TITLE 252. DEPARTMENT OF ENVIRONMENTAL QUALITY
CHAPTER 626. PUBLIC WATER SUPPLY CONSTRUCTION STANDARDS

SUBCHAPTER 3. PERMIT PROCEDURES

252:626-3-2. Applications

(a) Submit legible applications on forms provided by the DEQ and include:
  (1) the type of entity that is applying
  (2) the legal description,
  (3) a minimum of ~~2~~ two (2) sets of plans and specifications, with at least one set printed on 11" x 17" paper,
  (4) a final design analysis,
  (5) all appropriate fees, and
  (6) engineering report approved by the DEQ for major waterworks projects, or smaller projects utilizing non-conventional processes.

(b) Public entities other than municipalities must provide certified copies of the results of the last election or appointment of the members of the governing body. Public entities must provide a citation of legal authority to own and operate the proposed facility.

(c) Applicants other than public entities must provide certified copies of documents that created them and provide a citation to their statutory authority.

252:626-3-6. Engineering report

(a) Submit three (3) copies of an approvable engineering report as required in OAC 252:626-3-2 for proposed new construction or modifications to PWS systems, at least 30 days prior to the submission of the application for a permit to construct.

(b) The purpose of the report is to present the Engineer's findings with enough attention given to detail(s) to allow adequate review of the project by the owner and applicable regulatory agencies.

(c) The report must include all information necessary for a comprehensive evaluation of the proposed construction. The report must present, at a minimum, the following:
  (1) **General information.** Include the following:
    (A) a description of existing water works and wastewater facilities,
    (B) identification of the municipality or area served,
    (C) name and mailing addresses of the owner and official custodian,
    (D) a statement as to whether the project will be constructed in phases. If the project is to be constructed in phases, the statement will include the number of phases necessary to complete the project and which portions of the project will be completed in each phase,
    (E) a demonstration that adequate capacity, treatment and compliance with the primary drinking water standards are maintained during construction, and
    (F) a letter from the permittee approving the contents contained in the engineering report as submitted.
  (2) **Extent of water works system.** Include the following:
    (A) a description of the area to be served,
    (B) provisions for extending the waterworks system,
    (C) establish the anticipated design average and peak flows for existing and potential industrial, commercial, institutional and other water supply needs for both the current service area and potential future service areas, and
    (D) a hydraulic analysis that demonstrates that a minimum of 25 psi shall be met at all times throughout the distribution system.
  (3) **Alternate plan.** Where feasible and practical, provide a minimum of three (3) alternative solutions and discuss the alternatives, including cost estimates and reasons for selecting the one recommended.
  (4) **Soil, ground water conditions, and foundation problems.** The report must include a description of the following:
    (A) the character of the soil where water mains are to be laid,
    (B) soil conditions, which might affect foundations of proposed structures, and
    (C) the approximate elevation of ground water in relation to subsurface structures.

(5) **Water use data.** Provide the following water use data:

(A) a description of the population trends as indicated by available records, and the estimated population which will be served by the proposed water supply system or expanded system,

(B) present water consumption of existing systems and the projected average and maximum daily demands that were used as the basis of the design, and

(C) present or estimated yield of supply source(s) along with a copy of the water rights verification form and/or the purchase water contract.

(6) **Fire flow requirements.** Demonstrate that the plans meet the requirements regarding fire flows pursuant to the *International Fire Code,* published by the International Code Council, Inc., 2003 Edition, *Distribution System Requirements for Fire Protection, M 31,* published by the AWWA, 3rd Edition or other recommendations of similar organizations for the fire service area

(7) **Sewer system available.** Describe the methods of disposal for sanitary and all other wastewater from the treatment plant.

(8) **Sources of water supply.** For the alternative chosen, the report must describe the proposed source or sources of water supply to be developed, the reasons for their selection, and provide information required by OAC 252:626-7 and the following:

(A) surface water sources, including:

(i) hydrological data, stream flow and weather records,

(ii) safe yield, including all factors that may affect it,

(iii) maximum flood or pool elevation,

(iv) description of watershed, noting any existing or potential sources of contamination which may affect water quality, and

(v) quality of the raw water with special reference to fluctuations.

(B) ground water sources, including:

(i) sites considered,

(ii) advantages of the site selected,

(iii) elevations with respect to surroundings,

(iv) character of formations through which the source is to be developed,

(v) geologic conditions affecting the site,

(vi) summary of exploration; test well depth and method of construction; placement of liners or screen; test pumping rates and duration; water levels and specific capacity; chemical and radiological quality of the water,

(vii) sources of possible contamination including but not limited to wastewater collection and treatment facilities, landfills, outcroppings of consolidated water-bearing formations, waste disposal wells, slush pits, irrigation wells and abandoned wells, and

(viii) industrial and other private water supply. Where pertinent, use significant ground water developments within a 1 mile radius of the proposed ground water source, giving depths, size, protective casing depth, capacity, location, type and any available information pertaining thereto.

(9) **Proposed treatment processes.** Summarize and determine the adequacy of proposed processes and unit parameters for the treatment of the water under consideration. Pilot studies may be required for innovative design. Post treatment for membrane systems shall be in accordance with OAC 252:626-9-9 (f)(6).

(10) **Residuals management.** Submit a Residuals Management Plan that discusses the wastes and volume generated by existing and proposed water treatment processes, their volume, proposed treatment of waste products, points of discharge or method of disposal or land application.

(11) **Project sites.** Address the following in the report:

(A) discussion of various sites considered and advantages of those recommended,

(B) the proximity of residences, industries, and other establishments, and

(C) any potential sources of pollution that may influence the quality of the supply or interfere with effective operation of the water works system, including but not limited to, absorption systems, septic tanks, privies, sink holes, sanitary landfills, refuse and garbage dumps.

(12) **Cost estimates.** Address the following in the report:

(A) estimated cost of integral parts of the system,
(B) detailed estimated annual cost of operation, and
(C) proposed methods to finance both capital charges and operating expenses.

(13) **Future extensions.** Summarize future needs and services.

SUBCHAPTER 5. GENERAL DESIGN

252:626-5-6. Laboratory facilities

Each public water supply must have its own equipment and facilities for routine laboratory testing necessary to ensure proper operation. Provide methods for verifying adequate quality assurances and for routine calibration of the equipment.

(1) **Testing equipment.** Laboratory equipment and facilities must be compatible with the raw water source, intended use of the treatment plant and the complexity of the treatment process involved. The laboratory must have enough equipment to perform operating control tests set forth in OAC 252:631 and provide the following laboratory equipment:

(A) a pH meter, jar testing equipment, a nephelometric turbidimeter, and titration equipment for both hardness and alkalinity for surface water treatment plants utilizing flocculation and sedimentation, including those that soften the water with lime ~~soften~~,

(B) a pH meter and titration equipment for both hardness and alkalinity for ion exchange softening plant and lime softening plant treating only ground water,

(C) for iron and manganese removal plants, test equipment capable of accurately measuring:

(i) iron to a minimum of 0.1 mg/l, ~~or~~ and/or

(ii) ~~test equipment capable of accurately measuring~~ manganese to a minimum of 0.05 ~~0.1~~ mg/l ~~for iron or manganese removal plants~~,

(D) test equipment for determining both free and total chlorine residuals for PWS systems that chlorinate,

(E) test equipment for determining fluoride concentration for PWS systems that fluoridate or that treat or use blending for the reduction of naturally occurring fluoride, and

(F) test equipment capable of accurately measuring phosphates from 0.1 to 20 mg/l for PWS systems that feed poly or ortho-phosphates.

(2) **Physical facilities.** Provide sufficient bench space, adequate ventilation, lighting, storage space, laboratory sinks, and auxiliary facilities.

SUBCHAPTER 9. TREATMENT

252:626-9-7. Iron and manganese control

(a) **General.** DEQ must approve treatment processes. When selecting treatment processes, local conditions must be evaluated using engineering investigations, including chemical analyses of representative samples of water to be treated. Include provisions for pH adjustment of the water to optimize the chemical reaction and to produce a non-corrosive finished water, containing not more than 0.3 part per million of iron and 0.05 part per million of manganese.

(1) **Removal by oxidation, detention, and filtration.**

(A) **Oxidation.** Provide oxidation through the use of chlorination, chlorine dioxide, potassium permanganate, aeration, ozonation or other approved method.

(B) **Detention.**

(i) **Reaction.** Provide a minimum detention time of 30 minutes following oxidation in order to insure that the oxidation reactions are as complete as possible. Design the detention basin as a holding tank with sufficient baffling to prevent short circuits. Provide drains for the basin.

(ii) **Sedimentation.** Provide sedimentation basins when treating water with high iron or manganese content, or where chemical coagulation is used to reduce the load on the filters.

(C) **Filtration.** Provide filtration.

(2) **Removal by the lime-soda softening process.** See OAC 252:626-9-10.

(3) **Removal by manganese green sand filtration.**

(A) Make provisions to apply the permanganate as far ahead of the filter as practical.
(B) Provide an anthracite media cap of at least 6 inches over the manganese green sand.
(C) Three gal/min/ft^2 is the maximum filtration rate.
(D) Normal wash rate is 8 to 10 gal/min/ft^2 of filter area.
(E) Provide air washing.
(F) Provide sample taps:
(i) prior to application of permanganate,
(ii) immediately ahead of filtration,
(iii) at a point between the anthracite media and the manganese green sand,
(iv) halfway down the manganese green sand, and
(v) at the filter effluent.

(4) **Sequestration by polyphosphates.** Do not use sequestration by polyphosphates where the concentration of iron, manganese, or the combination of the 2 exceeds 1.0 mg/l. Do not exceed 10 mg/l of total phosphate as PO_4. Where phosphate treatment is used, provide chlorination and maintain chlorine levels throughout the distribution system as required by OAC 252:631.
(A) Feeding equipment must meet the requirements of OAC 252:626-11.
(B) Do not apply polyphosphates ahead of iron and manganese removal treatment.

(b) **Sampling and testing equipment.**
(1) Provide smooth-nosed sampling taps for control purposes. Locate taps on each raw water source, treatment unit influent and effluent.
(2) Provide testing equipment with the capacity to accurately measure the iron content to a minimum of 0.1 mg/l and the manganese content to a minimum of 0.05 mg/l.
(3) ~~Where polyphosphate sequestration is practiced, provide appropriate phosphate testing equipment~~. Public water supply systems that feed polyphosphate or orthophosphate shall have test equipment capable of accurately measuring phosphates from 0.1 to 20 milligrams per liter.

252:626-9-11. Disinfection

(a) **General.**
(1) **Surface and GWUDI.** All surface and GWUDI supplies require disinfection.
(2) **Groundwater.** Full-time disinfection of a groundwater supply is required whenever the record of bacteriological tests indicates the water is or was ever bacteriologically unsafe pursuant to OAC 252:626-7-4 (a)(2).
(3) **Modification to disinfection process.** Do not make any changes to the disinfection process unless approved by the DEQ.
(4) **CT Standards.** Design the system to meet the CT standards in accordance with 40 CFR § 141.72. CT shall provide 4.0 log inactivation for viruses.
(5) **Accomplished log inactivation.** Total log removal/inactivation required for *giardia, cryptosporidium* and viruses shall be accomplished through filtration and disinfection as described in the *Microbial and Disinfection Byproduct Rules Simultaneous Compliance Guidance Manual,* EPA 815-R-99-015.

(b) **Chlorination.**
(1) **Chlorinators.** Provide solution-feed-gas-type chlorinators positive displacement hypochlorite feeders or tablet chlorinators. Only NSF approved tablet chlorinators are allowed.
(2) **Capacity.** Design the capacity of chlorine feeders to produce a free chlorine residual of at least 2 mg/l in the water after a contact time needed to meet the required CT Value. The equipment must accurately operate over the desired feeding range.
(3) **Stand-by equipment.** Provide stand-by equipment to replace the largest unit during shutdowns and adequate spare parts for chlorinators. Hypochlorinators of adequate capacity may temporarily replace gas-type chlorinators in small plants.
(4) **Proportioning.** Provide automatic proportioning chlorinators where the rate of flow or chlorine demand is not constant.
(5) **Contact time and point of application.**
(A) At plants treating surface water, make provisions for applying disinfectant to raw water, water applied to filters, filtered water, and water entering the distribution system. At plants treating ground water, make provisions for applying chlorine to the detention basin inlet and water entering the distribution system.

(B) Design all basins used for disinfection to minimize short-circuiting and increase contact time.

(C) If primary disinfection is accomplished using ozone, chlorine dioxide, or any other chemical that does not provide a residual disinfectant, then chlorine or chloramines must be added to provide a residual disinfectant.

(6) **Testing equipment.** Provide chlorine residual test equipment recognized in the latest edition of "Standard Methods for the Examination of Water and Wastewater" published by AWWA, APHA, and WEF. ~~Provide continuous monitoring and recording equipment for plants serving a population greater than 3,300.~~ Public water supply systems that serve a population greater than 3,300 shall have equipment that continuously measures and records chlorine residuals at the entry point to the distribution system.

(7) **Chlorinator piping.** Design the chlorinator water supply piping to prevent contamination of the treated water supply by back-siphonage or cross connections with non-potable water. At all facilities treating surface water, pre- and post-chlorination systems must be independent to prevent possible siphoning of partially treated water into the clear well.

(c) **Chloramines.** Disinfection with chloramines is not ~~appropriate~~ allowed for primary disinfection to meet CT requirements.

(d) **Chlorine dioxide.** Perform an oxidant demand study before selecting chlorine dioxide as a primary disinfectant.

(e) **Chlorine dioxide testing equipment.** When treatment with chlorine dioxide is used, provide equipment for testing concentrations of chlorine dioxide and chlorites.

(f) **Ultraviolet disinfection**. UV drinking water disinfection applications shall be closed channel reactors. Full-scale drinking water applications generally use UV low-pressure, UV low-pressure high-output, or UV medium pressure mercury vapor lamps. There are several factors to determine which lamp to use, including the number of lamps needed, lamp life, power usage, start-up time and germicidal efficiency.

(1) **Reactor dose monitoring approaches.** One of the following UV reactor dose-monitoring approaches shall be used:

(A) **UV intensity setpoint approach.** This approach relies on one or more "setpoints" for UV intensity that are established during validation testing, pursuant to the requirements contained in OAC 252:626-9-11 (e)(2)(C), to determine UV dose. During operations, the UV intensity as measured by the UV sensors must meet or exceed the setpoint(s) to ensure delivery of the required dose. In the UV intensity setpoint approach, UV transmittance does not need to be monitored separately. Instead, the intensity readings by the sensor account for changes in UV transmittance. The operating strategy can be with either a single setpoint (one UV intensity setpoint is used for all validation flow rates) or a variable setpoint (the UV intensity setpoint is determined using a lookup table or equation for a range of flow rates).

(B) **Calculated dose approach.** This approach uses a dose monitoring equation to estimate the UV dose based on the measured flow rate, UV intensity, and UV transmittance. The dose monitoring equation shall be developed through validation testing, pursuant to the requirements contained in OAC 252:626-9-11 (e)(2)(C). During reactor operations, the UV reactor control system inputs the measured parameters into the dose monitoring equation to produce a calculated dose. The water system operator divides the calculated dose by the validation factor and compares the resulting value to the required dose for the target pathogen and log inactivation level.

(2) **Design.** The following criteria shall be included in the design of the UV system:

(A) **Flow rate.** Maximum ~~instanteous~~ instantaneous flow rates shall be stated in the validation report pursuant to the requirements contained in OAC 252:626-9-11 (e)(2)(C).

(B) **Target pathogen(s) and log inactivation.** The log inactivation for the target pathogen(s) must be determined before sizing the UV reactor. The target microorganism(s) and their log-inactivation level shall be stated in the engineering report. The required UV doses for *Cryptosporidium* and *Giardia* inactivation are lower than those needed for the inactivation of viruses. Most viruses can be easily inactivated with chlorine.

(C) **Validation.** To ensure the validation testing and data analysis is conducted in a technically sound manner and without bias, a person independent of the UV reactor manufacturer shall oversee the validation testing. Individuals qualified for such oversight shall include engineers experienced in testing and evaluating UV reactors and scientists experienced in the microbial aspects of biodosimetry. Appropriate individuals should have no real or apparent conflicts of interest regarding the ultimate use of the UV reactor being tested. The range of validated operating conditions must be included in the validation testing and submittal of a validation report shall be required. The validation testing shall be completed in accordance with procedures outlined in the publication, *"Ultraviolet Disinfection Guidance Manual for the Final Long Term 2 Enhanced Surface Water Treatment Rule,"* EPA 815-R-06-007, (2006).

(D) **Sizing.** A fouling aging factor of 0.70 shall be used to size the UV reactor.

(E) **Required UV dose.** The validation process shall determine the dose monitoring for the required dose over the range of flow, UVT, lamp aging and fouling that will occur at the water treatment plant.

(F) **Water quality.** The following water quality parameters shall be included in the design of the system:

(i) Fouling factors, which include, temperature, pH, turbidity, iron, calcium, manganese, alkalinity and total hardness;

(ii) UV transmittance at 254 mn; and

(iii) UV transmittance from 200-300 mn for MP reactors only.

(G) **Operating pressure.** Provide the expected operating pressures for the UV system. The maximum operating pressure to be withstood by the lamp sleeves and UV reactor housing.

(H) **UV sensors.** A germicidal spectral response shall be specified. A minimum of one UV sensor shall be specified per UV reactor. The actual number shall be the same as used during the validation process pursuant to the requirements contained in OAC 252:626-9-11 (e)(2)(C). The following shall also be required:

(i) UV sensors used during validation shall read within ten percent (10%) of the average of three (3) or more reference sensor measurements.

(ii) UV sensors during operation shall be calibrated with three (3) or more reference UV sensor measurements. Reference UV sensors are off-line UV sensors that shall be at least as accurate as the duty UV sensors and shall be constructed identically, unless changes are made to the reference sensor to make said sensor more accurate.

(iii) Reference UV sensors shall have calibration traceable to one of the following national standards:

(I) The National Physical Laboratory;

(II) The National Institute of Standards and Technology;

(III) Deutsche Vereinigung des Gas- und Wasserfaches (GVDW); and

(IV) Osterreichisches Normungsinstitut (ORNORM).

(I) **Hydraulics.** The following hydraulic information shall be provided:

(i) The maximum system pressure at the UV reactor;

(ii) The maximum allowable head loss through the UV reactor;

(iii) Special surge conditions that may be experienced; and

(iv) The hydraulic constraints based on the site-specific and validated conditions.

(J) **Location constraints.** Do not install UV disinfection upstream of filtration for surface and GWUDI water treatment plants due to the potential of particles interfering with UV disinfection.

(K) **Lamp Sleeves.** The following shall be applicable to all lamp sleeves installed:

(i) Lamp sleeves shall be annealed to minimize internal stress;

(ii) Lamp sleeve specifications shall describe the type of lamp sleeve cleaning system to be used, whether an off-line chemical clean, an off-line mechanical clean, or an on-line mechanical and/or chemical clean method is used. Indicate how the capacity of the system will be affected by the chosen cleaning system; and

(iii) Provide piping and valves necessary to properly dispose of chemicals used during the cleaning of the lamp sleeves.

(L) **Alarms.** At a minimum, the following UV reactor alarms shall be specified:

(i) Lamp or ballast failure;

(ii) Low UV intensity or low validated UV dose;

(iii) High temperature;
(iv) Operating conditions outside of validated range; and
(v) Wiper failure.

(M) **Instrumentation.** At a minimum, the following signals and indicators shall be specified:
(i) UV lamp status;
(ii) UV reactor status;
(iii) All signals used in the dose monitoring algorithm (e.g. at a minimum lamp output, UV intensity, flow, and UVT);
(iv) Lamp cleaning cycle and history;
(v) Accumulated run time for individual lamps or banks of lamps and reactors; and
(vi) Influent flow rate.

(N) **Controls.** At a minimum, the following UV reactor controls shall be specified:
(i) UV dose setpoints, UV intensity set points or UV transmittance setpoints as appropriate;
(ii) UV lamps, on and off control;
(iii) UV reactor, on and off control;
(iv) UV reactor manual and automatic control;
(v) UV reactor local and remote control;
(vi) Manual lamp power level control;
(vii) Manual lamp cleaning cycle control; and
(viii) Automatic lamp cleaning cycle setpoint control.

(O) **Startup Criteria.** The equipment installed shall meet the performance requirements contained in the specifications. The following specific performance criteria shall be included in the specifications:
(i) Allowable head loss at each design flow rate;
(ii) Estimated power consumption under the design operating conditions;
(iii) Disinfection capacity of each reactor under the design water quality conditions;
(iv) Sensitivity of equipment to variations in voltage or current; and
(v) Reference UV sensor, duty UV sensor, and UV transmittance analyzer performance.

(P) **Warranties.** A physical equipment warranty for a minimum of one year is required. Lamps shall be warranted to provide the lamp intensity under design conditions and warranted for a minimum number of operating hours taking into consideration the fouling and aging of the lamp.

(Q) **UV transmittance analyzer.** When a UV transmittance analyzer is provided, a calibrated spectrophotometer is required, capable to measure UV absorbance and/or UVT at 254 nm, across a 4 cm or 5 cm pathlength.

(R) **Back-up power supply.** Power surges and the appropriate power conditioning equipment must be addressed in the specifications.

252:626-9-12. Fluoridation [REVOKED]

~~(a) **Approval of fluoridation program.** Fluoridation programs for PWS systems must be approved by the Oklahoma Department of Health. DEQ approves the installation of the facilities. The requirements include:~~
~~(1) the governing body of the water authority must authorize fluoridation by ordinance or resolution,~~
~~(2) written endorsement or resolution of the local medical and dental societies and the local health authorities,~~
~~(3) detailed plans showing the location of the equipment, piping layout, manner of control, and point of fluoride application,~~
~~(4) detailed specifications for the chemical-feeding equipment including a description of the equipment and its maximum and minimum feed range,~~
~~(5) statement of the chemical to be used and plans for storage and handling,~~
~~(6) plans for dust control facilities, and~~
~~(7) methods of analysis and control to be used in making the fluoride control tests.~~

~~(b) **Fluoride compounds.** Sodium fluoride, sodium silicofluoride, and hydrofluosilicic acid that~~

~~are approved by NSF are suitable for the fluoridation of PWS systems. Fully label containers used to store fluoride compounds including chemical name, purity, concentration, and supplier name and address.~~
~~(c) **Equipment.** Equipment for feeding fluoride compounds must comply with OAC 252:626-11.~~

SUBCHAPTER 11. CHEMICAL APPLICATION

252:626-11-4. Additional requirements for specific chemicals
(a) **Chlorine gas.**
(1) **Housing.** Enclose chlorine gas feed and storage and separate them from other operating areas. The chlorine room must:
(A) have a shatter resistant, clear glass inspection window installed in an exterior door or interior wall to permit the chlorinator to be viewed without entering the room,
(B) be constructed so that all openings between the chlorine room and the remainder of the plant are sealed,
(C) be provided with doors equipped with panic hardware and opening only to the building exterior,
(D) be on ground floor with easy access for handling cylinders from a ramp or dock at floor level, and
(E) provide a gas-tight room to separate gas chlorination equipment, chlorine cylinders and ozone generation equipment from other parts of the building, if the building is used for other purposes. Do not connect floor drains from the chlorine room to floor drains from other rooms. Doors to this room shall only open to the outside of the building, with panic hardware, at ground level and allow easy access to all equipment. One (1) ton chlorine cylinders shall have separate storage and feed areas. All doors and emergency equipment shall be compatible with chlorine.
(2) **Ventilation.**
(A) Provide each room with a ventilating fan with the capacity to provide 1 complete air change per minute.
(B) Locate air inlets near the ceiling and the point of discharge near the floor. Locate the point of discharge to avoid contaminating air inlets to any rooms or structures.
(C) Locate switches for fans and lights outside of the room, at the entrance. Provide a labeled signal light indicating fan operation at each entrance where the fan can be controlled from more than 1 point.
(3) **Heat.** Provide the ability to heat the room to 60°F (15°C) and protect from excessive heat. Keep cylinders at room temperature.
(4) **Storage of chlorine cylinders.** Full and empty cylinders of chlorine gas must be:
(A) isolated from operating areas,
(B) restrained in position to prevent upset,
(C) stored in rooms separate from ammonia storage,
(D) stored in areas not in direct sunlight or exposed to excessive heat, and
(E) a minimum of a one (1) ton chlorine container, if more than one hundred and fifty pounds (150 lbs.) of chlorine per day is needed.
(5) **Scales.** Provide corrosion-resistant accurate scales for weighing chlorine cylinders. Provide at least a platform scale. Indicating and recording scales are required.
(6) **Chlorine gas line.** Do not allow chlorinator feed lines to carry chlorine gas beyond the chlorinator room, unless gas is fed under vacuum. Lines must be extra heavy weight pipes, resistant to corrosion and slope upward from the cylinder to the chlorinator.
(7) **Water supply.** Provide an ample supply of water to operate the chlorinator. Back-up any booster pumps, according to the back-up power requirements.
(8) **Handling Equipment.** For cylinders up to one hundred and fifty pounds (150 lbs.), provide securing restraints and a hand-truck designed for the cylinders. For one (1) ton cylinders, provide:
(A) A hoist with 4,000 lbs. capacity,
(B) Cylinder lifting bar,
(C) Monorail or hoist with sufficient lifting height to pass one cylinder over another, and

(D) Cylinder trunnions to allow exchanging the cylinders for proper connection.

(9) **Manifolds.** Gaseous chlorine cylinders may be connected to a manifold, if all cylinders are maintained at the same temperature or the system is designed for gas transfer from a warm container to a cool container. Do not connect liquid chlorine cylinders to a manifold.

(10) **Leak detection.** Provide an emergency response plan for chlorine leaks. Provide a bottle of 56% ammonium hydroxide solution for detecting chlorine leaks. Where one (1) ton containers are used, provide a leak repair kit approved by the Chlorine Institute and include caustic soda solution reaction tanks to absorb leaks. At large chlorination installations, provide automatic gas detection and related alarm equipment. Air pollution control regulations may require additional air scrubbing equipment be installed.

(11) **Evaporators.** The specifications shall demonstrate that a sufficient volume of chlorine can be supplied.

(12) **Respiratory protection.** Where chlorine gas is handled, provide respiratory air-pac protection equipment that meets the National Occupational Safety and Health (NIOSH) standards. Store the equipment and operating instructions at a convenient location outside the room where chlorine is used or stored. The units must use compressed air, with at least a 30-minute capacity. In the emergency response plan, describe how to maintain the air-pac protection equipment.

(b) **Acids and caustics.**

(1) Keep acids and caustics in closed acid-resistant or caustic resistant shipping containers or storage units.

(2) Design bulk acid and caustic storage systems with a liquid level indicator, overflow pipe, and receiving basin or drain capable of receiving accidental spills or overflows.

(3) Do not handle acids or caustics in open vessels. Pump acid or caustics in undiluted form from original containers through a suitable line to the point of treatment or to a covered day tank.

(4) Due to their potential explosive nature, do not store acids and bases together or allow discharge to a common drain.

(c) **Fluoride~~ compound storage and handling~~.** Documentation of approval from the Oklahoma State Department of Health for the use of fluoride for a PWS system shall be submitted to DEQ with the engineering report.

(1) **Approved fluoride compounds.** The following compounds may be used for the fluoridation of PWS systems when approved by NSF:

(A) sodium fluoride,

(B) sodium silicofluoride, and

(C) hydrofluosilicic acid.

~~(1)~~(2) **Storage.**

(A) Store fluoride chemicals so that substitution for other chemicals used in water treatment can be avoided.

(B) Provide storage facilities so fluoride dry chemicals can be stored a minimum of ~~6~~ six inches (6") from floor surface to prevent moisture build up within chemical (dry chemicals only).

(C) Store fluoride compounds in covered or unopened shipping containers inside an enclosure.

(D) Do not reuse empty fluoride shipping containers (bags, drums, or barrels).

~~(2)~~(3) **Chemical feed equipment and methods.**

(A) **Scales.** Provide accurate scales and loss-of-weight recorders for hydrofluosilicic acid solution feeders.

(B) **Solution feeders.** Provide a positive displacement pump having a stroke rate of not less than twenty (20) strokes per minute for the application of fluoride solution. Do not introduce fluoride solution directly into the suction pipe of a pump or any other pipe or conduit that normally operates under atmospheric or negative pressure.

(C) **Feed lines.** Provide easily accessible feed lines made of corrosion resistant material. Protect feed lines from freezing. If using a horizontal pipe, apply the hydrofluosilicic acid into the lower half of the pipe. Provide anti-siphon devices for all fluoride feed lines. Do not add fluoride compounds before lime-soda softening or ion exchange softening.

(D) **Dry-chemical feeders.** Provide a minimum of ~~12~~ twelve (12) gallons of solution water per pound of sodium fluoride or silicofluoride applied. Provide agitation of the chemical and gravity feed from the solution pots. Provide a minimum retention period of ~~5~~ five (5) minutes for sodium fluoride or fifteen (15) minutes for sodium silicofluoride in the solution pot or basin.

~~(3)~~(4) **Protective equipment.** Place a sign in fluoride feeding areas, stating that hands and other exposed areas must be washed with liberal quantities of water after handling fluoride materials.

(A) Provide the following protective equipment when sodium fluoride and sodium silicofluoride is utilized:

(i) gauntlet-type gloves made of neoprene, plasticized polyvinyl chloride, or other equally resistant material,

(ii) dust respirator of a type certified by the National Institute of Occupational Safety and Health (NIOSH) for toxic dusts,

(iii) an apron or other protective clothing, and

(B) Provide the following protective equipment when hydrofluosilicic acid is used:

(i) gauntlet-type gloves made of neoprene, plasticized polyvinyl chloride, or other equally resistant material,

(ii) chemical safety goggles or shield,

(iii) an acid resistant apron made of neoprene or other equally resistant material, and

(iv) an operational safety shower and eyewash device in case of emergency.

(d) **Powdered activated carbon.** Powdered activated carbon storage and handling must meet the following requirements:

(1) store activated carbon in a fireproof compartment or building. Do not store any other material in the same compartment or building with carbon. Provide explosion-proof lights, switches, and motors,

(2) install an exhaust fan with a dust collector for each room where carbon is stored or handled,

(3) provide wet carbon storage tank dust collectors at the charging point and an agitation device to keep the slurry in suspension,

(4) provide pumps for transfer of the slurry to the feeders,

(5) construct all tanks, pipes, valves, pumps, agitators, etc., which will come in contact with the carbon slurry, of materials that will withstand the corrosive action of the slurry, and

(6) the maximum slurry concentration is 1 pound of activated carbon per gallon of water.

(e) **Chlorine dioxide.**

(1) **Feed system.**

(A) Provide fiberglass reinforced vinyl ester plastic (FRP) or high density linear polyethylene (HDLPE) tanks with no internal insulation or heat probes for bulk storage of 25 to 38 percent solution sodium chlorite.

(B) If centrifugal pumps are used, provide Teflon packing material. Pump motors must be:

(i) totally enclosed,

(ii) fan-cooled,

(iii) equipped with permanently sealed bearings, and

(iv) equipped with double mechanical seals or other means to prevent leakage.

(C) Provide chlorinated PVC, vinyl ester or Teflon piping material. Do not use carbon steel or stainless steel piping systems.

(D) Provide glass view ports for the reactor if it is not made of transparent material.

(E) Provide flow monitoring on all chemical feed lines, dilution water lines, and chlorine dioxide solution lines.

(F) Do not use excessively hard dilution water in order to avoid calcium deposits. Dilution water must be near neutral pH.

(G) Control air contact with chlorine dioxide solution to limit potential for explosive concentrations building up within the generator.

(H) The maximum chlorine dioxide concentration in the air is 10 percent volume.

(2) **Storage.**

(A) Designate space for storage and feeding.

(B) Do not store and handle combustible or reactive materials, such as acids or organic materials, in the sodium chlorite area.

(C) Provide non-combustible material for construction, such as concrete.
(D) Store chemicals in clean, closed, non-translucent containers.
(E) Avoid exposure to sunlight, UV light, or excessive heat.
(F) Provide a water supply near the storage and handling area for cleanup.
(G) Design the parts of the chlorine dioxide system in contact with the strong oxidizing or acid solutions of inert material.
(H) Provide adequate ventilation and air monitoring equipment.
(I) Provide gas masks and first aid kits outside the chemical areas.

(f) **Sodium chlorite.** The storage and use of sodium chlorite must be approved by the DEQ in the engineering report prior to the preparation of final plans and specifications. Provisions shall be made for proper storage and handling of sodium chlorite to eliminate any danger of fire or explosion associated with its oxidizing nature.

(1) **Storage.** Sodium chlorite shall be stored as follows:
(A) Sodium chlorite shall be stored alone in a separate room and in an outside building detached from the water treatment facility. The sodium chlorite shall be stored away from organic materials;
(B) Storage structures shall be constructed of noncombustible materials; and
(C) The storage structure shall be located in an area where water is provided for fire protection and the structure shall be in an area sufficiently cool to prevent heat induced explosive decomposition of the chlorite.

(2) **Handling.** Sodium chlorite shall be handled as follows:
(A) Sodium chlorite shall be handled to prevent spillage;
(B) An emergency operation plan shall be developed for the clean up of any spillage; and
(C) Storage drums shall be thoroughly flushed prior to recycling and/or disposal.

(3) **Feeding.** Sodium chlorite shall be fed as follows:
(A) Positive displacement feeders shall be provided;
(B) Tubing for conveying sodium chlorite or chlorine dioxide solutions shall be Type I PVC, polyethylene or materials recommended by the manufacturer;
(C) Chemical feeders installed in chlorine rooms shall provide sufficient space or facilities as approved in the specifications;
(D) Feed lines shall be installed in a manner to prevent formation of gas pockets and shall terminate at a point of positive pressure; and
(E) Check valves shall be provided to prevent backflow of chlorine into the sodium chlorite line.

(g) **Sodium hypochlorite.** Sodium hypochlorite storage and handling procedures shall be arranged to minimize the slow natural decomposition process either by contamination or by exposure. In addition, feed rates shall be regularly adjusted to compensate this progressive loss in chlorine content.

(1) **Storage.** Sodium hypochlorite shall be stored as follows:
(A) In the original shipping containers or in a sodium hypochlorite compatible container; and
(B) Storage containers or tanks shall be located in a cool area, away from any sunlight, and vented to the outside of the building.

(2) **Feeding.** Sodium hypochlorite shall be fed as follows:
(A) Positive displacement pumps shall be used;
(B) To avoid air locking, for or systems using self-priming pumps, the use of a foot valve is required;
(C) Where flooded suction is used, arrange pipe work to ease the escape of gas bubbles;
(D) Plants utilizing bulk storage of greater than 100 gallons shall be required to use calibration tubes or mass flow monitors which allow for direct physical checking of actual feed rates; and
(E) Injectors shall be removable to allow for regular cleaning.

(h) **Ammonia.** Ammonia for chloramine formation shall be added to water either as a water solution of ammonium sulfate, or as aqua ammonia (ammonia gas in water solution), or as anhydrous ammonia [purified 100% ammonia in liquid or gaseous form]. Special provisions are required for each form of ammonia as follows:

(1) **Ammonium sulfate.** A water solution is made by addition of ammonium sulfate solid to water with agitation. The tank and dosing equipment contact surfaces shall be made of corrosion resistant non-metallic materials. The point of delivery to the main water stream shall be placed in a region of rapid and turbulent water flow.

(2) **Aqua ammonia.** Aqua ammonia (also known as ammonium hydroxide) feed pumps and storage shall be enclosed and separated from other operating areas. The aqua ammonia room shall be equipped as follows:

(A) A corrosion resistant, closed, unpressurized tank shall be used for bulk storage, vented through an inert liquid trap to a high point outside and an incompatible connector or lockout provisions shall be made to prevent the accidental addition of other chemicals to the storage tank.

(B) The storage tank shall be fitted with either a cooling/refrigeration and/or with a provision without opening the system to dilute and mix the contents with water to avoid conditions where temperature increases cause the ammonia vapor pressure over the aqua ammonia to exceed atmospheric pressure.

(C) An exhaust fan shall be installed to withdraw air from high points in the room and makeup air shall be allowed to enter at a low point.

(D) The aqua ammonia feed pump, regulators, and lines shall be fitted with pressure relief vents discharging outside the building away from any air intake and with water purge lines leading back to the headspace of the bulk storage tank.

(E) The aqua ammonia shall be conveyed direct from storage to the treated water stream injector without the use of a carrier water stream unless the carrier stream is softened.

(F) The point of delivery to the main water stream shall be placed in a region of rapid and turbulent water flow.

(G) Provisions shall be made for easy access for removal of calcium scale deposits from the injector.

(3) **Anhydrous ammonia.** Anhydrous ammonia shall be readily available in pure liquefied gas form under moderate pressure in cylinders or as a cryogenic liquid, boiling at negative 15 degrees Celsius at atmospheric pressure. Anhydrous ammonia shall be handled as follows:

(A) Anhydrous ammonia and storage feed systems (including heaters where required) shall be enclosed and separated from work areas and constructed of corrosion resistant materials.

(B) Pressured ammonia feed lines shall be restricted to the ammonia room.

(C) An emergency air exhaust system, with an elevated intake, shall be provided in the ammonia storage room.

(D) Leak detection systems shall be fitted in all areas where the ammonia is piped.

(E) Special vacuum breaker/regulator provisions shall be made to avoid potentially violent results of backflow of water into cylinders or storage tanks.

(F) The ammonia injector shall either use a vacuum eductor or a perforated tube fitted with a closely fitting flexible rubber tubing seal punctured with a number of small slits to delay the fouling by lime deposits.

(G) A provision shall be made for the periodic removal of scale/lime deposits from injectors and carrier piping.

(H) Meet OSHA requirements for the installation of an emergency gas scrubber capable of absorbing the entire contents of the largest ammonia storage unit whenever there is a risk to the public as a result of potential ammonia leaks.

SUBCHAPTER 19. DISTRIBUTION SYSTEM

252:626-19-2. Installation of ~~mains~~ piping

(a) **Standards.** The standards in this Section apply to the installation of piping in public water supply distribution systems. Specifications must incorporate the provisions of the AWWA standards.

(b) **Bedding.** Provide continuous and uniform bedding in the trench for all buried pipe. Tamp backfill material in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe. Remove all stones found in the trench to a depth of at least 6 inches below the bottom of the pipe.

(c) **Cover.** Provide all water mains with at least 30 inches of cover or with sufficient insulation to prevent freezing.

(d) **Blocking.** Provide reaction blocking, tie rods, or joints designed to prevent movement at all tees, bends, plugs and hydrants to prevent movement of the pipe.

(e) **Pressure and leakage testing.** Test the installed pipe for leakage in accordance with AWWA standard specifications. Leakage must not exceed 10 gal/inch diameter per mile of pipe per 24 hours at 150 psi testing pressure.

(f) **Disinfection and testing.** Disinfect all waterlines according to AWWA standard specifications. Obtain safe bacteriological samples on two consecutive days before placing the waterline into service.

(g) **Permeation of system by organic compounds.** Where distribution lines are installed in areas of soil or groundwater contamination by organic compounds use:

- (1) pipe and joint materials that are not subject to permeation by organic compounds.
- (2) non-permeable materials for all portions of the system including water mains, service connections, and hydrant leads.

(h) **Separation of water mains and sewers from contamination sources.**

- (1) **Horizontal separation.**
  - (A) Measure the separation distance edge to edge.
  - (B) Locate water mains at least 10 feet horizontally from any existing or proposed sewer lines.
  - (C) Locate water mains at least 5 feet horizontally from any existing or proposed storm sewers, raw water lines, petroleum product lines, natural gas lines, and other buried utility lines.
  - (D) Locate cast iron waterlines at least 10 feet from any gasoline storage tank and lines and PVC water lines at least 50 feet horizontally from any gasoline storage tank and lines.
  - (E) Locate waterlines at least 15 feet from all parts of septic tanks and absorption fields, or other sewage treatment and disposal systems.
- (2) **Vertical Separation.**
  - (A) Measure the separation distance from edge to edge.
  - (B) Lay waterlines crossing sewer lines to provide a minimum vertical distance of 24 inches between the water main and the sewer line. Arrange the piping so that joints in a 20-foot length of PVC or 18 foot length of cast iron sewer pipe will be equidistant from the water main. Where a water main crosses under a sewer, provide adequate structural support for the sewer to prevent damage to the water main.
  - (C) Maintain a two foot vertical separation between waterlines and any existing or proposed storm sewers, raw water lines, petroleum product lines, natural gas lines, and other buried utility lines.
- (3) **Special conditions.** When it is impossible to obtain proper horizontal and vertical separation as stipulated above, design and construct the other line equal to water pipe, and pressure test it to assure water tightness of joints adjacent to the water line prior to backfilling.

(I) **Surface water crossings.**

- (1) **Above-water crossings.** Adequately support and anchor the pipe. Provide protection from damage and freezing. Make waterline accessible for repair or replacement.
- (2) **Underwater crossings.** Provide a minimum cover of 2 feet over the pipe. For waterlines crossing a well defined channel bottom greater than 15 feet in width, construct the waterline as follows:
  - (A) design the pipe for river crossings and have flexible, restrained or welded watertight joints,
  - (B) provide valves at both ends of water crossings so that the section can be isolated for testing or repair. The valves must be easily accessible and not subject to flooding. The valve closest to the supply source must be in a manhole, and
  - (C) make permanent taps on each side of the valve within the manhole to allow insertion of a small meter for testing to determine leakage and for sampling purposes.

(j) **Tracer wire**. Install metal tracer wire on all non-ferrous piping used for public water supply mains.