shall be maintained; and

(E) The flow-fill shall extend from trench sidewall to trench sidewall and extend at least two inches above the top of the pipe.

(iii) Flow-fill for pipe crossings shall comply with the following:

(A) To the extent possible, there shall be no joints or taps within nine feet of the crossing;

(B) The flow-fill shall extend from undisturbed earth at the bottom of the lower pipe to at least two inches above the top of the upper pipe;

(C) The block of flow-fill shall be wide enough to ensure the structural integrity of the installation; and

(D) Pipes that cross one another shall be separated by a minimum of two inches when encased in flow-fill.

(m) Cross-connections shall comply with the following requirements:

(i) There shall be no water service connection installed or maintained between a public water supply and any water user whereby unsafe water or contamination may backflow into the public water supply.

(A) To protect all public water supplies from the possibility of the introduction of contamination due to cross-connections, the water supplier shall:

(I) Require backflow prevention devices for each water service connection in accordance with Table 4 of this Section, with the exception of (B)(I) residential water service connections and (B)(II) domestic non-residential water service connections;

(II) Take appropriate actions that may include:

1. Immediate disconnection for any water user that fails to maintain a properly installed backflow prevention device; or

2. Compliance with other measures as identified in this Section.

(III) Any high hazard non-residential connection to any public water supply shall be protected by the backflow prevention device required by Table 4.

(IV) Water suppliers shall establish record keeping and management procedures to ensure that requirements of this regulation for installation and maintenance of backflow prevention devices are being met.

(B) The method of backflow control, selected from Table 4, shall be determined based upon the degree of hazard of the cross-connection and the cause of the potential backflow. Hazards shall be classified as high hazard or low hazard. The potential cause of the backflow shall be identified as being back-siphonage or back-pressure.

(I) Residential water service connections shall be considered to be low hazard back-siphonage connections unless determined otherwise by a Hazard Classification.

(II) Domestic non-residential water service connections (such as schools without laboratories, churches, office buildings, warehouses, and motels) shall be considered to be low hazard back-pressure connections unless determined otherwise by a Hazard Classification conducted by the water supplier.

(III) Any water user’s system with an auxiliary source of supply shall be considered to be a high hazard, back-pressure cross-connection. A reduced pressure principle backflow device shall be installed at the water service connection to any water user’s system with an auxiliary source of supply.

(IV) All water loading stations shall be considered high hazard connections. A device, assembly, or method consistent with Table 4 shall be provided.

(V) Non-domestic commercial or industrial water service connections (such as restaurants, refineries, chemical mixing facilities, sewage treatment plants, mortuaries, laboratories, laundries, dry cleaners, irrigation systems, and facilities producing or using hazardous substances) shall be considered to be high hazard back-pressure connections unless determined otherwise by a Hazard Classification. For some of these service connections, a Hazard Classification may result in a determination of a back-siphonage or low hazard classification. The backflow prevention device required shall be appropriate to the degree of hazard established by the Hazard Classification. Where potential high hazards exist within the non-residential water user's system, even though such high hazards may be isolated at the point of use, an approved backflow prevention device shall be installed and maintained at the water service connection.

(C) Determination of the hazard classification of a water service connection is the responsibility of the water supplier. The water supplier may require the water user to furnish a Hazard Classification Survey to be used to determine the Hazard Classification.

(D) Hazard Classification Surveys that have been conducted by Hazard Classification Surveyors that have been certified by another state certification program shall include the following information for Administrator approval:

(I) Documentation that indicates the Hazard Classification Surveyor has received certification from the regulatory agency that issued the current certification that states the name of the Hazard Classification Surveyor, the status of their certification, the date originally issued, the expiration date, and the classification for which the Hazard Classification Surveyor is certified; and

(II) Any disciplinary action imposed against the applicant; if any.

(E) All backflow prevention devices shall be in-line serviceable (repairable), in-line testable except for devices meeting ASSE 1024, and installed in accordance with manufacturer instructions and applicable plumbing codes.

(F) All backflow prevention devices must have a certification by an approved third-party certification agency. Approved certification agencies are:

(I) American Society of Sanitary Engineers (ASSE);

(II) International Association of Plumbing/Mechanical officials (IAPMO); and

(III) Foundation for Cross-Connection Control and Hydraulic Research, University Of Southern California (USC-FCCCHR).

(G) Backflow prevention devices at water service connections shall be inspected and certified by a certified backflow assembly tester at the time of installation. Certification of the assembly tester shall be by one of the following:

(I) The American Society of Sanitary Engineers (ASSE); or

(II) American Backflow Prevention Association (ABPA).

(H) Backflow prevention devices installed at high hazard non-residential cross-connections shall be inspected and tested on an annual basis by a certified backflow assembly tester.

(I) If any device is found to be defective or functioning improperly, it shall be immediately repaired or replaced. Failure to make necessary repairs to a backflow prevention device will be cause for the water service connection to be terminated.

(J) All public water suppliers shall report any high hazard backflow incident within seven days to the Division. The backflow incident shall be reported on a form provided by the Administrator.

(ii) Neither steam condensate nor cooling water from engine jackets or other heat exchange devices shall be returned to the public water supply after it has passed through the water service connection.

Table 4. Backflow Prevention Devices, Assemblies and Methods

	Degree of Hazard				
Device, Assembly, or Method	Low Hazard		High Hazard		Notes
	Back-Siphonage	Back-Pressure	Back-Siphonage	Back-Pressure	
Airgap	X	X	X	X	See Note 1 and Note 2
Atmospheric Vacuum Breaker	X		X		Not allowed under continuous pressure
Spill-proof Pressure-type Vacuum	X		X		
Double Check Valve Backflow Preventer	X	X			
Pressure Vacuum Breaker	X		X		

Reduced Pressure Principal Backflow	X	X	X	X	See Note 2,
Dual Check	X				Restricted to residential services

Note 1: Minimum Airgap for Water Distribution. For spouts with an effective opening diameter of ½ inch or less, the minimum airgap when the discharge is not affected by side walls shall be one inch. The minimum airgap when the discharge is affected by sidewalls shall be 1 ½ inches. For effective openings greater than ½ inch, the minimum airgap shall be two times the effective opening diameter when the discharge is not affected by sidewalls. The minimum airgap when the discharge is affected by sidewalls shall be three times the effective opening diameter.

Note 2: Extreme Hazards. In the case of any water user's system where, in the opinion of the water supplier or the Administrator, an undue health threat is posed because of the presence of extremely toxic substances or potential back pressures in excess of the design working pressure of the device, the water supplier may require an airgap at the water service connection to protect the public water system.

Section 17. Laboratory Requirements.

(a) 2018 TSS, parts 2.8.1-2.8.1(h), testing equipment, is herein incorporated by reference.

(b) Test procedures for analysis of monitoring samples shall conform to the Standard Methods for the Examination of Water and Wastewater.

(c) All treatment plants shall have the capability to perform or contract for the self-monitoring analytical work required by the Safe Drinking Water Act, 42 U.S.C. §300f et seq. All plants shall, in addition, be capable of performing or contracting the analytical work required to ensure good management and control of plant operation and performance.

(d) All laboratories used for the tests, analysis, and monitoring required by this Section shall meet the following requirements:

(i) The laboratory shall be located away from vibrating machinery or equipment that might have adverse effects on the performance of laboratory instruments or the analyst and shall be designed to prevent adverse effects from vibration.

(ii) Walls shall have an easily cleaned, durable, and impervious surface.

(iii) Cabinet and storage space shall be provided for dust-free storage of instruments and glassware. Benchtop height shall be 30 inches. Benchtops shall be field joined into a continuous surface with acid, alkali, and solvent-resistant cement.

(iv) Fume hoods shall be provided where reflux or heating of toxic or hazardous materials is required. A hood shall not be situated near a doorway unless a secondary means of exit is provided. All fume hood switches, electrical outlets, and utility and baffle adjustment handles shall be located outside the hood. Light fixtures shall be explosion-proof. 24-hour continuous exhaust capability shall be provided. Exhaust fans shall be explosion-proof.

(v) The laboratory shall have a minimum of two sinks per 400 square feet (not including cup sinks). Sinks shall be double well with drainboards and shall be made of epoxy resin or plastic. All water fixtures shall have reduced pressure zone backflow preventers. Traps shall be constructed of glass, plastic, or lead and be accessible for cleaning.

(vi) Distilled water shall conform to the quality specified by Standard Methods for the Examination of Water and Wastewater 2018.

(e) Portable testing equipment shall be provided where necessary for operational control testing.

Section 18. Operation and Maintenance Manuals.

(a) Each new or modified treatment or pumping facility shall have an operation and maintenance manual (O & M Manual) located at the facility. The manuals shall provide the following information as a minimum:

(i) Introduction;

(ii) Description of facilities and unit processes within the plant from influent structures through effluent structures;

(A) The size, capacity, model number (where applicable), and intended loading rate of facilities and unit processes;

(B) A description of each unit, including the function, controls, lubrication, and maintenance schedule;

(C) A description of start-up operations, routine operations, abnormal operations, emergency or power outage operations, bypass procedures, and safety;

(D) Flow diagrams of the entire process, as well as individual unit processes that show the flow options under the various operational conditions listed in paragraph (a)(ii) of this Section; and

(E) The design criteria for each unit process, including the number, type, capacity, sizes, and other relevant information.

(iii) Plant control system;

(iv) Utilities and systems;

(v) Emergency procedures, including:

(A) Details of emergency operations procedures for possible foreseeable emergencies, such as power outage, equipment failure, development of unsafe conditions, and other emergency conditions;

(B) Emergency operations valve positions, flow control settings, and other information to ensure continued operation of the facility at maximum possible efficiency during emergencies; and

(C) Emergency notification procedures to be followed to protect health and safety under various emergency conditions.

(vi) Permit requirements and other regulatory requirements;

(vii) Staffing needs;

(viii) Index of manufacturers' manuals;

(ix) Index of equipment maintenance manuals; and

(x) General information on safety in and around the plant and its components, including the following safety information:

(A) Each unit process discussion shall include applicable safety procedures and precautions; and

(B) For unit processes or operations having extreme hazards (such as chlorine and closed tanks), the discussion shall detail appropriate protection, rescue procedures, and necessary safety equipment.

(b) Administrator approval of the final O & M Manual is required prior to plant startup.

(c) Public water supply facilities shall have an equipment maintenance manual located at the facility for each piece of equipment. Each equipment maintenance manual shall:

(i) Have a typewritten table of contents for each volume arranged in a systematic order;

(ii) Include the following general contents:

(A) Product data;

(B) Drawings;

(C) Written text as required to supplement product data for the particular installation;

(D) Copies of each warranty, bond, and service contract issued;

(E) Descriptions of unit and component parts;

(F) Operating procedures;

(G) Maintenance procedures and schedules;

(H) Service and lubrication schedule;

(I) Sequence of control operation;

(J) Parts list; and

(K) Recommended spare parts list.

(iii) Include a section on troubleshooting that shall include:

(A) Typical operation problems and solutions; and

(B) A telephone number for factory troubleshooting assistance.

(iv) Meet the requirements of the engineer and contractor for installation and startup of equipment.

Section 19. Incorporation by Reference.

(a) The following codes, standards, rules, and regulations referenced in this Chapter are incorporated by reference:

(i) American National Standards Institute/National Sanitation Foundation Standard 53, Drinking Water Treatment Units - Health Effects (2019), referred to as "NSF/ANSI 53," available at https://webstore.ansi.org/Standards/NSF/NSFANSI532020;

(ii) American National Standards Institute/National Sanitation Foundation Standard 55, Ultraviolet Microbiological Water Treatment Systems (2020), referred to as "NSF/ANSI 55," available at https://webstore.ansi.org/Standards/NSF/NSFANSI552021;

(iii) American National Standards Institute/National Sanitation Foundation Standard 61, Drinking Water System Components - Health Effects NSF/ANSI/CAN 61-2020/NSF/ANSI/CAN 600-2021, referred to as "NSF/ANSI/CAN 61-2020/NSF/ANSI/CAN 600-2021," available at https://webstore.ansi.org/Standards/NSF/NSFANSI612021600;

(iv) American National Standards Institute/National Sanitation Foundation Standard 372, Drinking Water System Components-Lead Content 372-20, referred to as "NSF/ANSI/CAN 372-20," available at https://webstore.ansi.org/Standards/NSF/NSFANSI3722020;

(v) American National Standards Institute/National Sanitation Foundation Standard 419, Public Drinking Water Equipment Performance – Filtration, referred to as "NSF/ANSI 419-2018," available at https://webstore.ansi.org/Standards/NSF/NSFANSI4192018;

(vi) American Petroleum Institute Specification 5L, Line Pipe, Forty-Sixth Edition (2019), referred to as "API 5L," available at https://www.techstreet.com/api/standards/api-spec-5l?gateway_code=api&product_id=2010552;

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(xvi) American Water Works Association Standard C906, Polyethylene (PE) Pressure Pipe and Fittings, 4 in. through 65 In. (100 mm Through 1,650 mm), for Waterworks, C906-21 (2021), referred to as "AWWA C906," available at https://engage.awwa.org/PersonifyEbusiness/Store/Product-Details/productId/105341623;

(xvii) American Water Works Association Standard C950, Fiberglass Pressure Pipe, C950-13 (2013), referred to as "AWWA C950," available at https://engage.awwa.org/PersonifyEbusiness/Store/Product-Details/productId/34040472;

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(xxi) American Water Works Association Standard D104-17, Automatically Controlled, Impressed-Current Cathodic Protection for the Interior of Steel Water Storage, referred to as "AWWA D104-17," available at https://engage.awwa.org/PersonifyEbusiness/Store/Product-Details/productId/65522513;

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(xxiv) American Water Works Association Standard D108-19, Aluminum Dome Roofs for Water Storage Facilities, referred to as "AWWA D108-19," available at https://engage.awwa.org/PersonifyEbusiness/Store/Product-Details/productId/80933896;

(xxv) American Water Works Association Standard D110-13 (R18), Wire- and Strand-Wound, Circular, Prestressed Concrete Water Tanks, referred to as "AWWA D110-13 (R18)," available at https://engage.awwa.org/PersonifyEbusiness/Store/Product-Details/productId/72304450;

(xxvi) American Water Works Association Standard D115-20, Tendon-Prestressed Concrete Water Tanks, referred to as "AWWA D115-20," available at https://engage.awwa.org/PersonifyEbusiness/Store/Product-Details/productId/83072907;

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(xxxviii) ASTM International Standard C12, Standard Practice for Installing Vitrified Clay Pipe Lines, C12-17 (2017), referred to as "ASTM C12," available at https://webstore.ansi.org/standards/astm/astmc1217;

(xxxix) ASTM International Standard C14, Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe, C14-15a (2015), referred to as "ASTM C14," available at https://webstore.ansi.org/standards/astm/astmc1415a?gclid=Cj0KCQiA95aRBhCsARIsAC2xvfxIaQ66MqCuC40LMUwG0WMe0kbvHUvuxW6F3Nc7jy92bGyVdNFHiaoaAo-uEALw_wcB;

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isplay=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL.

(b) For these codes, standards, rules, and regulations incorporated by reference:

(i) The Environmental Quality Council has determined that incorporation of the full text in these rules would be cumbersome or inefficient given the length or nature of the rules.

(ii) This Chapter does not incorporate later amendments or editions of incorporated codes, standards, rules, and regulations.

(iii) All incorporated codes, standards, rules, and regulations are available for public inspection at the Department's Cheyenne office. Contact information for the Cheyenne office may be obtained at http://deq.wyoming.gov or from (307) 777-7937.