SUBCHAPTER A: ADMINISTRATIVE REQUIREMENTS

§§217.1 - 217.17

§217.1. Purpose and Applicability.

(a) Purpose.

(1)These rules establish the minimum design criteria that must be used in the design of domestic wastewater treatment facilities, treatment units, collection systems, and collection system units. The design criteria in these rules are intended to promote the design of facilities in accordance with good public health and water quality engineering practices. These criteria include the minimum requirements for an engineering report detailing the fully developed project along with related plans and specifications, and the minimum operation and maintenance requirements.

(2) All wastewater treatment facilities, treatment units, collection systems, and collection system units must be installed, operated, and maintained to ensure the safety of licensed operators authorized to operate wastewater treatment facilities, the executive director, and the public, to function as described in the engineering report and the associated plans and specifications approved by the executive director, and to ensure continuous compliance with applicable statutory and regulatory requirements.

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(b) Applicability.

(1) This chapter applies to the design, operation, and maintenance of:

a. wastewater treatment facilities that are constructed with plans and specifications received and approved by the executive director after the effective date of the amendments to this chapter;

b. treatment units that are altered, constructed, or re-rated with plans and specifications received and approved by the executive director after the effective date of the amendments to this chapter;

c. collection systems that are constructed with plans and specifications received and approved by the executive director after the effective date of the amendments to this chapter;

d. collection system units that are altered, constructed, or re-rated with plans and specifications received and approved by the executive director after the effective date of the amendments to this chapter;

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e. existing wastewater treatment facilities that do not have a wastewater discharge permit and are required to obtain a wastewater discharge permit;

f. existing collection systems that never received plans and specifications approval; and

g. collection system rehabilitation projects covered in §217.56(c) (relating to Trenchless Pipe Installation) and §217.71 (relating to Maintenance, Inspection, and Rehabilitation of the Collection System) of this chapter.

(2) Wastewater treatment facilities, treatment units, collection systems, and collection system units with plans and specifications approved by the executive director that were received on or after August 28, 2008 and before the effective date of this chapter must comply with the rules in this chapter, as they existed immediately before the effective date of this chapter. The rules in effect immediately before the effective date of this chapter are continued in effect for that purpose.

(3) This chapter does not apply to:

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a. the operation and maintenance of wastewater treatment facilities, treatment units, collection systems or collection system units with plans and specifications that were approved by the executive director on or before August 27, 2008;

b. wastewater treatment facilities, treatment units, collection systems or collection system units with plans and specifications approved by the executive director on or before August 27, 2008;

c. systems regulated by Chapter 285 of this title (relating to On-Site Sewage Facilities); or collection systems or wastewater treatment facilities that collect, transport, treat, or dispose of wastewater that does not have the characteristics of domestic wastewater, although the wastewater may contain domestic wastewater.

~~(a) This chapter applies to any person who proposes to construct, renovate, or re-rate a wastewater collection system or commission permitted wastewater treatment facility that will collect, transport, treat, or dispose of wastewater that retains the characteristics of domestic wastewater although it may contain industrial wastewater,~~

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~~except those systems regulated by Chapter 285 of this title (relating to On-Site Sewage Facilities).~~

~~(b) This chapter does not apply to a person who proposes to construct a collection system or commission permitted treatment facility that will collect, transport, treat, or dispose of wastewater that does not have the characteristics of domestic wastewater although it may contain domestic wastewater.~~

~~(c) The executive director will grant variances from the requirements of this chapter to a person who proposes to construct, materially alter, expand, or re-rate a collection system or treatment facility, if the plans and specifications for the project are submitted prior to March 1, 2009 and meet the design criteria that was in effect when the engineering design began.~~

§217.2. Definitions.

The following words and terms, when used in this chapter, have the following meanings unless the context clearly indicates otherwise.

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(1) Activated sludge – a collection of actively growing biological organisms that results from combining wastewater, organisms and air in an aerated treatment process.

(2) Activated sludge process -- A biological wastewater treatment process in which activated sludge is aerated. The activated sludge microorganisms are subsequently separated from the wastewater and wasted or returned to the process.

(3) ~~(1)~~ Advanced nutrient removal --A process to remove phosphorus, nitrogen, or both, that is intended to produce ~~and/or nitrogen and produce effluent of~~ higher quality effluent than is normally achieved by secondary treatment processes.

(4) Air gap--The unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet conveying water to a tank, fixture, receptor, sink, or other assembly and the flood level rim of the receptacle. To qualify as an air gap under this rule, the vertical, physical separation must be at least twice the diameter of the water supply outlet, but never less than 1.0 inch.

(5) Affirmative executive director approval -- non-automatic approval given by the executive director, in writing. The requirement for affirmative executive director approval in this chapter is indicated by the phrase "approved by the executive

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director"; "must be approved by the executive director"; "the executive director must approve"; "only if approved by the executive director"; or any similar phrase.

(6) Alter—

(A) To replace a treatment unit or a collection system unit.

(B) To modify a treatment unit, a collection system unit, or an associated appurtenance, in a way that changes any of the following for a treatment unit or collection system unit:

(i) the capacity;

(ii) the intended function;

(iii) the process;

(iv) the mode of operation;

(v) the configuration;

(vi) a design parameter;

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(vii) a major design assumption; or

(viii) the function of any other treatment unit or collection system unit.

(7)~~(2)~~ Alternative collection system-- Alternative collection systems are designed to make smaller pipe diameters and near-grade installation of pipes possible using specialized integral components such as grinder pumps, septic tanks, or vacuum valves, which are dispersed throughout the collection system. ~~A system or combination of systems that collects wastewater and incorporates any of the following: pressure sewer, small diameter gravity sewer, or vacuum sewer that is not a conventional gravity collection system.~~ An alternative collection system is comprised of both on-site and off-site components.

(8)~~(3)~~ Annual average flow--The arithmetic average of all daily flow determinations taken within a period of 12 consecutive months.

(9) Appurtenance – an appliance or a component associated with a treatment unit or collection system unit that is not considered integral to the identity of the unit.

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(10) Auxiliary pump—A secondary or supplementary pump that is available for use as needed.

(11)~~(4)~~ Biotower--A biological filtration system that involves biological film on a plastic media that reduces the biological oxygen demand of the effluent.

(12)~~(5)~~ Building lateral--A pipe that conveys raw wastewater and connects the plumbing of a structure to an on-site component or a collection system pipe. A building lateral is ~~privately owned and is~~ not a part of a ~~wastewater~~ collection system.

(13)~~(6)~~ Bypass--The intentional diversion of a waste stream from any portion of a wastewater treatment facility or collection system.

(14)~~(7)~~ Collection system--Pipes, conduits, lift stations, force mains, and all other constructions, devices, and appurtenant appliances used to transport domestic wastewater to a wastewater treatment facility.

(15) Collection system unit—A component of a collection system that performs a basic step in the transport of wastewater to a wastewater treatment facility,

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provides access to the collection system, or is an integral safety feature of the collection system (e.g. pipeline, lift station, manhole, etc.).

(16) Completely mixed aerated lagoon – A lagoon in which oxygen is supplied mainly through mechanical or diffused aeration, and in which the aeration system is designed to keep solids in suspension.

(17) Construct—to build, erect, place, assemble, remodel, or otherwise create a treatment unit, a collection system unit or an associated component or appurtenance of a treatment unit or collection system unit. For purposes of this chapter, construction also includes installation of fencing, excavation, site preparation, and placement of skid-mounted or modular units.

(18)

~~(8)~~ Constructed Wetland~~–~~—A wastewater ~~water~~ treatment ~~facility~~ unit ~~built~~ designed to ~~duplicate~~ replicate the processes ~~occurring~~ that occur in natural wetlands. ~~, which~~Constructed wetlands are complex, integrated systems in which water, plants, animals, microorganisms, and the environment (including sun, soil, and air) interact to improve water quality.

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(19) Day – A period of 24 consecutive hours beginning at 12:00 a.m. local time.

(20)~~(9)~~ Design Flow~~–~~–The highest anticipated 30-day average ~~daily~~ flow rate.

~~This is the daily average flow limit in a water quality permit issued by the commission.~~

(21) Design life – The length of time that an engineered structure or device is intended to function without failing.

(22) Decanter – A device used to draw off liquid without disturbing solids that are in the process of sedimentation.

(23)~~(10)~~ Diurnal Flow~~–~~–The daily cycle of high and low influent flows to a wastewater treatment ~~system~~facility.

(24)~~(11)~~ Domestic Wastewater~~–~~–~~Sewage~~ Wastewater ~~that is characterized as residential wastewater, not produced by commercial or industrial activity, and~~ which originates primarily from kitchen, bathroom, and laundry sources, including waste from food preparation, dishwashing, garbage grinding, toilets, baths, showers, and sinks of a

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residential dwelling. -Domestic wastewater may contain commercial or industrial wastewater contributions.

(25)(12) Effective size-- —Theresult of an analysis of a sample of filter media that equals the effective diameter, particle diameter that represents the smallest 10th percentile of a sample of filter media particles on a mass basis.D10, which is the diameter of the particle size at 10% finer-by-weight as plotted on a semi-log grain size distribution curve. In other words, 10% of the sample mass consists of particles that are finer smaller than the effective size and 90% of the sample mass consists of particles that are larger than the effective size.

(26) Effluent – Liquid that flows out of a process or confined space. This term may also be used to identify items or properties associated with effluent (e.g., effluent constituents, effluent limits, or effluent pump).

(27) Emergency overflow – A conduit or spillway designed to prevent an unauthorized discharge of wastewater by redirecting excess flow for processing in a treatment unit.

(28)(13) Engineer-- —A professional engineer, licensed by the Texas Board of Professional Engineers with expertise in wastewater treatment (and collection

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~~system)~~ design and construction of wastewater treatment and collection systems~~licensed by the Texas Board of Professional Engineers~~.

(29) Equalization basin—A treatment unit designed primarily to dampen fluctuations of flow or concentration before wastewater flows into a subsequent treatment unit.

(30)

~~(14)~~ Equivalent dwelling unit~~—~~—Any building or section of a building that produces wastewater of a composition and quantity ~~comparable~~ equal to that discharged by a single, private residence. For calculation purposed an equivalent dwelling unit is occupied by 3.5 individuals, unless a different number is justified by actual data.

(31)~~(15) Facility—All land, structures, operational units, or appurtenances used jointly to process, treat, and dispose of wastewater.~~

~~(16)~~ Filter media~~—~~—The material placed in a filter containment structure to ~~perform the filtering action~~separate solids from a liquid.

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(32)~~(17)~~ Firm pumping capacity~~--~~—The maximum flow rate achievable, under design conditions, with the largest pumping unit out of service.

(33)~~(18) Flat plate system – A membrane bioreactor that arranges membranes into rectangular cartridges with a porous backing material sandwiched between two membranes for structural support.~~

~~(19)~~ Force main~~--~~—A pressure-rated conduit that conveys wastewater from a ~~pump~~ lift station~~ to a discharge point~~.

(34)~~(20)~~ Free water surface wetland~~system --~~—A constructed wetland~~wetlands~~ designed to have the water surface above the wetland bed or substrate.

(35) Gravity relief sewer — A part of a collection system built to manage the flow of wastewater that exceeds the capacity of the existing collection system.

(36)~~(21)~~ Grinder pump~~--~~—A collection system unit ~~component~~ that receives raw wastewater~~ through a building lateral~~, grinds the solids in the wastewater into a slurry, and provides the motive force for transporting the ~~raw wastewater~~slurry to a lift station or a collection system.

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(37)~~(22) Gross flux rate--The volume of water that passes through a membrane measured in gallons per day per square-foot of membrane area at a standard temperature of 20 degrees Centigrade.~~

~~(23)~~ Headworks~~--~~—The location where wastewater enters a ~~facility~~wastewater treatment facility and ~~the first chance to treat the flow~~preliminary treatment occurs, typically by removing large solids ~~and~~ or grit.

~~(24) Hollow fiber system--A membrane bioreactor composed of bundles of very fine membrane fibers, approximately 0.5-2 millimeter diameter, held in place at the ends with hardened plastic potting material, and supported on stainless steel frames or rack assemblies. The outer surface of each fiber is exposed to the mixed liquor with filtrate flow from outside to inside through membrane pores.~~

(39) Influent – Liquid that flows into a process or confined space. This term may also be used to identify items or properties associated with influent (e.g., influent constituents, influent limits, or influent pump).

(40)~~(25)~~ Innovative technology~~--~~—A process, method, product, or material not addressed in this chapter or a process specifically identified as innovative by this chapter.

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(41)~~(26)~~ Interceptor tank~~--~~—A collection system ~~component~~ unit that receives raw wastewater ~~from a building lateral~~, removes floatable and settleable solids, stores the removed solids, and provides flow attenuation.

(42)

~~(27)~~ Lift station~~--~~—~~A belowground~~A structure that collects wastewater and uses ~~utilizes~~ pumps to raise it to a higher elevation. The term lift station applies to a structure in which the static head exceeds the frictional head losses.

(43) Maintenance—The scheduled preventative care, the repair, or the equivalent replacement of components or appurtenances of a treatment unit or a collection system unit. Replacement must not cause alteration, as defined in this chapter. Maintenance does not include replacement of a treatment unit or a collection system unit.

~~(28) Material alteration--a change to a collection system or treatment facility that changes efficiency of the collection system or treatment facility.~~

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(44)~~(29)~~ Membrane bioreactor system~~--~~—An activated sludge process ~~biological treatment system~~ that uses membrane filtration rather than ~~secondary~~ clarification ~~for solids separation~~to remove solids ~~and conventional filtration~~.

(45)~~(30)~~ Minimum grade effluent sewer~~--~~—An alternative ~~wastewater~~ collection system pipeline with a constant downward slope that transports effluent from an interceptor tank by gravity flow.

(46)~~(31)~~ Multiple equivalent dwelling unit - Either~~-~~:

(A) a group of two or more residences served by a common service connection; or

(B) a commercial, industrial, institutional, or other non-residential establishment that produces wastewater:

(i) in excess of 1,500 gallons per day; or

(ii) not comparable in composition to that discharged by a single private residence.

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(47)~~(32) Net flux rate--The gross flux rate adjusted for production lost during backwash, relaxation, and cleaning.~~

~~(33)~~ Nonconforming technology~~--~~—Technology or a process that does not conform to the design criteria of this chapter or a technology or process specifically identified as nonconforming ~~by~~ in this chapter.

(48)~~(34)~~ Off-site component~~--~~—A ~~wastewater~~ collection system component that includes collection system pipes, force mains, pump stations, lift stations, vacuum stations, and related appurtenances not located at a ~~outside a~~ wastewater treatment facility.~~facility's site bounda~~

(49)~~(35)~~ On-site component~~--~~—alternative collection system equipment placed on private property.~~Equipment, structure, or pipe located within a wastewater treatment facility's site boundary.~~

(50)~~(36)~~ Overflow~~--~~—an unauthorized flow of untreated or partially treated waste from a collection system or from a treatment unit at a wastewater treatment facility~~A flow over the weir of a treatment unit.~~

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(51)~~(37)~~ Owner~~--~~—A person who owns a collection system or a wastewater treatment facility or part of a system or facility. For the purposes of this chapter, "owner" refers to the owner and to the owner's representatives, agents, and designees (for example, an operator, an engineer, a staff member, a contractor).

(52) Partially mixed aerated lagoon – A lagoon in which oxygen is supplied mainly through mechanical or diffused aeration, in which the aeration system is designed to allow solids to settle out of suspension.

(53)~~(38)~~ Peak flow~~--~~—The highest two-hour flow expected under any operational conditions, including times of high rainfall, based on a two-year 24-hour storm or a prolonged period of wet weather.

(54) Plans – construction drawings or other documents that show details of the design of a project.

(55) Preliminary treatment—removal of wastewater constituents such as rags, sticks, floating material, and grit that may cause maintenance or operational problems in subsequent treatment units.

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(56)~~(39)~~ Pressure sewer~~--~~—A ~~wastewater~~ collection system that is pressurized by pumps at each service connection.

(57) Primary treatment – A physical treatment process, other than preliminary treatment, that removes biologically available wastewater constituents primarily by settling and floatation.

(58) Primary sedimentation unit— A treatment unit that removes solids from the wastewater by physical settling before the wastewater enters a unit that removes waste by biological conversion.

(59)~~(40)~~ Project~~--~~—A construction, repair, alteration, or rehabilitation of a ~~TCEQ permitted wastewater~~ collection system, a wastewater ~~or~~treatment facility, or an associated component, ~~on which~~beginning with design initiation and ending with permanent decommissioning.

~~construction has begun but that is not yet complete.~~

(60) Processing unit – A component of a wastewater treatment facility that performs a basic step in preparing sludge for disposal after the sludge has been separated from the wastewater (e.g. sludge thickener, digester, sludge drying bed, belt

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press). Processing units are considered a subset of treatment units for the purposes of this chapter.

(61)(41) Proposed facility—A TCEQ permitted wastewater treatment facility on which construction has not begun.

(62)

(42) Pump—A device that raises, transfers, or compresses fluids by suction, pressure, or both.

(63) Rehabilitate –To repair a collection system using a technology that is described in §217.56(c) of this title (related to Trenchless Pipe Installation) or using any other lining or coating method.

(64)

Re-rate—To change the design flow or design organic loading of a treatment unit, without altering the unit, based on actual performance data.

(65)(43) Report—The final engineering design report prepared, signed, and sealed by the design engineer. The report must include that contains calculations and written descriptions of processes, equipment, and structures that demonstrate

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compliance with this chapter, as described in §217.10 of this title (relating to Final Engineering Design Report) and as required throughout this chapter.

(66) Secondary treatment – the level of treatment defined as secondary treatment in §309.1(b) of this title (relating to Application of Effluent Sets).

(67)~~(44)~~ Sequencing Batch Reactor (SBR)~~--~~—A fill and draw activated sludge treatment system~~ that is identical to conventional activated sludge systems, except the processes are carried out~~where secondary aeration and secondary clarification processes are carried out sequentially in the same tank. An SBR system has the following five steps that are carried out in the following sequence:

(A) fill--the basin is filled with the influent;

(B) react--the influent in the basin is aerated;

(C) settle--the mixed liquor within the basin is settled (clarification);

(D) draw--the basin is decanted; and

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(E) idle--the sludge is removed from the basin.

(68) Sludge Stabilization – The process of destroying or inactivating pathogens in sludge.

(69)(45) Small diameter effluent sewer-- –A collection system that receives effluent from an interceptor tank and, transports the flow by gravity., A small diameter effluent sewer and may include minimum grade effluent sewers and variable grade effluent sewers.

(70) Specifications – Precise standards of performance for construction work, materials, and manufactured products, which make possible the expression of expected value when they are purchased or contracted for and which provide means of determining their conformance with expectations after they are purchased or constructed.

(71) Stabilization lagoon—A shallow lagoon used to achieve secondary treatment through natural processes. In this chapter, “stabilization lagoon” is synonymous with “stabilization pond”; “oxidation lagoon”; and “oxidation pond.”

(71) Subsurface flow wetland – A wetland system that maintains the water

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level below the surface of the gravel or other media placed in the wetland bed or cell.

(72) Summary transmittal letter – A letter submitted to the executive director that provides basic information about a project so that the executive director can determine whether to require a full review of the project plans and specifications.

(73) Surcharge—The hydraulic overloading of a portion of a gravity collection system. A surcharge causes wastewater to rise within manholes and may cause overflow.

(74)~~(46) Transmembrane pressure - The difference between the average pressure on the feed side of a membrane and the average pressure on the permeate side of a membrane or the driving force associated with any given flux rate.~~ Treatment unit—A component of a wastewater treatment facility that performs a basic step in the wastewater treatment process (e. g. lift station, bar screen, aeration basin, clarifier, chlorine contact chamber).

(75)~~(47) Tubular system - A system in which sludge is pumped from an aeration basin to a pressure driven membrane system outside of a bioreactor where the suspended solids are retained and recycled back into the bioreactor while the effluent passes through a membrane.~~

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~~(48)~~ Variable grade effluent sewer~~--~~—A small diameter gravity ~~wastewater~~ collection system that does not require a uniform gradient, but will allow ~~inflective~~ for both positive and negative gradients ~~where sections of the collection system are below the hydraulic grade line~~. A variable grade effluent collection system ~~M~~may be used with septic tank effluent pumps.

(76)~~(49)~~ Variance~~--~~—A deviation from a specific requirement of this chapter. A variance requires executive director approval.

(77)~~(50)~~ Wastewater~~--~~—A waterborne industrial waste, recreational waste, domestic waste, or combination of these wastes.

(78) Wastewater treatment facility— All contiguous land and fixtures, structures, and appurtenances used for storing, processing, and treating wastewater.

(79)~~(51)~~ Wasting~~--~~—The practice of removing ~~excess or old~~ sludge from a wastewater treatment process.

(80) Weir overflow – the flow of liquid through or over a weir.

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§217.3. Purpose.

(a) The purpose of this chapter is to establish the minimum design criteria for the comprehensive design of ~~domestic sewage~~ collection systems and wastewater treatment ~~and disposal~~ facilities. The minimum design criteria ~~are not~~may not be sufficient for all situations. A design must protect the public health and meet water quality standards established by the commission.

(b) The executive director may require more stringent design criteria of a collection system or wastewater treatment facility if the executive director determines it is necessary to protect public health or to meet water quality standards established by the commission.

(c) This chapter establishes procedures for the review and approval of project plans and specifications and allows approved review authorities to review and approve plans and specifications in accordance with this chapter on behalf of the executive director, according §217.8 of this title (relating to Municipality Reviews) and §217.9 or this title (relating to Texas Water Development Board Reviews). An approval granted by an approved review authority is considered equivalent to approval by the executive director.

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§217.4. Variances.

(a) The report must include all requested variances from the requirements of this chapter.

(b) The report must include a technical justification for each variance requested. The executive director may determine what level of justification is acceptable.

(c) If the executive director determines that a variance may potentially endanger public health or the environment, the executive director may deny the variance. ~~or require compensatory measures be taken.~~

(d) The executive director shall not grant or approve a variance that would violate any expressed prohibition in this chapter.

(e) If the executive director does not notify an owner ~~by facsimile or letter~~in writing that additional information is requested or that a variance is denied within 30 working days after receiving a ~~signed and dated~~ variance request that has been signed, dated, and sealed by an engineer, the variance is approved. However, approval under this provision is conditional, subject to an executive director determination under §217.4(c) or (d) of this title. Additionally, if this provision conflicts with a prohibition

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stated in this chapter or a requirement in this chapter that requires affirmative executive director approval, then this provision does not apply.

~~(f) A variance request from any rule in this chapter that requires affirmative executive director approval is not eligible for the approval process in subsection (e) of this section.~~

§217.5. Plans and Specifications General Requirements.

(a) An owner is required to have an engineer design a ~~build a wastewater~~ collection system or wastewater treatment facility that meets the minimum requirements of this chapter.~~according to the plans and specifications approved by the executive director~~ The executive director may determine that additional requirements are needed.

(b) An owner is required to construct a collection system or wastewater treatment facility according to the plans and specifications approved by the executive director or by an approved review authority, as designated by §217.8 of this title (relating to Municipality Reviews) or §217.9 of this title (relating to Texas Water Development Board Reviews).

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(c~~b~~) The executive director's approval of plans and specifications of a wastewater treatment facility does not relieve an owner of the responsibility to obtain a wastewater permit or other authorization from the commission in accordance with Texas Water Code, Chapter 26.

(d~~c~~) The commission's ~~executive director's~~ approval of a wastewater permit does not relieve an owner of the responsibility to obtain a plans and specifications approval letter for a ~~facility~~wastewater treatment facility and the associated collection system from the executive director in accordance with this chapter.

(e~~d~~) An owner must ensure that its wastewater treatment facility plans and specifications meet all ~~design~~ requirements in the associated wastewater permit.

(f) The executive director's approval of plans and specifications must be in writing, unless the project is approved through the automatic approval processes in §217.6(f) or §217.6(h) of this title.

(g) Affirmative executive director approval, as defined in this chapter, must be in writing.

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§217.6. Submittal Requirements and Review Process.

(a) An owner is not required to submit collection system or wastewater treatment facility plans and specifications to the executive director for approval prior to the commission issuing the wastewater treatment facility's wastewater permit.

(b) An owner is not required to submit collection system or wastewater treatment facility plans and specifications for approval if the project only consists of maintenance, as defined in this chapter.

(c)(~~(b)~~ A wastewater treatment facility's plans and specifications must be based on a design that will produce effluent that will at least meet the requirements and effluent limits in the associated wastewater permit.

(d)~~(c)~~ An owner shall submit a summary transmittal letter to the executive director and a copy to the appropriate regional office ~~a summary transmittal letter~~ for each collection system project and wastewater treatment facility project that includes the following requirements, except as provided by §217.8 of this title (relating to Municipality Reviews):

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(1) the name and address of the design firm;

(2) the name, phone number, ~~and~~ facsimile number, and email address of the ~~design~~ engineer;

(3) the county~~(s)~~ or counties where the project will be located;

(4) an identifying name for the project;

~~(5) the name(s) of the person(s) that proposes to operate the collection system or treatment facility;~~

(5)~~(6)~~ the collection system or wastewater treatment facility owner's name, and if applicable, the wastewater treatment facility permit number~~,~~ and wastewater treatment facility name;

(6)~~(7)~~ a statement certifying that the plans and specifications are in substantial compliance with all requirements of this chapter, with the exception of any ~~listed~~ variance requests, which must be listed in the letter;

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(7)~~(8)~~ a statement certifying that any variances ~~from the requirements~~ will not threaten public health or the environment, based on the best professional judgment of the engineer who prepared the report and the project plans and specifications;

(8)~~(9)~~ a brief description of the project scope ~~that includes~~including:

(A) a brief engineering summary of the collection system ~~or~~ or wastewater treatment facility;

(B) a brief description that identifies every alteration, construction, rehabilitation, and re-rating within the project scope;

(C) a map of the collection system or wastewater treatment facility that identifies the location of every alteration, construction, rehabilitation, and re-rating within the project scope;

(D~~B~~) a description of all variances from the requirements of this chapter, including the use of nonconforming or innovative technology; and

(E~~C~~) an explanation of the reasons for ~~such~~ all variances in accordance with §217.4 of this title (relating to Variances).~~; and~~

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(9)~~(10)~~ the signature and seal of the engineer responsible for the design of the collection system or wastewater treatment facility.

(e) ~~(d)~~ The executive director may review the plans and specifications for any collection system or wastewater treatment facility.

(f)~~(e)~~ If the executive director does not notify an owner ~~by fax or letter~~in writing within 30 business days ~~after~~ of the receipt of a summary transmittal letter that a review will occur, the project is approved. However, such approval is conditional, and remains subject to an executive director determination under §217.4(c) or (d) of this title. Additionally, if this provision conflicts with ~~any other rule~~a requirement in this chapter that requires affirmative executive director approval, then this provision does not apply.

(g)~~(f)~~ If the executive director notifies an owner ~~by fax or letter~~in writing ~~-~~of the intent to review a collection system or wastewater treatment facility's design, the owner shall submit the following within 30 days from the date of the ~~after receiving~~ notice:

(1) a complete set of plans and specifications;

(2) a complete report as defined in §217.10 of this chapter;

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(3) ~~any~~ all requested variances; and

(4) sufficient information to satisfy the executive director that a project is in ~~substantial~~ compliance with this chapter.

(h)~~(g)~~ If the executive director does not notify an owner of any ~~insufficiency~~ deficiencies within 30 business days ~~after~~ of receipt of any additional ~~additionally requested~~ information requested, the project is approved as long as the project does not violate any expressed prohibition in this chapter. However, such approval is conditional, subject to an executive director determination under §217.4(c) or (d) of this title (relating to Variances). Additionally, if this provision conflicts with a requirement in this chapter that requires affirmative executive director approval, then this provision does not apply.

§217.7. Types of Plans and Specifications Approvals.

(a) Approval given by the executive director or other review authority authorized under Texas Water Code 26.034(d) and §217.8 or this title (respectively relating to Approval of Disposal System Plans; Municipality Reviews) or § 217.9 of this title (relating to Texas Water Development Board Reviews) ~~authorized review authority~~ does

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not relieve an owner of any liability or responsibility with respect to designing, constructing, or operating a collection system or wastewater treatment facility in accordance with applicable commission rules and the associated wastewater permit.

(b) The executive director, a municipality authorized under §217.8 of this title (relating to Municipality Reviews) or the Texas Water Development Board, as authorized in §217.9 of this Title (relating to Texas Water Development Board Reviews) ~~or other authorized review authority~~ may grant the following types of approvals: standard approvals: innovative and nonconforming technology approvals, and conditional approvals.~~:~~

(1) Standard approval. The executive director may grant a standard approval for plans and specifications that do not include any variance requests~~requested variances~~, do not include any innovative or nonconforming technologies, and comply with all applicable parts of this chapter.

(2) Approval of innovative and nonconforming technologies. The executive director may grant approval of innovative and nonconforming technologies in accordance with §217.4 of this title (relating to Variances).

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(A) An owner who requests approval for an innovative or nonconforming technology must submit a summary transmittal letter in accordance with §217.6(d~~e~~) of this title (relating to Submittal Requirements and Review Process) and must describe the technology and give the reason(s) for selecting the ~~engineering proposal for a process, equipment, and construction material~~technology.

(B) An owner must receive written approval from the executive director before constructing, installing, or operating any innovative or nonconforming technology.

(C) The executive director may require ~~a request to use a nonconforming or innovative technology to be supported by~~ a pilot or demonstration study for an innovative or nonconforming technology. Performance data from a similarly designed full-scale process that has operated for a reasonable period under conditions similar to those of a proposed design, as determined by the executive director, may be submitted in addition to or in lieu of a pilot or demonstration study.

(D) The executive director may require an owner to submit evidence that the owner, the manufacturer, or the supplier of the equipment for innovative or nonconforming ~~equipment~~ technology has provided a performance bond that:

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(i) is acceptable to the executive director;

(ii) is from a surety company listed on the United States Treasury Department's current Listing of Certified Companies; and

(iii) insures the performance of the equipment for innovative or nonconforming ~~equipment or process~~technology.

(E) The performance bond referenced ~~required~~ in §217.7(b)(2)(D) of this section must cover the innovative or nonconforming technology for at least two years from the date the treatment unit or equipment is put into service, and must include:

(i) the full cost of removing equipment and closing the ~~collection system or the treatment facility~~innovative components;

(ii) the replacement of the innovative or nonconforming technology using standard ~~all failing processes and equipment with corresponding~~ processes and equipment that conform ~~conforms~~ to these rules; and

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(iii) all associated engineering costs necessary for the removal and replacement of any failing ~~process or~~ treatment unit or equipment.~~; and~~

~~(iv) at least two years from the date the facility or equipment is put into service.~~

(F) The executive director may require an owner to submit a ~~separate~~ supplement to the report on the performance of ~~a~~ an ~~nonconforming~~ innovative or ~~innovative~~ nonconforming technology after a collection system or wastewater treatment facility is ~~built~~ constructed and operating.

(3) Conditional approval.

(A) The executive director may grant conditional approval for a specific set of operating conditions.

(B) If a conditional approval is granted, an owner is responsible for ensuring that the conditions, stipulations, and restrictions outlined in the approval letter ~~by the executive director~~ are met. Operating outside the conditions, stipulations, or restrictions in a conditional approval is a violation of ~~this section~~commission rules.

§217.8. Municipality Reviews.

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(a) The executive director may grant approval authority to a municipality that requests approval authority and meets the requirements in Texas Water Code~~,~~ §26.034(d) (relating to Approval of Disposal System Plans).

(b) The executive director ~~shall~~ may not require plans and specifications for a ~~wastewater~~ collection system that transports ~~primarily~~ domestic wastewater to be submitted for approval from:

(1) a municipality that has been granted approval authority by the executive director under authority of Texas Water Code, §26.034(d) (relating to Approval of Disposal System Plans), if the plans and specifications ~~subject to review~~ are prepared by a private engineering consultant and a review is conducted by an engineer who is an employee of or consultant to the municipality ~~separate from~~not affiliated with the private engineering consultant ~~charged with the design of~~that prepared the plans and specifications under review; or

(2) an entity that is required by local ordinance to submit the plans and specifications to a municipality that has been granted approval authority by the executive director for review and approval under authority of Texas Water Code, §26.034(d) (relating to Approval of Disposal System Plans).

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(c) If a municipality seeks to perform technical reviews of ~~wastewater~~ collection systems, the municipality ~~shall~~ must submit a map or maps to the executive director delineating the municipality's jurisdictional boundaries for the area where it is seeking ~~responsibility for review of plans and specifications~~approval authority at least 30 days before commencing ~~to~~ review of plans and specifications in accordance with subsection (b) of this section.

(d) The municipality shall submit a revised map or maps to the executive director identifying jurisdictional boundary changes at least 30 days prior to any proposed change.

(e) If a municipality ends its review authority, the municipality shall provide written notice to the executive director at least 30 days prior to ending municipal reviews.

(f) A municipality's review and approval program must incorporate the following requirements:

(1) ~~The~~ the municipality's review and approval process shall ensure compliance with all the applicable rules of this chapter;~~.~~

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(2) ~~A~~ the municipality may only review and approve engineering reports and plans and specifications ~~only~~ for projects that transport ~~primarily~~ domestic wastewater within the jurisdictional boundaries of ~~jurisdiction of~~ that municipality~~.~~;

(3) ~~The~~ the municipality shall issue a written approval document that ~~approves and~~includes the details of each project approved for construction;~~.~~ and

(4) ~~The~~ the municipality shall maintain complete files of all review and approval activities.

(g) The executive director may perform periodic audits of ~~the~~ a municipality's review and approval program ~~process of a municipality with review authority~~ to ensure that the review process and approved projects comply with this chapter.

(1) The executive director shall provide ~~a municipality with~~ written notice of a pending audit to a municipality a minimum of five working days prior to beginning ~~review of municipal files related to~~ an audit.

(2) The municipality shall ~~provide~~ make all files relating to its review and approval activities under this chapter available to the executive director, and shall

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maintain files for the life of each project, unless otherwise directed by statute. ~~an opportunity to review any existing project files relating to its review and approval activities under this chapter.~~

(3) The municipality shall make documentation of all agreements between private consultants and the municipality that relate to its review and approval activities under this chapter available ~~provide~~ to the executive director. ~~an opportunity to review documentation of all agreements between a private consultant or consultants and the municipality that relate to its review and approval activities under this chapter.~~

(h) If the executive director finds, through review of specific projects or through audit of a municipality's review and approval ~~process~~ program, that a municipality's review and approval ~~process~~ program does not provide for compliance with the minimum design and installation requirements detailed in this chapter, the municipality must achieve compliance within a time frame established by the executive director.

(i) If the municipality does not achieve the required compliance within the timeframe established by the executive director, the commission may revoke the review

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authority of a municipality. If the commission revokes the municipality's approval authority, subsections (j), (k), (l), and (m) apply.

(j) The executive director shall notify a municipality in writing of the intention to revoke the municipality's approval authority and shall include a justification for revoking the authority.

(k) If the executive director revokes the approval authority of a municipality~~If the authority of a municipality is revoked~~, all new projects proposed to be constructed within that municipality's jurisdiction must be submitted to the executive director in accordance with §217.6 of this title (relating to Submittal Requirements and Review Process).

(l) If the executive director revokes the approval authority of a municipality~~If the authority of a municipality is revoked~~, the municipality shall return all subsequently submitted plans and specification ~~projects~~ in its jurisdiction and notify any applicants of the requirement to seek approval from the ~~commission~~executive director.

(m) If the ~~commission~~ executive director revokes the approval authority of a municipality, owners of any completed projects or projects under construction whose

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plans and specifications were already approved by the municipality ~~prior to revocation~~ are not required to seek approval from the ~~commission~~executive director.

§217.9. Texas Water Development Board Reviews.

If the Texas Water Development Board reviews plans and specifications for a ~~wastewater~~ collection system or wastewater treatment facility ~~or treatment or disposal facility~~ in accordance with Texas Water Code~~,~~ §17.276(d) (relating to Action on Application)~~,~~ the owner shall send a copy of the approval to the executive director.

§217.10. Final Engineering Design Report.

(a) An owner shall submit ~~the~~ a report within 30 days of the date of the executive director's written request. ~~for any proposed collection system or treatment facility or proposed material alteration or expansion to an existing collection system or treatment facility.~~

(b) The report must include the signed and dated seal of the engineer responsible for the report.

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(c) The report must include all pertinent calculations, analyses, graphs, formulas, constants, tables, geologic information, hydraulic information, hydrological information, historical data, manufacturer's recommendations, technical assumptions, and any other information needed to demonstrate that the design of the project complies ~~compliance~~ with this chapter.

(d) If a variance is requested, the report must include a justification for the variance and all pertinent supporting calculations, analyses, graphs, formulas, constants, tables, geologic information, hydraulic information, hydrological information, historical data, manufacturer's recommendations, technical assumptions, and any other information needed to ~~or~~ justify the ~~variances from this chapter in accordance with §217.4 of this title (relating to Variances)~~variance request ~~by including all pertinent calculations, analyses, graphs, formulas, constants, tables, geologic information, hydraulic and hydrological information, historical data, and technical assumptions~~.

(e~~d~~) If the executive director requests additional information for the report, an owner shall submit the requested information prepared, signed, and sealed by an engineer, within 30 days after the date of ~~receiving~~ a written request.

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(f~~e~~) The report for a ~~wastewater~~ collection system project must include the following:

(1) a map showing the current service area, the proposed service area, and any area proposed for future expansion;

(2) the topographical features of the current, the proposed, and any future service areas;

(3) a description of how the design flow was determined;

(4) the minimum and maximum grades for each size and type of pipe;

(5) calculations of expected minimum and maximum velocities in the system for each size and type of pipe;

(6) the proposed ~~system's~~ project's effect on ~~an associated~~ the existing collection system's capacity;

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(7) the existing and anticipated inflow and infiltration, the hydraulic effect of the inflow and infiltration on the proposed and existing systems, ~~any~~ inflow and infiltration flow rate monitoring, and ~~any~~ inflow and infiltration abatement measures;

(8) a description of the ability of the existing and proposed trunk and interceptor ~~wastewater~~ collection systems and lift stations to handle the peak flow;

(9) the capability of the ~~receiving~~ associated wastewater treatment facility to receive and ~~adequately~~ treat the anticipated peak flow;

(10) an engineering analysis ~~showing~~ demonstrating compliance with structural design, minimization of odor-causing conditions, and ~~and the~~ pipe design requirements of this chapter ~~requirements of §217.55 of this title (relating to Manholes and Related Structures)~~;

(11) a description of the areas not initially served by the ~~a~~ project, and the projected means of providing service to these areas, including special provisions incorporated into the present plans for future expansion;

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(12) the calculations and pump curves showing the operating characteristics of all system lift stations at minimum, maximum, and design flows during both present and future conditions; and

(13) the safety considerations incorporated into a project design, including ventilation, entrances, working areas, and explosion prevention.

(g~~f~~) The report for a wastewater treatment facility project must include ~~the following~~the quantity and characteristics of the influent, facility siting information, a sludge management plan~~:~~ , methods to control bypassing, and calculations and supporting information.

(1) Influent Characteristics. The report must include quantity and characteristics of any existing wastewater influent, any proposed changes to the influent quantity and characteristics, and any anticipated changes to the influent quantity and characteristics.

~~(2)~~ If adequate records are not available, analyses must be made of the existing conditions, and the results included in the report~~,~~ . ~~including:~~

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(2~~A~~) Wastewater Treatment Facility Siting Information. The report must include:

(A) a general location map for~~of~~ the proposed wastewater treatment facility;

(B) ~~and~~ a description of the area surrounding the wastewater treatment facility that includes prevailing winds, water treatment facilities, water supply wells, surface water intakes, present and proposed housing developments, present and proposed industrial sites, present and proposed highways and streets, present and proposed parks, present and proposed schools, present and proposed recreational areas, and present and proposed shopping centers, and any other information required by the executive director;

(C) ~~, the area included~~a map of the ~~in the~~ wastewater treatment facility site, including the site boundary, buffer zones, and the 100-year floodplain, with supporting documentation of compliance with the buffer zone criteria and the 100-year floodplain restrictions specified in §309.13 of this title (relating to Unsuitable Site Characteristics); and

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(D) ~~, the area that makes up the buffer zone, any 100-year flood event floodway or floodplain,~~ a map of ~~And~~ the discharge route or land application unit.~~;~~

~~(B) a description of the surrounding area that includes prevailing winds, water treatment facilities, water supply wells, surface water intakes, present and proposed housing developments, present and proposed industrial sites, present and proposed highways and streets, present and proposed parks, present and proposed schools, present and proposed recreational areas, and present and proposed shopping centers;~~

~~(C) documentation of compliance with the buffer zone criteria and the 100-year floodplain restrictions specified in §309.13 of this title (relating to Unsuitable Site Characteristics);~~

(3~~D~~) ~~a sludge management plan~~Sludge Management Plan. The report must include a sludge management plan that provides information regarding~~, including~~:

(~~i~~A) the estimated quantity and quality of sludge that will be generated, including future sludge loads based on flow projections;

(~~ii~~B) the sludge treatment requirements for final ~~ultimate~~ disposal, and the sludge storage requirements for each alternative;

(~~iii~~C) a method of sludge transport, use, storage, and disposal; and

(~~iv~~D) the alternatives, contingencies, and mitigation plans that ensure reliable capacity and operational flexibility.

(4)~~(E) The m~~Methods to Control Bypassing. The report must include~~, including~~:

(~~i~~A) information and data describing features to prevent bypassing such as auxiliary power, standby and duplicate units, holding tanks, ~~storm water~~ stormwater clarifiers, or flow equalization basins; and

(~~ii~~B) operational arrangements such as ~~flexibility~~ the ability of pipes and valves to control flow through the treatment units and reliability of power sources to prevent unauthorized discharges of untreated or partially treated wastewater.

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(5)~~(F)~~ Calculations and Supporting Information. The report must include~~information and calculations demonstrating the facility's compliance with the design requirements of this chapter, including~~:

(~~i~~A) the types of units proposed and their capacities;

(~~ii~~B) the detention times, surface loadings, and weir loadings pertinent to each wastewater treatment unit; and

(~~iii~~C) ~~hydraulic profiles for wastewater and sewage sludge that include:~~

~~(I)~~ a plot of the hydraulic gradient at peak flow conditions for all gravity lines;

(D~~II~~) the anticipated operation mode of the wastewater treatment facility;

(~~III~~E) organic and volumetric loadings pertinent to each treatment unit; and

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(~~IV~~F) aeration demands and how those demands will be supplied.

§217.11. Construction of an Approved Project~~Facility.~~.

(a) An owner may not begin construction of a wastewater treatment facility with approved plans and specifications until the ~~executive director~~commission issues a wastewater permit for the wastewater treatment facility, unless the commission issues the owner an authorization to construct under Texas Water Code~~,~~ §26.027(c) (relating to Commission May Issue Permits).

(b) An owner must phase the construction of a wastewater treatment facility as required by the associated wastewater permit, unless a variance is granted under §217.4 of this title (relating to Variances).

(~~b~~c) An owner must obtain a plans and specifications approval of a particular permitted phase before beginning to construct or operate under that permitted phase.

~~(c) An owner must phase the construction of a facility as required by the associated wastewater permit, unless a variance is granted under §217.4 of this title (relating to Variances).~~

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(d) A person is prohibited from allowing a ~~bypass~~ discharge of untreated or partially treated wastewater during construction without a commission order for such discharge, such as an Emergency Order or a Temporary Order according to the requirements of chapter 35 of this title (relating to Emergency and Temporary Orders and Permits; Temporary Suspension or Amendment of Permit Conditions).

~~.~~

(e) An owner that ~~materially alters or expands an existing~~alters or constructs ~~collection system or~~ a treatment unit or collection system unit ~~facility or builds a new facility~~ must comply with the requirements of this chapter that are in effect on the date the plans and specifications are submitted for approval unless granted a variance in accordance with §217.4 of this title (relating to Variances). ~~§217.1(c).~~

(f) An owner that rehabilitates ~~-~~a ~~treatment unit or~~ collection system ~~component~~ under §217.56(c) (relating to Trenchless Pipe Installation) or ~~and~~ §217.69 (relating to Maintenance, Inspection, and Rehabilitation of the Collection System) of this title must comply with the requirements of this chapter that are in effect on the date the plans and specifications are submitted for approval unless granted a variance in accordance with §217.4 of this title (relating to variances.

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(g~~f~~) The owner of an existing ~~A~~ wastewater treatment facility ~~owner~~ that must apply for a new permit must comply with the requirements of this chapter that are in effect at the time the new permit application is received by the executive director.

(h) A wastewater treatment facility owner ~~or~~ that never received a plans and specifications approval for an existing wastewater treatment facility or treatment unit must comply with the requirements of this chapter that are in effect at the time the ~~new permit application is submitted or the~~ lack of plans and specifications approval is discovered.

(i)~~(g)~~ A collection system owner that never received a plans and specifications approval for an existing collection ~~system~~ system or collection system unit must meet the design criteria in effect at the time the lack of the plans and specifications approval is discovered.

§217.12. Substantial Design Changes.

(a) A substantial design change is a change to the approved plans and specifications or an approved variance of a process, equipment, or design that has the potential to alter the way a wastewater treatment facility or collection system functions.

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(b) A substantial design change request must include the signed and dated seal of the ~~an~~ engineer.

(c) If the executive director determines that a substantial design change may potentially endanger public health or the environment, the executive director may deny the design change or require the owner to take compensatory measures ~~to be taken~~.

(d) The executive director shall not grant or approve a substantial design change that would violate any expressed prohibition in this chapter.

(e) If the executive director does not notify an owner ~~by fax or letter~~in writing that additional information is requested or that a substantial design change is denied within 30 business days after receiving a signed, dated, and sealed ~~and dated~~ substantial design change request ~~that has been sealed by an engineer~~, the substantial design change is approved as long as it does not violate any prohibition in this chapter. However, such approval is conditional subject to an executive director determination under subsection (c) or (d) of this section. Additionally, if this provision conflicts with any other rule in this chapter that requires affirmative executive director approval, then this provision does not apply.

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(f) A substantial design change must be approved by the executive director before it can be ~~built~~constructed, installed, or put into service.

§217.13. Final Construction Drawings and ~~Technical~~ Specifications.

(a) If requested by the executive director, an owner shall submit final construction drawings and ~~technical specifications~~specifications for a constructed collection system or constructed wastewater treatment facility within 30 days from the date of ~~after receiving~~ the request.

(b) The signed and dated seal of the engineer who is responsible for the wastewater treatment facility design must be on each sheet of the final construction drawings and on the title page of the bound final ~~technical specifications~~specifications.

(c) The final construction drawings and ~~technical specifications~~specifications must include ~~all~~ each of the items in the following paragraphs that are applicable to ~~a~~ the project.

(1) Construction drawings for a ~~wastewater~~ collection system.

(A) The drawings for a ~~wastewater~~ collection system must include plan and profile drawings for both gravity pipes and pressure pipes.~~, and t~~The drawings must specify the size, grade, and type of pipe materials.

(B) The drawings must ~~also~~ specify the location of any structural features of a collection system, including manholes, waterway crossings, bridge crossings, siphons, lift stations, and air release valves.

(C) The drawings must ~~locate~~ specify the location of all potable water distribution lines that are 9.0 feet or closer to any portion of a ~~wastewater~~ collection system and indicate the actual separation distances.

(D) The drawings must include dimensional section details of manholes, manhole covers, and any other collection pipe appurtenances.

(E) The drawings for a lift station must show the location of the following:

(i) all pumps, valves, pumping control equipment, safety equipment, and ventilation equipment;

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(ii) points that may be accessed by operational staff, such as manholes and cleanout ports;

(iii) hatches and hoisting equipment for installing and removing equipment;

(iv) slope and location of any wet well, floor grouting, valve vaults, valve vault pipes, and gas migration prevention measures used between a wet well and a valve vault;

(v) pipe entrances and exits;

(vi) sump pumps;

(vii) elevations of level control switches; and

(viii) any other lift station-related appurtenances.

(2) Construction drawings for a wastewater treatment facility.

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(A) The drawings for a wastewater treatment facility must show a vertical and horizontal scale and must include:

(i) plan drawings of all pipes;

(ii) plan and profile drawings of each treatment unit;

(iii) the dimensions of each ~~wastewater~~ treatment unit;

(iv) all mechanical, electrical, and construction details; and

(v) a hydraulic profile of a wastewater treatment facility at both design and peak flows.

(B) The construction drawings may include plans for future expansion of a wastewater treatment facility.

(C) The construction drawings may include a clarification of any complex details of pipe systems by including an isometric flow diagram.

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(3) The specifications for an ~~material alteration~~alteration ~~or expansion~~ of an existing collection system or wastewater treatment facility must include technical descriptions of all equipment including:

(A) the quantity and sizes of any equipment;

(B) any applicable materials specifications;

(C) testing requirements; and

(D) citations to national standards with which the project complies. ~~citations.~~

(4) If requested by the executive director in writing, an owner must submit additional information relating to the plans and specifications within 30 days after the date of ~~receiving~~ a request.

§217.14. Completion Notice.

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(a) Upon completion of the construction of a collection system or wastewater treatment facility, an owner shall provide a completion notice to the executive director that:

(1) is signed, sealed, and dated by the ~~an~~ engineer;

(2) certifies that the completed work ~~substantially~~ complies with this chapter, the approved plans and specifications, any approved variances, any approved substantial design changes, and the associated wastewater permit; and

(3) states that an operation and maintenance manual, as required in §217.16 of this title (relating to Wastewater Treatment Facility Operation and Maintenance Manual), has been prepared and a copy is located at the wastewater treatment facility.

(b) An owner shall disclose in a completion notice any deviation from the approved plans and specifications that is incorporated into a project after construction began or from an approved substantial design change. An owner shall ~~certify that~~retain an engineer to review design changes and to certify, based on ~~the~~ best professional judgment, all substantial design changes were submitted ~~of an engineer, the change that was not submitted~~ for approval ~~will not result in substantial design change~~, as

substantial design change is defined in §217.12(a) of this title (relating to Substantial Design Changes).

§217.15. Inspection.

(a) The executive director may inspect a project at any time during any phase of the project to determine compliance with the project plans and specifications, the report, any variance approval, any substantial change approval, an associated permit, or the requirements of this chapter.

(b) All documents required by this chapter must be immediately available for review by the executive director upon request.

§217.16. Wastewater Treatment Facility Operation and Maintenance Manual.

(a) An owner of a wastewater treatment facility is responsible for developing an operation and maintenance manual with the assistance of an engineer and certified wastewater operations staff. The manual must be updated when there are personnel changes, construction of treatment units, alteration of treatment units, re-rating of

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treatment units, or changes in the influent quality or quantity that require permanent changes in the operation of the wastewater treatment facility.~~.~~

(b) An owner must ensure that the operation and maintenance manual includes all information specific to the wastewater treatment facility that is necessary to ensure efficient and safe operation, maintenance, monitoring, and reporting~~ by a facility operator~~. The operation and maintenance manual must include ~~the following items~~administrative and recordkeeping items, operation and maintenance information, and safety information.~~:~~

(1) ~~a~~Administrative and recordkeeping items must include~~, including~~:

(A) a table of contents;

(B) a copy of the current wastewater permit;

(C) names and telephone numbers for contacts with the appropriate state and federal regulatory agencies;

(D) names and telephone numbers of staff contacts;

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(E) a copy of the final engineering report, construction drawings, and specifications for each project, as required by §217.10 of this title (relating to Final Engineering Design Report) and §217.13 of this title (relating to Final Construction Drawings and Technical Specifications);

(F) a copy of all documents required by this chapter, including correspondence with the executive director regarding approval of plans and specifications for each project;

(G) a copy of all manufacturer's recommendations relied on in the design of each project;

(H~~D~~) a sample of each type of Discharge Monitoring Report or Monthly Effluent Report an owner is required to submit for the wastewater treatment facility;

(I~~E~~) a sample daily activity report for documenting internal monitoring done in association with internal process control, including flow rates from treatment ~~various~~ units, dissolved oxygen levels, pH, solids concentrations, sludge settling, clarifier sludge blanket depths, sludge age or retention time, and disinfection residuals; and

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(J~~F~~) a description of the quality assurance and quality control recordkeeping requirements for all laboratory analyses performed.

(2) ~~o~~Operation and maintenance ~~items~~information must include~~,~~ ~~including~~:

(A) expected flow patterns, size, and capacity of all treatment units and processing units within the~~-~~ wastewater treatment facility;

(B) start-up procedures, routine operational procedures, emergency operations procedures, and shut down procedures for all treatment units and processing units;

(C) the manner and expected volumes in which solids return to aeration or waste;

(D) expected solids concentrations in each treatment unit and processing unit;

(E) expected clarifier weir overflow rates;

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(F) expected disinfectant and dechlorination usage and dosage amounts during normal and emergency operating conditions;

(G) descriptions and frequencies of all routine in-situ and laboratory analyses to be performed and a list of references to standard analytical ~~testing~~ procedures ~~literature~~;

(H) description and schedule of routine maintenance activities to be performed, including lubrication and inspection of all pumps, motors, and other equipment; ~~and~~

(I) the design life of each treatment unit; and

(J)~~(I)~~ a recommended spare parts inventory with source information.

(3) ~~s~~Safety requirements information must include~~, including~~:

(A) all known potential or actual safety hazards within a wastewater treatment facility;

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(B) the location and method of use for all personal protective ~~safety~~ equipment in accordance with §217.324(a) of this title (relating to Chemical Handling);

(C) a schedule for servicing all personal protective equipment, respiratory equipment, and protective equipment;

(D)~~(C)~~ evacuation, shelter, and shelter-in-place plans;

(E)~~(D)~~ the names and phone numbers of entities and individuals to be contacted during emergencies;

(F)~~(E)~~ emergency operation plans for power outages, flooding, and other site specific emergency situations that may develop;

(G)~~(F)~~ annual safety training curriculum and schedule for all wastewater treatment facility staff;

(H)~~(G)~~ first aid precautions, location of first aid supplies and description of appropriate emergency medical treatment;

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(I)~~(H)~~ chemical disposal in accordance with §217.247(q) of this title (relating to Chemical Pretreatment of Sludge), if applicable;

(J)~~(I)~~ ultraviolet light precautions in accordance with §217.299 of this title (relating to Ultraviolet Light Disinfection System Safety), if applicable; and

(K)~~(J)~~ hazardous task precautions~~s~~ in accordance with §217.323(b) of this title (relating to Hazardous Operation and Maintenance), if applicable.

(c) An owner shall keep a copy of a current operation and maintenance manual at the wastewater treatment facility site. The operation and maintenance manual shall be immediately available for inspection by the executive director upon request.

(d) An owner shall submit a copy of the operation and maintenance manual to the executive director within 30 days ~~after receiving a request~~of a written request from the executive director.

§217.17. Collection System Records.

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An owner of a collection system shall maintain collection system record for the life of the project and make available to the executive director immediately upon request the following:

(1) a copy of the final engineering report, construction drawings, and specifications for each project, as required by §217.10 of this title (relating to Final Engineering Design Report) and §217.13 of this title (relating to Final Construction Drawings and Technical Specifications);

(2) a copy of all documents required by this chapter, including correspondence with the executive director regarding approval of plans and specifications for each project; and

(3) a copy of all manufacturer's recommendations relied on in the design of each project.

~~(1) a complete set of the final plans and specifications with engineer's certification;~~

~~(2) a copy of the complete report;~~

~~(3) all change orders and test results;~~

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~~(4) a copy of the summary transmittal letter submitted to the executive director; and~~

~~(5) any approvals for variances or substantial changes.~~

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SUBCHAPTER B: WASTEWATER TREATMENT FACILITY DESIGN REQUIREMENTS

§§217.31 - 217.39

§217.31. Applicability.

This subchapter details the design values that an owner shall use when determining the size of any wastewater treatment facility component. This subchapter applies to the treatment design for a new wastewater treatment facility, ~~material~~the alteration ~~or expansion~~ of an existing wastewater treatment facility, ~~and~~ the re-rating of an existing wastewater treatment facility, and to an existing wastewater treatment facility that is required to apply for a new permit.

§217.32. Organic Loadings and Flows for New Wastewater Treatment Facilities.

(a) The design of a new wastewater treatment facility must be based on the flows and loadings in paragraphs (1) - (3) of this subsection, unless subsection (b) of this section applies.

(1) Design flow.

(A) If the flow limit in a permit is based on an annual average, then the ~~For a facility equal to or greater than 1.0 million gallons per day (mgd), the permitted~~design flow is ~~the average annual flow value~~ determined by multiplying the per capita flow in Table B.1. in paragraph (3) of this subsection by the number of ~~people~~ individuals in the service area.

(B) ~~) For a facility less than 1.0 mgd~~If the flow limit in a permit is based on a daily average, then the ~~permitted~~ design flow ~~is the maximum 30-day average flow estimated~~ is determined by multiplying the average annual flow by a factor of at least 1.5. The annual average flow is determined by multiplying the per capita flow in Table B.1. in paragraph (3) of this subsection by the number of individuals in the service area.

(C) The design flow for a new wastewater treatment facility or a wastewater treatment facility alteration must be based on the facility's wastewater permit.

(2) Peak flow. When site-specific data is unavailable, the ~~instantaneous two-hour~~ peak flow must be ~~estimated~~ determined by multiplying the ~~permitted~~ design

flow by a factor of at least 4.0. If site-specific data or projections are available, the peak flow must be based on the site-specific data.

(A) If the average daily peaking factor at a wastewater treatment facility exceeds 4.0, ~~experiences unusual periodic flow variations,~~ the actual daily peaking factor ~~a higher multiplier may~~ must be used to calculate the peak flow, unless flow equalization is provided.

(B) If a wastewater treatment facility experiences occasional peak events with a peaking factor that exceeds 5.0, the event-based peaking factor must be used to calculate the peak flow, unless flow equalization is provided.

(C~~B~~) In a wastewater treatment facility with flow equalization, the wastewater treatment facility may be designed for a lower estimated peak flow. The report shall include data that supports the lower estimated peak flow.~~, if supporting data included in the report supports the estimate.~~

(~~C~~D) A treatment unit, pipe, weir, flume, disinfection unit, or any other treatment unit that is flow limited must be sized to transport or treat the ~~estimated~~ peak flow.

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~~(D) A facility must use a totalizing flow meter for flow measurement.~~

(3) Design organic loading. If available, actual organic loading data must be used as the basis for the design of the wastewater treatment facility. If actual organic loading data is not available, the design organic load must be determined by using the following table. The design organic loading is determined ~~used as the basis for design. The design organic load is determined~~ by multiplying the ~~projected uses by~~ annual average flow from the projected uses ~~determined from the following table and~~ by ~~using~~ the ~~appropriate~~ corresponding influent concentrations ~~from the following table~~:

Figure: 30 TAC §217.32(a)(3)

Table B.1. - Design Organic Loadings and Flows for a New Wastewater Treatment Facility

~~Table B.1. - Design Organic Loadings and Flows for a New Facility~~				
Source	**Remarks**	**Daily Wastewater Flow (gallons/person)**	**Wastewater Strength (mg/l BOD_5)**	**Wastewater Strength (mg/l NH_3-N)**
Municipality	Residential	75-100	200-~~350~~400	15-75
Subdivision	Residential	75-100	200-~~350~~400	15-75
Trailer Park (Transient)	2½ ~~Persons~~ Individuals per Trailer	50-60	250-~~300~~350	15-75

Mobile Home Park	3 ~~Persons~~ Individuals per Trailer	50-75	300	15-75
School	Cafeteria & Showers Cafeteria/No Showers	20 15	300 300	15-75 15-75
Recreational Parks	Overnight User Day User	30 5	200 100	15-75 15-75
Office Building or Factory	A facility must be designed for the largest shift	20	300	15-75
Hotel/Motel	Per Bed	50-75	300	15-75
Restaurant	Per Meal	7-10	1000*	15-75
Restaurant with bar or cocktail lounge	Per Meal	9-12	1000*	15-75
Hospital	Per Bed	200	300	15-75
Nursing Home	Per Bed	75-100	300	15-75
Alternative Collection Systems (Subchapter D)	Per Capita	75	N/A	N/A
*Based on a restaurant with a grease trap				

(b) ~~For an~~An owner designing ~~constructing~~ a new wastewater treatment facility ~~system to~~ that will serve the same service area as an existing wastewater treatment facility must use historical data from the existing facility to design the new wastewater

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treatment facility, if there is enough historical data to meet the needs of §217.34 of this title (relating to Organic Loadings and Flows for Existing Wastewater Treatment Facilities, Re-Ratings, and Alterations)~~with sufficient historical data, the data from §217.34 of this title (relating to Re-Rating, Expanding, or Materially Altering an Existing Facility), may be used to design a wastewater treatment facility~~. The report must justify the design conclusions that are based on existing data ~~if justified in the report~~.

§217.33. Flow Measurement.

(a) A wastewater treatment facility must include a means of ~~accurate~~ effluent flow measurement with less than 10% error, or the manufacturer's error tolerance, whichever is less, throughout the expected range of flows.

(b) An effluent flow-measuring device must have an open channel to allow for easy inspection, calibration, and cleaning.

(c) Flow measurement must use a combination of primary and secondary flow measuring devices.

(1) Primary flow measuring devices.

(A) A primary flow measuring device must include a weir or a flume.

(B) A primary flow measuring device must have a non-corrosive ruler (staff gauge) that is graduated in no greater than 1/4 inch increments that are clearly visible.

(C) A primary flow measuring device must ~~be installed upstream of a secondary measuring device to permit the~~allow for manual measurement of water depth.

(2) Weirs.

(A) A channel approach section to a weir must be straight for a length at least 20 times the maximum expected head height on a weir at peak flow. The executive director may consider using manufacturer's recommendations supplied by the engineer in lieu of this requirement.

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(B) The minimum ~~height~~ distance between a channel bottom and a weir crest must be at least ~~be the greater of~~ twice the maximum expected head height on the weir at peak flow, or ~~a minimum of~~ 1.0 foot, whichever is greater.

(C) The upstream edge of a weir must not be corroded.

(D) The crest of a weir must be exactly level to ensure a uniform depth of flow.

(E) The upstream face of a weir must be smooth and perpendicular to the axis of the channel in both the horizontal and vertical directions.

(F) A~~Upstream of a weir, there must be a~~ secondary flow measuring device must be installed: ~~located a minimum distance of the greater of:~~

(i) upstream of the weir at a distance of three times the maximum expected head height on a weir at peak flow; or

(ii) at the location and distance recommended by the equipment manufacturer.

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(3) Flumes.

(A) A flume must be located in a straight section of an open channel.

(B) A flume must be installed in accordance with the manufacturer's recommendations.

(C) A flume must distribute the approaching flow evenly across a flow channel to preclude turbulence and waves.

(4) Secondary flow measuring devices.

(A) A wastewater treatment facility must use a totalizing meter as a secondary flow measuring device, which ~~A secondary measuring device~~ must measure the liquid level discharging through ~~in~~ the primary flow measuring device~~,~~ and ~~must~~ convert this liquid level into a flow rate that is integrated to a totalized flow.

(B) A secondary flow measuring device must be installed in accordance with the manufacturer's recommendations and in a manner that reduces turbulence and promotes laminar flow.

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(C) A secondary flow measuring device must include a display of the instantaneous flow rate and a means of reading the totalized flow.

(D) A secondary flow measuring device must be designed to allow recalibration.

(E) A secondary flow measuring device must not interfere with the accuracy of the primary flow measuring device.

§217.34. Organic Loadings and Flows for Existing Wastewater Treatment Facilities, Re-Ratings, and Alterations.~~Re-Rating, Expanding, or Materially Altering an Existing Facility.~~

An owner who proposes to ~~materially~~ alter or~~,~~ ~~expand, or~~ re-rate an existing ~~facility~~wastewater treatment facility, or to obtain approval for an existing facility after that facility's permit expired, ~~in order to meet an amended permit condition~~ is required to use the wastewater treatment facility's current operating data for flow and organic loading (biochemical oxygen demand or carbonaceous biochemical oxygen demand, total suspended solids, and ammonia nitrogen, as required by the permit) as the design

basis. ~~for sizing the proposed wastewater treatment equipment and processes.~~ The compiled data must meet the criteria outlined in paragraphs (1) and (2) of this section.

(1) Flows.

(A) ~~The volume of existing flow shall be determined when an existing treatment facility~~When an existing wastewater treatment facility is to be re-rated or ~~,~~ altered~~expanded, or upgraded.~~,

~~(B) An existing~~ the ~~facility~~wastewater treatment facility's data for the ~~latest~~ last five years must be used to determine the annual average flow, the maximum monthly average flow, the peak flow, the ratio of maximum monthly average flow to annual average flow, and the ratio of the peak flow to the annual average flow. All flow data for these analyses must be collected by a totalizing meter. If the ~~facility~~wastewater treatment facility is less than five years old, all existing data must be used. All calculations and assumptions must be included in the report.

~~(C) All flow data for these analyses must be collected by a totalizing meter.~~

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(B~~D~~) An analysis of the peak flow must be based on a frequency distribution analysis using flow charts for each individual day~~ to determine the maximum sustained flow rate over any two-hour period~~.

(C~~E~~) The projected peak flow must be the result of collection system monitoring or modeling based on a two-year, 24-hour storm event for the service area.

(D) For a wastewater treatment facility that will not be affected by future growth, the design flow for a re-rating or alteration must be calculated using the wastewater treatment facility's average flow plus one standard deviation.

(E) For a wastewater treatment facility that will be affected by future growth, the design flow for a re-rating or alteration must be based on future flow, calculated using anticipated changes from the existing flow. The design analysis may use a linear regression or other appropriate statistical method for predicting the design flow when significant data exists.

(2) Organic loadings.

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(A) When an existing wastewater treatment facility is to be re-rated or altered, ~~When an owner seeks to have an existing facility re-rated or to expand or upgrade an existing facility,~~ the design organic loading must be calculated based on the average daily organic loading~~load that the facility is required to treat during the design life~~. ~~A calculation of the average daily organic loading must use the facility's actual data plus one standard deviation. The data must conform at a minimum to the following:~~

(i) The data used to determine the organic loading must be from the analyses of at least three composite samples of the influent wastewater per week, taken during days with representative flow, for a period of at least one year. ~~document a minimum of one year, consisting of three samples per week taken during days with a representative flow.~~ If ~~a sampling program is~~ samples are collected at a ~~for a~~ frequency of less than three times per week or less than a three-part composite ~~grab~~ sample, the Executive Director may require an owner~~-~~ to collect and analyze additional samples ~~shall document how the proposed sampling program is~~ that are representative of actual conditions at the ~~facility~~wastewater treatment facility. The data must include samples collected during both wet and dry weather conditions.

(ii) If the samples are not 24-hour flow-weighted composite samples, the samples must be representative of the peak loading.

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(iii) ~~Sampling~~ Sample data must include the following parameters, at a minimum, unless monitoring of the parameter is not required by the wastewater permit:

(I) ~~of~~ five-day carbonaceous biochemical oxygen demand or five-day biochemical oxygen demand;~~,~~

(II) total suspended solids;~~,~~ and

(III) ammonia-nitrogen.~~, unless justified because of specific treatment requirements.~~

(B)~~(iv)~~ The owner must provide an engineering analysis for the minimum sampling period in the report, which must include:

(i)~~(I)~~ a summary of the monthly data;

(ii)~~(II)~~ the ~~annual~~ average monthly load; and

(iii)~~(III)~~ the standard deviation of the monthly data.

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(C) For a wastewater treatment facility that will not be affected by future growth, the design organic loading for a re-rating or alteration must be calculated using the wastewater treatment facility's average organic loading plus one standard deviation.

(D) For a wastewater treatment facility that will be affected by future growth, the design organic loading for a re-rating or alteration must be based on future loading calculated using anticipated changes from the existing loading. The design analysis may use a linear regression or other appropriate statistical method for predicting the design organic load when significant data exists.

(E)~~(v) An analysis may use a linear regression or other appropriate statistical method for predicting the design organic load when significant data exists.~~

~~(B) A design must be based future loading and future flow calculated from the anticipated changes from the existing loading and flow.~~

~~(C) The report must justify the design organic loading.~~

~~(i) A design organic loading must account for both dry weather and wet weather conditions.~~

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~~(ii) An owner shall use t~~The design organic loading must be used to determine the required size of each ~~any~~ treatment unit that provides treatment of organic waste.

§217.35. One Hundred-Year Flood Plain Requirements.

(a) If a 100-year flood plain is located within 1,000 feet of the site of a ~~proposed facility~~wastewater treatment facility, ~~the owner must show~~ the 100-year flood plain must be shown on the site plan. A flood plain determination must be based on a superimposition of the 100-year flood elevation on the most accurate available topography and elevation data for the ~~of a proposed~~ site.

(1) A 100-year flood plain must be based on the Federal Emergency Management Agency (FEMA) Flood Insurance Study ~~(FIS)~~ in effect at the time the plans and specifications are submitted to the executive director. FEMA maps are prima facie evidence of flood plain locations.

(2) An appropriate flood insurance rate map or ~~FIS~~ Flood Insurance Study profile, adjusted to the ~~project's~~ site's vertical data, may be used to determine~~s~~ flood elevations.

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(3) If a site is adjacent to a FEMA 100-year flood delineation, but has no flood elevation published, a 100-year flood elevation may be determined by overlaying the effective FEMA delineation over a United States Geological Survey Quadrangle Map and interpolating a flood elevation.

(4) If FEMA flood plain information is not available, the report shall include a 100-year flood elevation based on the best information available.

(b) The 100-year ~~One hundred-year~~ flood plain must be shown on the profile drawings.

(1) The FEMA 100-year water surface elevation must be marked on a hydraulic profile of a ~~facility~~wastewater treatment facility in accordance with the vertical scale of the drawing.

(2) If a ~~proposed facility~~wastewater treatment facility will occupy less than 1,000 feet of shoreline along a flood plain, the profile must show a single line coincident with the elevation of the centerline of any outfall pipe.

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(3) ~~When~~ If a ~~proposed facility~~wastewater treatment facility will occupy 1,000 feet or more of shoreline along a flood plain, the profile must show the water surface elevation at both the upstream and downstream limits of any protective structure for the proposed ~~facility~~wastewater treatment facility.

(c) The executive director will not approve a design of a proposed treatment unit within a 100-year flood plain, unless the design provides protection for all open process tanks and electric units from inundation during a 100-year flood event.

§217.36. Emergency Power Requirements.

(a) A wastewater treatment facility must be designed to prevent the discharge of untreated or partially treated wastewater during electrical power outages.

(b) A wastewater treatment facility must include an audiovisual alarm system. The alarm system must transmit all alarm conditions through the use of an auto-dialer system, a Supervisory Control and Data Acquisition (SCADA) system, or a telemetering system connected to a continuously monitored location. Audiovisual alarms are not required if the SCADA system notifies the operator about communication loss, in addition to all other alarm conditions.

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(c) An alarm system must self-activate if:

(1) the power goes out;

(2) a pump fails; or

(3) a high water level alarm is triggered.

(d) An alarm system must include self-testing capability at the control panel.

(e) An owner shall determine the reliability of the existing commercial power service for a wastewater treatment facility using records from the past 60 consecutive months from the appropriate electric utility. The entire record must be used if 60 months of records are not available. The owner must provide the power outage records and the reliability determination in the report. The records must:

(1) be in writing;

(2) be on the electric utility's letterhead and bear a signature of an electric utility employee;

(3) identify the location of the wastewater treatment facility;

(4) list the total number of power outages that have occurred during the past 60 consecutive months; and

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(5) indicate the date and duration of each recorded power outage.

(f) Systems for preventing discharge of untreated or partially treated wastewater must be designed to operate for a duration at least equal to the longest power outage on record for the past 60 consecutive months, or at least 20 minutes, whichever is longer. The design must consider the effects of peak flow, inflow, and infiltration.

(g) Systems for preventing discharge of untreated or partially treated wastewater at a wastewater treatment facility must either be permanent features of the wastewater treatment facility, or be temporary power systems that are capable of being made operational before unauthorized discharge occurs during any electrical power outage. The engineer must describe how a temporary power system will be deployed and operated in the report, and must address deployment during all types of weather events that might reasonably cause a power outage at the wastewater treatment facility.

(h) Systems for preventing discharge of untreated or partially treated wastewater may include any combination of alternate power sources, on-site generators, interceptor systems, on-site retention, collection system storage, portable generators, mechanical backup systems, or other similar systems.

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(1) Collection system storage is prohibited as a sole means of preventing the discharge of untreated or partially treated wastewater during a power outage.

(2) The main power source and an alternate power source may not be provided by the same power plant.

(3) Portable generators and pumps may only be used to guarantee service if:

(A) a tested quick-connect mechanism and a properly sized automatic transfer switch is provided where the generator will be used; and

(B) a licensed operator that is knowledgeable in operation of the portable generators and pumps will be on call 24 hours per day every day.

(i) The report must include a description of emergency operation of the wastewater treatment facility. Treatment units that require continuous operation during a power outage must be identified in the report.

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(1) A wastewater treatment facility must be designed to achieve primary treatment and to disinfect the wastewater to ensure compliance with the bacteria limits established in the treatment facility's wastewater permit during all power outages.

(2) All components of the disinfection system, including any reclaimed water used to make a chemical solution, must be designed to operate at full capacity during all power outages according to the requirements of §217.37 of the title (relating to Disinfection System Power Reliability).

(3) Return activated sludge pumps must be operational during any power outage lasting longer than four hours.

(4) If portable generators or pumps are used to guarantee service, the report must include:

(A) the storage location of each generator and pump;

(B) the amount of time that will be needed to transport each generator or pump to where it will be used;

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(C) the treatment units to which each generator or pump is designated as a backup; and

(D) the routine maintenance and upkeep planned for each portable generator and pump to ensure that they will be operational when needed.

~~(a) Reliability of existing commercial power service.~~

~~(1) An owner shall determine the reliability of the existing commercial power service for a facility from the power outage records obtained from the appropriate power company.~~

~~(2) The records must:~~

~~(A) be in writing;~~

~~(B) be on the utility's letterhead and bear a signature of a utility employee;~~

~~(C) identify the location of the wastewater treatment system or off-site lift station(s) being served;~~

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~~(D) list the total number of outages that have occurred during the past 24 months; and~~

~~(E) indicate the date and duration of each recorded outage.~~

~~(b) An owner shall submit an power reliability determination and all backup documentation in the report for the approval of the executive director.~~

~~(c) If the executive director determines a power supply is unreliable:~~

~~(1) the owner will be notified in writing;~~

~~(2) the facility shall incorporate an on-site, automatically starting generator, capable of ensuring continuous operation of all critical wastewater treatment system units for a duration equal to the longest power outage in the power records; and~~

~~(3) any off-site lift station must incorporate an on-site, automatically-starting generator capable of ensuring continuous operation of the lift station for a duration equivalent to the longest power outage on record for the past 24 months.~~

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~~(d) Exceptions to the auxiliary power generator requirements for wastewater treatment facilities are:~~

~~(1) The requirements for on-site, automatically starting generators for wastewater treatment facilities may be reduced as follows:~~

~~(A) Facilities may use lift stations and collection systems to store wastewater in lieu of on-site generators when the report calculations show that sufficient storage volume exists in the lift stations, upstream gravity wastewater collection system lines, and manholes to store the volume of wastewater during a peak diurnal event equal to the longest outage in the power records.~~

~~(B) If storage is used in lieu of backup power generators, the report must show that the hydraulic grade line of a collection system is such that in no case will wastewater be allowed to bypass the treatment facility during a peak flow event equal to the longest outage in the power records.~~

~~(C) When upstream storage is used as a means of ensuring complete treatment of the influent wastewater, a design must include the following:~~

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~~(i) Storage is prohibited as a substitute for on-site generators if any of the flow to the treatment facility is gravity flow.~~

~~(ii) If the influent storage is less than two hours and power outage records indicate a maximum outage of less than two hours, the on-site, automatically starting generators need only provide sufficient power to operate all components of the disinfection system.~~

~~(iii) If the influent storage is at least two hours but not more than four hours and the power outage records indicate an outage of at least two hours but not more than four hours, a generator need only supply sufficient power to operate all or components of the disinfection system. Auxiliary generators are also required to supply power for return activated sludge pumps if the report does not show sufficient volume in the clarifiers for storage of sludge.~~

~~(2) Off-Site Lift Stations. Off-site lift stations may substitute portable generators or pumps in combination with collection system storage for on-site generators if the following criteria exist:~~

~~(A) the firm pumping capacity of a lift station is less than 100 gallons per minute;~~

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~~(B) a station includes an auto-dialer or telemetry system with battery backup;~~

~~(C) operators knowledgeable in acquisition and startup of the portable generators and pumps are on 24-hour call;~~

~~(D) a station is accessible during a 25-year flood event;~~

~~(E) reasonable assurances exist as to the timely availability and accessibility of the proper portable equipment; and~~

~~(F) a station is equipped with properly designed and tested quick connections.~~

§217.37. Disinfection System Power Reliability.

(a) A disinfection system must include a backup power system capable of providing sufficient power to operate continuously during all ~~any~~ power outages in accordance with the requirements of §217.36 of this title (relating to Emergency Power Requirements). ~~outage.~~

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(b) A backup power system must automatically restart the disinfection system during a power outage.

(c) A backup power system must meet the requirements of §217.36 of this title (relating to Emergency Power Requirements~~Emergency Power Requirements~~).

§217.38. Buffer Zones and Odor Abatement.

(a) The buffer zone requirements in §309.13 of this title (relating to Unsuitable Site Characteristics)~~,~~ apply to all treatment units in a ~~facility~~wastewater treatment facility.

(b) The report must include the design of any odor abatement measures intended to comply with §309.13(e) - (g) of this title.

(c) An odor abatement measure that is used in lieu of buffer zones ~~zone requirements~~ is subject to review in accordance with §217.7(b)(2) of this title (relating to Types of Plans and Specifications Approvals).

§217.39. Wastewater Treatment Facility Use of Reclaimed Water.

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(a) A wastewater treatment facility that is designed after the effective date of this chapter must use reclaimed water in place of potable water in all treatment units, ~~used~~ for wash down water, and for irrigating the grounds within the boundaries of the wastewater treatment facility. ~~, and any other appropriate use.~~

(b) A wastewater treatment facility that is designed after August 28, 2008~~the effective date of this chapter~~ must include a meter to measure reclaimed water use in ~~at~~ the wastewater treatment facility.

(c) Reclaimed water may only be used after treatment in a secondary treatment process. Untreated or partially treated wastewater may not be used as reclaimed water. A reclaimed water system must provide for screening or filtration, pumping backup with controls, and a pressure-sustaining device such as a hydro-pneumatic tank.

(d)~~(e)~~ ~~An owner must reclaim water after it has been disinfected,~~ If disinfection is part of the treatment, reclaimed water may only be used after it has been disinfected. ~~A reclaimed water system must provide for screening or filtration, pumping backup with controls, and a pressure-sustaining device such as a hydro-pneumatic tank.~~

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~~(d) An owner may use only reclaimed water that meets the requirements for Type I or Type II water, in accordance with §210.33 of this title (relating to Quality Standards for Using Reclaimed Water) for wash down water, disinfection system operation, chemical mixing, irrigating the grounds, and any other appropriate use.~~

(e) Reclaimed water ~~An owner~~ may be used within the wastewater treatment ~~use reclaimed water on a~~ facility ~~site~~ with no further authorization from the executive director if it is used in accordance with this section and §210.4(c) of this title (relating to Notification).

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SUBCHAPTER C: CONVENTIONAL COLLECTION SYSTEMS

§§217.51 - 217.70

Statutory Authority

[Language drafted and provided for inclusion by OLS attorney assigned to this rulemaking project (this should be done simultaneously while the Fiscal Note information is being drafted (if not before)).]

§217.51. Applicability.

This subchapter applies to the design, construction, operation, and testing of ~~standards for~~ conventional gravity ~~wastewater~~ collection systems, conventional wastewater lift stations, force mains for wastewater transport, and reclaimed water conveyance systems.

§217.52. Edwards Aquifer.

An owner who plans to install a ~~wastewater~~ collection system located over the Edwards Aquifer recharge zone, as "recharge zone" is defined in Chapter 213 of this title (relating to Edwards Aquifer), must design and install the collection system in

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accordance with Chapter 213 of this title (relating to Edwards Aquifer), in addition to these rules.

§217.53. Pipe Design.

(a) Flow Design Basis. An owner must use the requirements of this section to design a gravity collection system.

(1) ~~An owner must design~~ A ~~wastewater~~ collection system must be designed to transport ~~to handle the transport of~~ the peak ~~dry weather~~ flow from the service area, plus infiltration and inflow. The design must minimize inflow and infiltration. Flow calculations must be included in the report.

(2) The flow calculations must include the details of the average ~~dry weather~~ flow, the ~~dry weather~~ flow peaking factor, and the infiltration and inflow.

(3) The flow calculations must include the flow expected in the wastewater treatment facility immediately upon completion of construction and at the end of a 50 year period following construction. ~~its 50-year life.~~

(b) Gravity Pipe Materials.

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(1) An owner must identify in the report the proposed gravity collection system pipe with its appropriate American Society for Testing and Materials (ASTM), American National Standards Institute (ANSI), or American Water Works Association (AWWA) standard numbers for both quality control (dimensions, tolerances, working pressure rating etc.) and installation (bedding, backfill, etc.).

(2) The selection of gravity collection system pipes ~~pipe~~ must be based on:

(A) the characteristics of the wastewater conveyed;

~~(B) the character of industrial wastes;~~

(B) ~~(C)~~ the possibility of septic conditions;

(C) ~~(D)~~ the ~~exclusion~~ ability to minimize~~of~~ inflow and infiltration;

(D) ~~(E)~~ any external forces;

(E) ~~(F)~~ any groundwater conditions;

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(F) ~~(G)~~ the internal pressures; and

(G) ~~(H)~~ the abrasion and corrosion resistance of the pipe material.

(c) Joints for Gravity Pipes. ~~Pipe.~~

(1) The ~~technical~~ specifications for joints for gravity pipes ~~pipe~~ must include the materials and methods used in making joints.

(2) Materials used for gravity pipe joints must prevent inflow, infiltration, and root entrance. A joint must:

(A) include rubber gaskets;

(B) include polyvinyl chloride (PVC) compression joints;

(C) include high density polyethylene compression joints;

(D) be welded; or

(E) be heat fused.~~; or~~

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–(3) The technical specifications must include ASTM, AWWA, ANSI, or other appropriate national reference standards for the pipe joints.

(d) Separation Distances. Between Public Water Supply Pipes and Wastewater Collection System Pipes or Manholes.

(1) Collection system pipes must be installed in trenches separate from public water supply trenches.

(2) Wherever possible, collection system pipes must be no closer than nine feet in any direction from a water supply pipe. If a collection system pipe cannot be located at least nine feet away from a water supply pipe, the owner must justify in the report why it is not possible to provide at least nine feet of separation between the pipes.

(3) Wherever possible, a collection system pipe must be located below a water supply pipe. If a collection system pipe cannot be located below a water supply pipe, the owner must justify in the report why it is not possible to locate the collection system pipe below the public water supply pipe.

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(4) The design of a collection system pipe located above a water supply that runs parallel to the water supply pipe must provide that each portion of the collection system pipe within nine feet of the water supply pipe must be encased in a carrier pipe according to the requirements of subparagraph (4)(A) of this paragraph. The design of a collection system pipe located above a water supply that crosses the water supply pipe must provide that each portion of the collection system pipe within nine feet of the water supply pipe must be encased in a carrier pipe according to the requirements of subparagraph (4)(B) of this paragraph, or must be constructed using 150 psi pressure class pipe according to the requirements of subparagraph (4)(C) of this paragraph.

(A) A carrier pipe for a collection system pipe that runs parallel to and above a water supply pipe must be constructed of at least 150 psi pressure class pipe that:

(i) encases the entire length of collection system pipe that is within nine feet of the water supply pipe;

(ii) is sealed at both ends with cement grout or a manufactured seal;

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(iii) is at least two nominal sizes larger than the wastewater collection pipe; and

(iv) is supported by spacers between the collection system pipe and the encasing pipe at a maximum of five-foot intervals.

(B) A carrier pipe for a collection system pipe crosses above a water supply pipe must be constructed of at least 150 psi pressure class pipe that is:

(i) centered on crossing;

(ii) sealed at both ends with cement grout or a manufactured seal;

(iii) at least 18 feet long;

(iv) at least two nominal sizes larger than the wastewater collection pipe; and

(v) supported by spacers between the collection system pipe and the encasing pipe at a maximum of five-foot intervals.

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(C) A collection system pipe that crosses above a water supply pipe must be constructed of 150 psi pressure class pipe, must be constructed of cast iron, ductile iron, or PVC pipe, and must use manufacturer-approved adapters if it is not encased in a carrier pipe. Gasketed joints, compression joints, and other non-bonded joints must be designed to seal at atmospheric pressure.

(5) The design of a collection system pipe located below a water supply pipe that runs parallel to the water supply pipe must provide that each portion of the collection system pipe within nine feet of the water supply pipe must be constructed using 150 psi pressure class pipe according to requirements of subparagraph (5)(A) of this paragraph. The design of a collection system pipe located below a water supply pipe that crosses the water supply pipe must provide that each portion of the collection system pipe within nine feet of the water supply pipe must be constructed using 150 psi pressure class pipe according to requirements of subparagraph (5)(B) of this paragraph, encased in cement-stabilized sand according to the requirements of subparagraph (5)(C) of this paragraph, or encased in a carrier pipe constructed using 150 psi pressure class pipe according to the requirements of subparagraph (5)(D) of this paragraph.

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(A) A collection system pipe that runs parallel to and below a water supply pipe must:

(i) be constructed of 150 psi pressure class cast iron, ductile iron, or PVC;

(ii) be located at least two vertical feet below the water supply pipe;

(iii) be located at least four horizontal feet away from the water supply pipe; and

(iv) include joints that are designed to seal at atmospheric pressure.

(B) A collection system that crosses below a water supply pipe and is constructed of cast iron, ductile iron, or PVC must:

(i) be at least 150 psi pressure class;

(ii) have at least six inches of separation between the outsides of the pipes;

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(iii) be centered on the crossing;

(iv) be at least 18 feet long ; and

(iv) terminate at joints that are designed to seal at atmospheric pressure.

(C) A collection system pipe that crosses below a water supply pipe and is constructed of any material other than cast iron, ductile iron, or PVC must:

(i) have at least two feet of separation between the outsides of the pipes; and

(iii) be encased in cement-stabilized sand backfill that meets the requirements of subparagraph (5)(E) of this paragraph.

(D) If the requirements of subparagraph (5)(A), (5)(B), or (5)(C) of this paragraph cannot be met, the collection system pipe must be encased in a 150 psi pressure class carrier pipe that:

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(i) encases the entire length of collection system pipe that is within nine feet of the water supply pipe;

(ii) is sealed at both ends with cement grout or a manufactured seal;

(iii) is at least two nominal sizes larger than the wastewater collection pipe; and

(iv) is supported by spacers between the collection system pipe and the encasing pipe at a maximum of five-foot intervals.

(E) Cement-stabilized sand for encasing collection system pipes must:

(i) include at least 160 pounds of cement for every cubic yard of sand;

(ii) be installed beginning one-quarter pipe diameter below the centerline of the collection system pipe;

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(iii) be installed ending one full pipe diameter above the top of the collection system pipe, or 12 inches above the top of the collection system pipe, whichever is greater.

~~(2) collection system pipes must be no closer than nine feet in any direction to a public water supply line.~~

~~(3) If a nine-foot separation distance cannot be achieved, the following guidelines will apply.~~

~~(A) If a collection system parallels a public water supply pipe the following requirements apply.~~

~~(i) A collection system pipe must be constructed of cast iron, ductile iron, or PVC meeting ASTM specifications with at least a 150 pounds per square inch (psi) pressure rating for both the pipe and joints.~~

~~(ii) A vertical separation must be at least two feet between the outside diameters of the pipes.~~

~~(iii) A horizontal separation must be at least four feet between outside diameters of the pipes.~~

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~~(iv) A collection system pipe must be below a public water supply pipe.~~

~~(B) If a collection system pipe crosses a public water supply pipe, the following requirements apply:~~

~~(i) If a collection system is constructed of cast iron, ductile iron, or PVC with a minimum pressure rating of 150 psi, the following requirements apply:~~

~~(I) A minimum separation distance is six inches between outside diameters of the pipes.~~

~~(II) A collection system pipe must be below a public water supply pipe.~~

~~(III) Collection system pipe joints must be located as far as possible from an intersection with a public water supply line.~~

~~(IV).~~

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~~(ii) If a collection system pipe crosses under a public water supply pipe and the collection system pipe is constructed of acrylonitrile butadiene styrene (ABS) truss pipe, similar semi-rigid plastic composite pipe, clay pipe, or concrete pipe with gasketed joints, the following requirements apply:~~

~~(I) A minimum separation distance is two feet.~~

~~(II) If a collection system pipe is within nine feet of a public water supply pipe, the initial backfill around the collection system pipe must be:~~

~~(a) sand stabilized with two or more 80 pound bags of cement per cubic yard of sand for any section of collection system pipe within nine feet of a public water supply pipe.~~

~~(b) installed from one quarter of the diameter of the collection system pipe below the centerline of the collection system pipe to one pipe diameter (but not less than 12 inches) above the top of the collection system pipe.~~

~~(iii) If a collection system crosses over a public water supply pipe, one of the following procedures must be followed:~~

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~~(I) Each portion of a collection system pipe within nine feet of a public water supply pipe must be constructed of cast iron, ductile iron, or PVC pipe with at least a 150 psi pressure rating using appropriate adapters.~~

~~(II) A collection system pipe must be encased in a joint of at least 150 psi pressure class pipe that is:~~

~~(-a-) centered on the crossing;~~

~~(-b-) sealed at both ends with cement grout or manufactured seal;~~

~~(-c-) at least 18 feet long;~~

~~(-d-) at least two nominal sizes larger than the wastewater collection pipe; and~~

~~(-e-) supported by spacers between the collection system pipe and the encasing pipe at a maximum of five-foot intervals.~~

~~(4) Public water supply pipe and collection system manhole separation.~~

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~~(A) Unless collection system manholes and the connecting collection system pipe are watertight, as supported by leakage tests showing no leakage, they must be installed A minimum of nine feet of horizontal clearance from an existing or proposed public water supply pipe.~~

~~(B) If a nine-foot separation distance cannot be achieved, the requirements in paragraph (3) of this subsection apply.~~

(e) Building Laterals and Taps. Building laterals and taps ~~on an installation~~ must:

(1) include a manufactured fitting that ~~limits~~ prevents infiltration and root entrance;

(2) prevent protruding service lines; and

(3) protect the mechanical and structural integrity of a ~~wastewater~~ collection system.

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(f) Bore or Tunnel for Crossings. The spacing of supports for carrier pipe through casings must maintain the grade, slope, and structural integrity of the~~a~~ pipe as required by subsection (k) of this section.

(g) Corrosion Potential of Collection System Pipes.

(1) The report must include calculations or other information that demonstrate the structural integrity of a pipe during the minimum 50-year design life cycle ~~I~~if a pipe or an integral structural component of a pipe ~~will~~ has potential to deteriorate when subjected to corrosive internal conditions, or if a pipe or component does not have a corrosion~~corrosive~~ resistant liner installed by the pipe manufacturer~~, the report must demonstrate the structural integrity of a pipe during the minimum 50-year design life cycle~~.

(2) If the corrosion analysis indicates that corrosion will reduce the functional life of the pipe to less than 50 years based on the structural analysis in subsection (k) of this section, then the~~A~~ pipe must have a ~~n appropriate~~ lining that will extend the functional life to 50 years~~if the corrosion analysis indicates that corrosion will reduce the functional life of the pipe to less than 50 years~~.

(h) Odor Control.

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~~(1)~~ An owner shall ~~determine~~ implement~~if~~ odor control measures ~~are~~ necessary to prevent a ~~wastewater~~ collection system from becoming a nuisance, based upon the potential of the ~~wastewater~~ collection system to generate hydrogen sulfide throughout ~~.~~

~~(2) A potential odor determination must include the estimated flows immediately following construction and throughout a~~the ~~system's~~ 50-year ~~expected~~ design life cycle of the system.

(i) Active Geologic Faults.

(1) An owner shall identify ~~any~~ all active faults within the ~~area of~~boundaries of ~~a~~ the collection system project, plus 200 feet, and minimize the number of collection system lines crossing faults.

(A) ~~Where~~ If the crossing of a collection system over an active fault ~~crossing~~ is unavoidable, the report must specify design features that protect the structural integrity of a ~~wastewater~~ collection system in the event of movement of the fault.

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(B) If a collection system line crosses an active fault line, the ~~design must specify~~design must specify:

(i) joints that provide maximum ~~deflection~~flexibility~~, as required in subsection (m) of this section~~; and

(ii) manholes on each side of the fault that would allow ~~so that~~ a portable pump ~~may~~ to be used to prevent unauthorized discharge in the event of a ~~wastewater~~ collection system failure.

(2) An owner shall not install a collection system service connection within 50 feet of an active fault.

(j) Capacity Requirements~~Capacity Analysis~~.

(1) An owner must ensure that a ~~wastewater~~ collection system's capacity is sufficient to serve the estimated future population of the area served by the project, including institutional, industrial, and commercial flows.

(2) An owner must include ~~in the report the~~ calculations in the report that demonstrate ~~that~~ the hydraulic capacity of a collection system, ~~includes~~ accounting for

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the peak flow of domestic ~~sewage~~wastewater, peak flow of waste from industrial sites, and maximum expected infiltration rates.

(3) An owner ~~collection system~~ must ~~be~~ ensure that the collection system has ~~designed to~~capacity to prevent a surcharge ~~in any pipe at the expected peak flow~~.

(4) An owner must ensure that a gravity pipe is at least 6.0 inches in ~~The minimum~~ diameter ~~allowed for a gravity pipe is 6.0 inches~~.

(5) Any connection between a stormwater collection system and a wastewater ~~Connecting storm water drains to a~~ collection system is prohibited.

(6) An owner may use the data from an existing collection system for design purposes. In the absence of existing data, a design must use data from a system with similar characteristics, including:

(A) location;

(B) inflow and infiltration characteristics;

(C) peak flows;

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(D) pipe materials;

(E) customer base; and

(F) any other characteristics required by the executive director.

~~system or as described in paragraph (7) of this subsection.~~

(7) New collection systems.

~~(A)~~ The sizing of pipe for a new collection system must be based on an engineering analysis of initial and future peak flow of domestic wastewater, peak flow of waste from industrial sites, and maximum expected infiltration rates~~flows~~, ~~.~~

~~(B) A new collection system design must be sized for the peak flow, which is~~ based on the estimated daily ~~sewage~~ wastewater flow contribution as shown in Figure: 30 TAC §217.32(a)(3), Table B.1 of this title (relating to Organic Loadings and Flows).

(k) Structural Analysis.

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(1) An owner must ensure that a collection system is designed to have a minimum structural life of 50 years.

(2) For flexible pipe used in a collection system, which is pipe that will deflect at least 2% without structural distress, ~~used in a collection system,~~ the report must include:

(A) live load calculations;

(B) allowable buckling pressure determinations;

(C) prism load calculations;

(D) wall crushing determinations;

(E) strain prediction calculations;

(F) calculations that quantify long term pipe deflection; ~~and~~

(G) ~~all information pertinent to a determination of an adequate design including, but not limited to:~~

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~~(i)~~ the method of determining the modulus of soil reaction for bedding material and in-situ material;

(H) ~~(ii)~~ pipe diameter and material with reference to appropriate standards;

(I) ~~(iii)~~ modulus of elasticity,

(J) ~~(iv)~~ tensile strength,

(K) ~~(v)~~ pipe stiffness or ring stiffness constant converted to pipe stiffness;

(L) ~~(vi)~~ Leonhardt's zeta factor;

(M) ~~(vii)~~ trench width;

(N) ~~(viii)~~ depth of cover;

(O) ~~(ix)~~ water table elevation; and

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(P) ~~(x)~~ unit weight of soil.

(3) ~~The design procedure dictates a minimum pipe stiffness.~~ For trench installations, the design must specify a minimum stiffness requirement to ensure ease of handling, transportation, and construction. Pipe stiffness must be related to the ring stiffness constant by the following equation:

Figure: 30 TAC §217.53(k)(3)

Equation B.1.

$$PS = C \times RSC \times \left(\frac{8.337}{D} \right)$$

Where:
PS = Pipe stiffness in pounds per square inch (psi)
C = Conversion factor, (0.80)
RCS = Ring stiffness constant
D = Mean pipe diameter in inches

(4) The owner is not required to perform the structural calculations in paragraphs 2 and 3~~Pipe that meet all the requirements in this paragraph~~, ~~are not required to perform the structural calculations in paragraph (3) of this subsection, provided~~if ~~that a~~the pipe is installed and tested in accordance with all other requirements of this subchapter and meets the all of the following:

(A) the pipe is installed using an open trench design;

(B) the pipe is flexible pipe with a pipe stiffness of 46 psi or greater;

(C) the pipe is buried 17 feet or less;

(D) the pips has diameter of 12 inches or less;

(E) the modulus of soil reaction for the in-situ soil is ~~of~~ 200 psi or greater;

(F) there are no effects on the ~~a~~ pipe due to live loads;

(G) the ~~a~~ unit weight of soil is ~~of~~ 120 pounds per cubic foot or less; ~~or~~ and

(H) the ~~a~~ pipe trench width is ~~of~~ 36 inches or greater.

(5) A design analysis for rigid pipe installations must be included in the report. ~~,~~ The design analysis must include ~~including~~ a structural analysis and ~~any~~ all

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details necessary to verify that the structural strength is sufficient to withstand the expected stresses. For rigid pipes~~conduits~~, the minimum strength for each class of pipe material and the appropriate standard must be included.

(l) Minimum and Maximum Slopes.

(1) All ~~wastewater~~ collection systems must contain slopes sufficient to allow a velocity ~~when flowing full of~~ not less than 2.0 feet per second when flowing at full capacity.

(2) When ~~Absent~~ site-specific data is not available, a collection system must be designed in accordance with the minimum and maximum slopes specified in this paragraph.

(A) The slopes ~~grades~~ shown in the following table are based on Manning's formula with an assumed "n factor" of 0.013 and are the minimum acceptable slopes.

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Figure: 30 TAC §217.53(l)(2)(A)

Table C.1 - Minimum and Maximum Pipe Slopes		
Size of Pipe*(inches)*	**Minimum Slope***(%)*	**Maximum Slope***(%)*
6	0.50	12.35
8	~~0.33~~0.335	8.40
10	0.25	6.23
12	0.20	4.88
15	0.15	3.62
18	~~0.11~~0.115	2.83
21	~~0.09~~0.095	2.30
24	0.08	1.93
27	~~0.06~~0.07	1.65
30	~~0.055~~0.06	1.43
33	~~0.05~~0.055	1.26
36	0.045	1.12
39	0.04	1.01
>39	*	*
* For pipes larger than 39 inches in diameter, the slope is determined by Manning's formula to maintain a velocity greater than 2.0 feet per second and less than 10.0 feet per second when flowing full.		

(i) The minimum acceptable "n" value for design ~~and construction~~ of minimum pipe slopes is 0.013.

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(ii) The "n" value must take into consideration the slime, grit, and grease layers that will affect hydraulics or hinder flow as a pipe ages.

(B) If a velocity greater than 10 feet per second will occur when a pipe flows full, based on Manning's formula, shown in the following figure, using the ~~and an~~ "n" value for new pipe as recommended by the manufacturer~~of 0.013~~, ~~special provisions~~the collection system -must designed to protect against pipe and bedding displacement.

Figure: 30 TAC §217.53(l)(2)(B)

Equation C.2. Manning's Formula.

$$V = \frac{1.49}{n} \times R_h^{0.67} \times \sqrt{S}$$

Where:
V = velocity (ft/sec)
n = Manning's roughness coefficient (0.013)
R_h = hydraulic radius (ft)
S = slope (ft/ft)

(m) Alignment.

(1) Alignment Requirements. A gravity collection system must be laid with a uniform grade ~~between manholes.~~ and straight alignment between manholes, if

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possible. All deviations from uniform grade and straight alignment must be justified in the report.

(2) Prohibited Deviations.

~~(2) The report must justify any deviation from straight alignment by complying with the requirements of this section.~~

(A~~3~~) Deviation from uniform grade (e.g., grade breaks or vertical curves) without manholes is prohibited if the open cut construction method is used ~~and with open cut construction is prohibited~~.

(B) A construction method that bends a pipe is prohibited.

(C) A construction method that bends a pipe joint is prohibited, unless the joints are offset less than the least of the following:

(i) five degrees;

(ii) 80% of the manufacturer's recommended maximum joint offset; or

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(iii) 80% of the appropriate ASTM, AWWA, ANSI, or other nationally established standard for joint offset.

(~~4~~3) Calculations and Plan Drawings. The calculations for horizontal pipe offset ~~curvature~~ at the joints ~~and the detail of the proposed curvature on the plans~~ must be included in the report. Details of the proposed curvature must be displayed on the plan drawings.

~~(5) A construction method that flexes a pipe joint is prohibited, unless a joint deflection meets the least of the following:~~

~~(A) equal to 5 degrees;~~

~~(B) less than or equal to 80% of the manufacturer's recommended maximum deflection; or~~

~~(C) 80% of the appropriate ASTM, AWWA, ANSI, or other nationally established standard for joint deflection.~~

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(~~6~~4) Manhole Spacing. The maximum allowable manhole spacing for collection systems with horizontal curvature at the joints is 300 feet. A manhole must be at the point of curvature and the point of termination of a curve.

(n) Inverted Siphons and Sag Pipes.

(1) A sag pipe must include:

(A) two or more barrels;

(B) a minimum pipe diameter of 6.0 inches; and

(C) the necessary appurtenances for convenient and routine flushing and maintenance.

(2) A manhole must include adequate clearance for rodding and cleaning.

(3) Sag pipes must be sized and designed with sufficient head to achieve a velocity of at least 3.0 feet per second at initial and design flows.

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(4) The arrangement of inlet and outlet details must divert the normal flow to one barrel.

(5) A portion of the collection system with the inverted siphon ~~system~~ must allow any barrel to be temporarily taken out of service for cleaning.

(6) Provisions must be made to allow cleaning across each bend with equipment available to the entity operating the collection system.

(7) A sag pipe must be designed to prevent ~~minimize~~ nuisance odors.

(8) Inverted siphons and sag pipes must be pressure tested according to the requirement of §217.57 of this title (relating to Testing Requirements for Installation of Gravity Collection System Pipes).

(o) Bridged Sections.

(1) Piping~~Pipe~~ with restrained joints or monolithic pipe across a bridged section requires a manhole on each end.

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(2) A bridged section must withstand the hydraulic forces, including buoyancy, applied by the occurrence of a 100-year flood event. ~~for a collection system site, including buoyancy.~~

(3) A bridged section must be capable of withstanding impacts from debris.

(4) Bank sections must be stabilized to prevent erosion.

(5) Bridge supports must be designed to ensure that a pipe has adequate grade, slope, and structural integrity.

§217.54. Criteria for Laying Pipe.

(a) Pipe Embedment.

(1) A rigid pipe must be laid with ~~the adequate~~ bedding, haunching, and initial backfill ~~to~~ that will meet the appropriate standards and ~~support~~ will support the anticipated load. The bedding classes that are allowed are A, B, or C, as described in American Society for Testing and Materials (ASTM) C 12, American National Standards

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Institute (ANSI) A 106.2,Water Environment Federation Manual of Practice No. 9, or American Society of Civil Engineers (ASCE) MOP 37.

(2) A flexible pipe must be laid with ~~the adequate~~ bedding, haunching, and initial backfill ~~to~~ that will meet the appropriate standards and will support the anticipated load. The bedding classes that are allowed are IA, IB, II, or III, as described in ASTM D-2321 or ANSI K65.171.

(3) Debris, large clods, ~~or~~ stones that are greater than six inches in diameter, organic matter, ~~or~~ and other unstable materials are prohibited as bedding, haunching, or initial backfill.

(4) Backfill must not disturb the alignment of a collection system pipe.

(5) If ~~trenching encounters significant~~ a fracture, fault zone~~s~~, cave~~s~~, or solutional modification to the rock strata that would prevent pipe bedding is encountered during construction, an owner must halt construction until an engineer prepares a written report detailing how construction will accommodate these site conditions.

(b) Compaction.

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(1) Compaction of ~~an~~ the pipe embedment ~~envelope~~ must meet the manufacturer's recommendations for the collection system ~~pipe~~ pipes used in a project.

(2) Compaction of ~~an embedment envelope~~the pipe embedment must provide the modulus of soil reaction for the bedding material necessary to ensure a ~~wastewater~~ collection system pipe's structural integrity as required by §217.53 of this title (relating to Pipe Design).

(3) The placement of the backfill above a pipe must not affect the structural integrity of a pipe.

(c) ~~Envelope Size~~Embedment Thickness.

(1) A minimum clearance of 6.0 inches below and on each side of the bell of all pipes to the trench walls and floor is required.

(2) The embedment material used for haunching and initial backfill must be installed to a minimum depth of 12 inches above the crown of a pipe.

(d) Trench Width.

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(1) The width of a trench must allow a pipe to be laid and jointed properly and must allow the backfill to be placed and compacted as needed.

(2) The maximum and minimum trench width needed for safety and a pipe's structural integrity must be included in the report.

(3) The width of a trench must allow ~~be sufficient to properly and safely place and compact~~proper and safe placement and compaction of haunching materials in accordance with the standards in §217.54(a).

(4) The space between a pipe and a trench wall must be wider than the compaction equipment used in the pipe zone.

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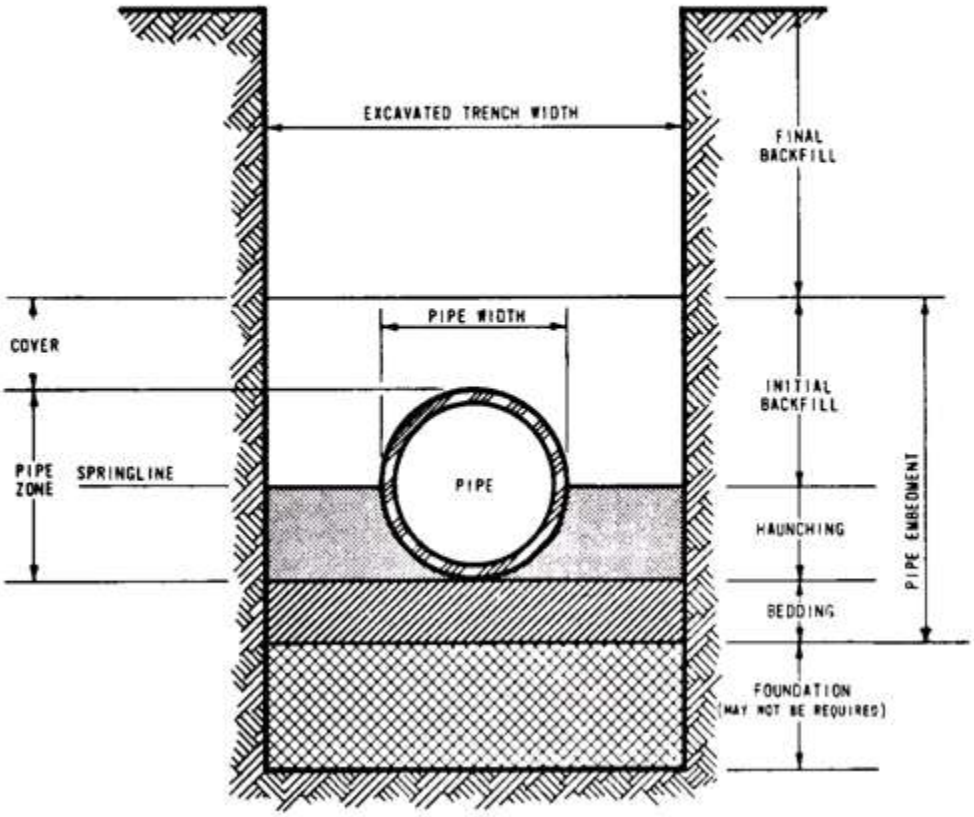
Figure: 30 TAC §217.54(d)(4)

TRENCH CROSS-SECTION SHOWING TERMINOLOGY



§217.55. Manholes and Related Structures.

(a) An owner must include manholes in a ~~wastewater~~ collection system at:

(1) all points of change in alignment, grade, or size;

(2) at all ~~the~~ intersections of ~~all~~ collection system pipes; and

(3) at the end of all pipes that may be extended at a future date.

(b) Manholes placed at the end of a ~~wastewater~~ collection system pipe that may be extended in the future must include pipe stub outs with plugs.

(c) A clean~~-~~out with watertight plugs may be installed in lieu of a manhole at the end of a ~~wastewater~~ collection system pipe if no extensions are anticipated.

(d) Cleanout installations must pass all applicable testing requirements outlined for gravity collection pipes in §217.57 of this title (relating to Testing Requirements for Installation of Gravity Collection System Pipes).

(e) A manhole must be made of monolithic, cast-in-place concrete, fiberglass, pre-cast concrete, high-density polyethylene, or ~~equivalent~~ other material ~~that provides adequate structural integrity~~designed to withstand the anticipated live and static loads.

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(f) The use of bricks to adjust a manhole cover to grade or construct a manhole is prohibited.

(g) Manholes may not be spaced no ~~further~~farther apart along the pipeline than the distances specified in the following table for a ~~wastewater~~ collection system ~~with straight alignment and uniform grades,~~ unless the executive director grants a variance in writing, based on the availability of cleaning equipment that is capable of servicing greater distances. ~~is granted by the executive director.~~

Figure: 30 TAC §217.55(g)

Table C.2. - Maximum Manhole Spacing	
Pipe Diameter*(inches)*	**Maximum Manhole Spacing***(feet)*
6-15	500
18-30	800
36-48	1000
54 or larger	2000

(h) Tunnels are exempt from manhole spacing -requirements~~requirements because of construction constraints~~.

~~(i) An intersection of three or more collection pipes must have a manhole.~~

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(~~j~~i) A manhole must not be located in a stream bed or where inundation may occur. ~~in the flow path of a watercourse, or in an area where ponding of surface water is probable.~~

(j~~k~~) The inside diameter of a manhole must be no less than 48 inches. A manhole diameter must be sufficient to allow personnel and equipment to enter, exit, and work in the manhole, and to allow proper joining of the collection system pipes in the manhole wall.

(k~~l~~) Manholes must meet the following requirements for covers, inlets, and bases.

(1) Manhole Covers.

(A) A manhole where personnel entry is anticipated requires a clear opening with at least a 30 inch diameter ~~clear opening~~.

(B) A manhole located within a 100-year flood plain must be gasketed and bolted down to prevent ~~have a means of preventing~~ inflow.

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(C) A manhole cover ~~construction~~ must be constructed of impervious material with no holes, unless the design includes an inflow prevention device.

(D) A manhole cover that is located in a roadway must meet or exceed the American Association of State Highways and Transportation Officials standard M-306 for load bearing.

(E) The report must specify an appropriate national reference standard for manhole gaskets.

(2) Manhole Inverts.

(A) The bottom of a manhole must contain a U-shaped channel that is a smooth continuation of the inlet and outlet pipes.

(B) A manhole connected to ~~a~~ pipes less than 15 inches in diameter must have a channel depth equal to at least half the largest pipe's diameter.

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(C) A manhole connected to ~~a pipe~~a pipe that is at least 15 inches in diameter but not more than 24 inches in diameter must have a channel depth equal to at least three-fourths of the largest pipe's diameter.

(D) A manhole connected to a pipe that is greater than 24 inches in diameter must have a channel depth equal to at least the largest pipe's diameter.

(E) ~~A manhole~~In a manhole with pipes of different sizes, ~~must have~~ the tops of ~~the~~ all the pipes ~~at the same~~must be at the same elevation and flow channels in the invert ~~sloped on an even slope from~~must be sloped evenly from pipe to pipe.

(F) A bench provided above a channel must slope at a minimum of 0.5 inch per foot.

(G) A manhole~~n~~ invert must be filleted to prevent solids from being deposited if a ~~wastewater~~ collection system pipe enters a manhole higher than 24 inches above a manhole invert.

(H) A ~~wastewater~~ collection system pipe entering a manhole more than 24 inches above an invert must have a drop pipe.

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(l~~m~~) ~~The inclusion of s~~Steps are prohibited in a manhole ~~is prohibited~~.

(m~~n~~) Connections. A manhole-pipe connection must use watertight, size-on-size resilient connectors that allow for differential settlement and must conform to American Society for Testing and Materials C~~-~~ 923.

(n~~o~~) Venting.

(1) An owner must ensure that the collection system is vented at least every 1,500 feet.

~~An owner must use an alternate means of venting if manholes are at more than 1,500 foot intervals and gasketed manhole covers are required for more than three manholes in sequence.~~ (2) Vents ~~must meet the following requirements:~~

~~(1) Vent design~~ must be designed to minimize inflow and ~~;~~

~~(2) Vents~~ must be located above a 100-year flood event elevation.~~;~~ ~~and~~

(3~~3~~) Tunnels must be vented in compliance with this subsection.

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(o~~p~~) Cleanouts. ~~The size of a~~A cleanout diameter must be ~~be~~ at least equal to ~~to~~ the ~~size~~ diameter of the ~~wastewater collection system main~~pipe to which it is attached.

§217.56. Trenchless Pipe Installation.

(a) ~~The following trenchless~~Trenchless technologies that may be used for installation of new ~~wastewater~~ collection system pipe include impact moling, pipe ramming, and microtunneling.~~:~~

(1) I~~i~~mpact moling ~~, which~~ is a technique that launches a percussive soil displacement hammer (mole) from an excavation to displace soil and form a bore. The new pipe is drawn behind the mole or pulled into the bore using the hammer's reverse action. A pneumatically driven mole displaces the soil by the action of a percussive piston.~~;~~

(2) P~~p~~ipe ramming is~~, which is~~ a ~~simple~~ technique using a pneumatic hammer to drive steel casings through the ground from one pit to another.~~; or~~

(3) M~~m~~icrotunneling ~~, which~~ is a remotely controlled mechanical tunneling system where the spoil is removed from the cutting head within the new pipeline, which is advanced by pipe jacking. The cutting head must have the appropriate

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cutting tools and crushing devices for the range of gravels, sands, silts, and clays that may be found at the collection system site.

(b) ~~The following~~ ~~t~~Trenchless technologies ~~may be~~ used for replacement of ~~wastewater~~ collection system pipe include pipe bursting, pipe splitting, and pipe eating.~~:~~

(1) ~~p~~Pipe bursting ~~, which~~ is a method of on-line replacement of fracturable pipe. An expanding device, either pneumatic or hydraulic, is introduced into the defective pipeline, shattering the pipe and drawing in the new pipe behind it. Insertion of short lengths may be made from pits but this involves jointing of the pipeline within the pit.~~;~~

(2) ~~p~~Pipe splitting~~, which~~ is similar in technique to pipe bursting, but is used on non-fragmental pipes such as steel, ductile iron, or polyethylene. The system uses specialized splitting heads designed to cut through the pipe wall and joints and expand the existing pipe into the surrounding ground.~~; or~~

(3) ~~p~~Pipe eating~~, which~~ is an on-line microtunneled replacement technique. The existing defective pipeline is crushed (or eaten), by the tunneling machine and removed through the new pipeline. It is used predominantly on concrete sewer installations. This system allows for size replacement and upsizing.

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(c) ~~The following t~~Trenchless technologies ~~may be~~ used for lining ~~of~~ existing ~~wastewater~~ collection system pipes include cement mortar lining, epoxy spray lining, cure in place pipe, and sliplining. These technologies reduce the inside diameter of a pipe.~~e, which reduces the inside diameter of the pipe:~~

(1) ~~e~~Cement mortar lining ~~, which~~ is the application of a cement mortar (typically about four millimeters thick) to the inside of a pipe to protect the pipe against corrosion.~~;~~

(2) ~~e~~Epoxy spray lining ~~, which~~ is a method of lining pipes with a thin lining of resin (typically about one millimeter thick), which ~~that~~ is sprayed onto the interior surface of a cleaned collection system pipe to isolate the pipe from the wastewater and possibly reinforce the structural capabilities of the pipe.~~;~~

(3) ~~e~~Cure in place pipe ~~, which~~ is a method of lining existing pipe with a flexible tube impregnated with a resin that produces a pipe inside a pipe after the resin cures. The resin may be set by the use of heat or ultraviolet light.~~; or~~

(4) ~~s~~Sliplining~~, by which~~ is a continuous or discreet pipe~~s are~~ inserted within an existing pipe~~s~~.

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(d) ~~Any~~ All other trenchless methods ~~method~~ of installing, replacing, or repairing collection system pipe are ~~is~~ nonconforming technologies ~~technology and~~ subject to the requirements of §217.7(b) of this title (relating to Types of Plans and Specifications Approvals).

(e) A ~~wastewater~~ collection system using a trenchless technology must be designed, installed, and constructed in accordance with American Society for Testing and Materials (ASTM) or American Water Works Association (AWWA) standards with reference to materials used and construction procedures. In the absence of ASTM or AWWA standards, the executive director review may be based upon other recognized standards used ~~utilized~~ by industry engineers.

(f) The report must include the following:~~;~~

(1) the trenchless method;

(2) the type of pipe;

(3) the type(s) of soil;

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(4) the pipe length and diameter;

(5) the pipe slope;

(6) the method for disconnecting and reconnecting lateral and service connections;

(7) the provisions for flow bypass for existing system; and

(8) the pipe standard.

~~(g) The method for disconnecting and reconnecting lateral and service connections must be included in the report.~~

(~~h~~g) ~~Pipe~~ Collection system pipe that is installed ~~by~~ using a trenchless technology is subject to the testing requirements in §217.57 of this title (relating to Testing Requirements for Installation of Gravity Collection System Pipes) and §217.68 of this title (relating to Force Main Testing~~Force Main Testing~~).

§217.57. Testing Requirements for Installation of Gravity Collection System Pipes.

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(a) For a collection system pipe that will transport wastewater by gravity flow, the design must specify an infiltration and exfiltration test or a low-pressure air test. ~~A~~The test must conform to the following requirements:

(1) Low Pressure Air Test.

(A) A low pressure air test must follow the procedures described in American Society For Testing And Materials (ASTM) C~~-~~828, ASTM C~~-~~924, or ASTM F~~-~~1417 or other procedure approved by the executive director. The ~~, except as to~~ testing times ~~as required~~listed in Table C.3 in subparagraph (B)(ii) of this paragraph or Equation ~~3.e~~C.3 in subparagraph (C) of this paragraph must be used, regardless of the testing procedure.

(B) For sections of collection system pipe less than 36 inch average inside diameter, the following procedure applies, ~~must apply,~~ unless a pipe is to be tested as required by paragraph (2) of this subsection.

(i) A pipe must be pressurized to 3.5 pounds per square inch (psi) greater than the pressure exerted by groundwater above the pipe.

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(ii) Once the pressure is stabilized, the minimum time allowable for the pressure to drop from 3.5 psi gauge to 2.5 psi gauge is computed from the following equation:

Figure: 30 TAC §217.57(a)(1)(B)(ii)

Equation C.3.

$$T = \frac{(0.085 \times D \times K)}{Q}$$

Where:
T = time for pressure to drop 1.0 pound per square inch gauge in seconds
K = 0.000419×~~H~~D×~~H~~L, but not less than 1.0
D = average inside pipe diameter in inches
L = length ~~of same~~ of pipe line ~~size being tested~~, in feet
Q = rate of loss, 0.0015 cubic feet per minute per square foot internal surface

(C) Since a K value of less than 1.0 may not be used, the minimum testing time for each pipe diameter is shown in the following table:

Figure: 30 TAC §217.57(a)(1)(C)

Table C.3. - Minimum Testing Times for Low-Pressure Air Test			
Pipe Diameter *(inches)*	**Minimum Time** *(seconds)*	**Maximum Length for Minimum**	**Time for Longer Length***(seconds/foot)*

		Time*(feet)*	
6	340	398	0.855
8	454	298	1.520
10	567	239	2.374
12	680	199	3.419
15	850	159	5.342
18	1020	133	7.693
21	1190	114	10.471
24	1360	100	13.676
27	1530	88	17.309
30	1700	80	21.369
33	1870	72	25.856

(D) An owner may stop a test if no pressure loss has occurred during the first 25% of the calculated testing time.

(E) If any pressure loss or leakage has occurred during the first 25% of a testing period, then the test must continue for the entire test duration as outlined above or until failure of the test.

(F) ~~Wastewater~~ Collection system pipes with a 27 inch or larger average inside diameter may be air tested at each joint instead of following the procedure outlined in this section.

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(G) A testing procedure for a pipe with an inside diameter greater than 33 inches must be approved by the executive director.

(2) Infiltration/Exfiltration Test.

(A) The total exfiltration, as determined by a hydrostatic head test, must not exceed 10 ~~50~~ gallons per inch of diameter per mile of pipe per 24 hours at a minimum test head of 2.0 feet above the crown of a pipe at an upstream manhole, or at least two feet above the existing groundwater level, whichever is greater.

(B) An owner shall use an infiltration test in lieu of an exfiltration test when pipes are installed below the groundwater level.

~~(C) The total exfiltration, as determined by a hydrostatic head test, must not exceed 50 gallons per inch diameter per mile of pipe per 24 hours at a minimum test head of two feet above the crown of a pipe at an upstream manhole, or at least two feet above existing groundwater level, whichever is greater.~~

~~(D) For construction within a 25-year flood plain, the infiltration or exfiltration must not exceed 10 gallons per inch diameter per mile of pipe per 24 hours at the same minimum test head as in subparagraph (C) of this paragraph.~~

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(~~E~~C) If the quantity of infiltration or exfiltration exceeds the maximum quantity specified, an owner shall ~~undertake~~ take remedial action in order to reduce the infiltration or exfiltration to an amount within the limits specified by Equation C.3 of this section before putting the system into service. An owner shall retest a pipe following a ~~remediation~~ remedial action according to the requirements of this chapter.

(b) If a gravity collection system pipe is composed of flexible pipe, deflection testing is also required. ~~The following procedures must be followed:~~

(1) For a collection system pipe with an inside diameter less than 27 inches, deflection measurement requires a rigid mandrel.

(A) Mandrel Sizing.

(i) A rigid mandrel must have an outside diameter (OD) not less than 95% of the base inside diameter (ID) or average ID of a pipe, as specified in the appropriate standard by the American Society for Testing and Materials, ~~ASTMs,~~ American Water Works Association, UNI-BELL, or American National Standards Institute.~~, or any related appendix.~~

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(ii) If the~~a~~ mandrel ~~sizing~~ diameter is not specified in the ~~appropriate~~ standards~~standard~~, the mandrel must have an OD equal to 95% of the ID of a pipe. In this case, the ID of the pipe, for the purpose of determining the OD of the mandrel, must equal ~~be~~ the average outside diameter minus two minimum wall thicknesses for OD controlled pipe and the average inside diameter for ID controlled pipe.

(iii) All mandrel dimensions must meet the appropriate standard.

(B) Mandrel Design.

(i) A ~~rigid~~ mandrel must be constructed of a metal or a rigid plastic material that can withstand 200 psi without being deformed. Adjustable or flexible mandrels are prohibited.

(ii) A mandrel must have an odd number of runners or legs.

(iii) A mandrel must have nine or more ~~odd number of~~ runners or legs.

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(~~iii~~iv) The~~A~~ length of the mandrel's barrel section ~~length~~ must equal at least 75% of the inside diameter of the collection system ~~a~~ pipe.

(~~i~~v) Each ~~size~~ mandrel size must use a separate proving ring.

(C) Method Options.

~~(i) An adjustable or flexible mandrel is prohibited.~~

(~~ii~~i) An owner ~~A test~~ may not use television inspection as a substitute for a deflection test.

(~~iii~~ii) If requested, the executive director may approve the use of a deflectometer or a mandrel with removable legs or runners on a case-by-case basis.

(D) Trenchless Testing. The executive director may exempt pipe sections installed by trenchless technologies from mandrel testing.

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(2) For a gravity collection system pipe with an inside diameter of 27 inches and greater, other test methods approved by the executive director may be used to determine vertical deflection.

(3) A deflection test method must be accurate to within plus or minus 0.2% deflection.

(4) An owner shall not conduct a deflection test until at least 30 days after the final backfill.

(5) ~~Gravity c~~Collection system pipe deflection must not exceed ~~five percent (~~5~~%~~%~~)~~.

(6) If a pipe section fails a deflection test, an owner shall correct the problem and conduct a second test after the final backfill has been in place at least 30 days.

(7) An owner shall not use any mechanical pulling devices during deflection testing.

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(8) An owner shall include a certification in the ~~construction report or the~~ notice of completion required in §217.14 of this title (relating to Completion Notice), that the ~~wastewater~~ collection system passed the deflection tests.

(c) An owner of a gravity collection system must inspect the structural integrity ~~analysis~~ of the collection system under the direction of an engineer during the construction and testing phases of the project.

§217.58. Testing Requirements for Manholes.

(a) All manholes must pass a leakage test.

(b) An owner shall test each manhole, ~~(~~after assembly and before backfilling,~~)~~ for leakage. An owner must use ~~, separate and independent of the collection system pipes, by~~ hydrostatic exfiltration testing, vacuum testing, or any other method approved by the executive director. A manhole must be tested separate and independent of the collection system pipes.

(1) Hydrostatic Testing.

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(A) The maximum leakage rate for hydrostatic testing or any alternative test methods is 0.025 gallons per foot diameter per foot of manhole depth per hour.

(B) To perform a hydrostatic ~~exfiltration~~ test, an owner shall seal all wastewater pipes coming into ~~a~~ the manhole with an internal pipe plug, fill the manhole with water, and maintain the test for at least one hour.

(C) A test for concrete manholes may use a 24-hour wetting period before testing to allow saturation of the concrete.

(2) Vacuum Testing. An owner can perform vacuum testing according to either subparagraph A or B of this paragraph. If a manhole fails the vacuum test, the owner must repair the manhole according to subparagraph C of this paragraph before retesting the manhole.

(A) Texas Test

i. To perform a vacuum test, an owner shall plug all lift holes and exterior joints with a non-shrink grout and plug all pipes entering a manhole.

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~~(B)~~ii. Grout may not ~~No grout must~~ be placed in horizontal joints before testing.

~~(C)~~iii. Stub-outs, manhole boots, and pipe plugs must be secured to prevent movement while a vacuum is drawn.

~~(D)~~iv. An owner shall use a minimum 60 inch/lb torque wrench to tighten the external clamps that secure a test cover to the top of a manhole.

~~(E)~~v. A test head must be placed at the inside of the top of a cone section, and the seal must be inflated in accordance with the manufacturer's recommendations.

~~(F)~~vi. There must be a vacuum of 10 inches of mercury inside a manhole to perform a valid test.

~~(G)~~vii. A test does not begin until after the vacuum pump is off.

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~~(H)~~viii. A manhole passes the test if after 2.0 minutes and with all valves closed, the vacuum is at least 9.0 inches of mercury.

(B) ASTM Test. The owner may require manhole testing that meets the requirements of ASTM D1244-05a.

(C) If a manhole fails a vacuum test, grout must be applied to the exterior of the excavated manhole and the manhole must be retested in accordance with the requirements of this section.

§217.59. Lift Station Site Requirements.

(a) Site access.

(1) A lift station must be located in a ~~design must include an access road located in a dedicated~~ right-of-way or a permanent easement.

(2) A lift station site must be accessible by truck during all weather conditions, including a 25-year, 24 hour rainfall event.

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(2) A road surface used to access a lift station must have a minimum width of 12 feet. ~~and must be constructed for use in all weather conditions.~~

~~(3) A road surface must be above the water level caused by a 25-year rainfall event.~~

(b) Security.

(1) The design of a lift station, including all mechanical and electrical equipment, must restrict access by an unauthorized person.

(2) A lift station must include an intruder-resistant fence, or must be completely enclosed by an intruder-resistant enclosure approved by the executive director. ~~, or a lockable structure.~~

(A) An intruder-resistant fence or intruder-resistant enclosure must be locked at each access point.

(B) An intruder-resistant fence must be at least 8.0 feet tall, and the bottom of the fence must be close enough to surface grade to prevent human access.

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(C) An intruder-resistant fence must be constructed wood, concrete, masonry, or metal. Other materials may be used, but only if approved by the executive director.

(D) The top of an intruder-resistant fence must have at least three strands of barbed wire. The top of an intruder-resistant fence may have outwardly-directed iron bars spaced on four-inch centers instead of barbed wire, if approved by the executive director.

(3) Above-ground valves located in an intruder-resistant fence must be chained and locked to prevent unauthorized operation. A valve does not need to be chained if the valve is located below ground or if the valve is fully enclosed in an intruder-resistant enclosure designed to prevent unauthorized operation.

(c)

~~(3) An intruder-resistant fence must use a minimum of a6.0 feet high chain link, masonry, or board fence with at least three strands of barbed wireor 8.0 feet high chain link, masonry, or board fence with at least one strand of barbed wire.~~

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~~(c) Flood Protection. The design of a lift station, including all electrical and mechanical equipment, must be designed to withstand and operate during a 100-year flood event, including wave action.~~

~~(d)~~ Odor Control. ~~The design of a lift station must minimize potential odor. An owner shall include any design for odor control in the report.~~An owner shall implement odor control measures necessary to prevent a lift station from becoming a nuisance, based upon the potential of the lift station to generate hydrogen sulfide throughout the 50-year design life cycle of the collection system. An owner shall consider the source of potential odor, turbulence, residence time, and other factors that contribute odor at a lift station when selecting odor control measures.

§217.60. Lift Station, Wet Well, and Dry Well Designs.

(a) Pump Controls.

(1) A lift station pump must operate automatically, based on the water level in a wet well. Pump controls must be designed to prevent surcharges in the collection system and must be designed to prevent adverse effects on the operation of the wastewater treatment facility.

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(2) The location of a wet well water level mechanism must ensure that the mechanism is unaffected by currents, rags, grease, or other floating materials.

(3) A wet well water level mechanism must be accessible without entering the wet well.

(4) Wet ~~well~~ wells ~~controls~~ with a bubbler system require dual air supplies~~supply~~ and dual controls.

(5) Motor control centers must be mounted at least 4.0 inches above grade to prevent water intrusion and corrosion from standing water in the enclosure.

(6) Electrical equipment and electrical connections in a wet well or a dry well must meet National Fire Prevention Association 70 National Electric Code explosion prevention requirements, unless continuous ventilation is provided.

(7) Electronic wet well level control systems must also use a float switch or similar manual backup.

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(8) Wet well control settings must be designed to discourage septic conditions in a lift station.

(9) Wet well control settings must be designed to prevent overloading of downstream pipes and treatment units.

(b) Wet Wells.

(1) A wet well must be enclosed by watertight and gas tight walls.

(2) A penetration through a wall of a wet well must be gas tight.

(3) A wet well must not contain equipment requiring regular or routine inspection or maintenance, unless inspection and maintenance can be done without a person ~~staff~~ entering the wet well.

(4) A gravity pipe discharging to a wet well must be located so that the invert elevation is above the liquid level of a pump's "on" setting.

(5) Gate valves and check valves are prohibited in a wet well.

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(6) Gate valves and check valves may be located in a valve vault next to a wet well or in a dry well.

(7) Pump cycle time, based on peak flow, must equal or exceed those in the following table:

Figure: 30 TAC §217.60(b)(7)

Table C.4. - Minimum Pump Cycle Times	
Pump Horsepower	**Minimum Cycle Times***(minutes)*
< 50	6
50-100	10
> 100	15

(8) An evaluation of minimum wet well volume requires the following formula:

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Figure: 30 TAC §217.60(b)(8)

Equation C.5.

$$V = \frac{T \times Q}{4 \times 7.48}$$

Where:
V = Active volume (cubic feet)
Q = Pump capacity (gallons per minute)
T = Cycle time (minutes)
7.48 = Conversion factor (gallons/cubic foot)

(c) Dry well access.

(1) An underground dry well must be accessible for maintenance.

(2) A stairway in a dry well must use non-slip steps and conform to Occupational Safety and Health Administration regulations with respect to rise and run.

(3) A ladder in a dry well must be made of non-conductive material and be rated for the load necessary for staff and equipment to descend and ascend.

(d) Lift Station Ventilation.

(1) Passive Ventilation for Wet Wells.

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(A) Passive ventilation structures must include screening to prevent the entry of birds and insects to a wet well. The screening must be made of corrosion-resistant material.

(B) All mechanical and electrical equipment in a wet well with passive ventilation must be constructed in compliance with explosion requirements in the National Fire Protection Association 70 National Electric Code.

(C) A passive ventilation system must be sized to vent at a rate equal to the maximum pumping rate of a lift station, but not to exceed 600 feet per minute through a vent pipe.

(D) The minimum acceptable diameter for an air vent is 4.0 inches.

(E) All~~A~~ vent outlets ~~outlet~~ must be at least 1.0 foot above the ~~a~~ 100-year flood plain elevation.

(2) Mechanical Ventilation in Lift Stations.

(A) Dry Wells.

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(i) A dry well must use mechanical ventilation.

(ii) Ventilation equipment under continuous operation must have a minimum capacity of six ~~air exchanges per~~complete air exchanges per hour.

(iii) Ventilation equipment under intermittent operations must provide~~have~~ a minimum capacity of 30 ~~air exchanges per~~complete air exchanges per hour and be connected to the~~a~~ lift station's lighting system.

(B) Wet Wells.

(i) ~~A wet well must use continuous mechanical ventilation~~Mechanical ventilation systems for wet wells must operate continuously.

(ii) The ventilation equipment must be designed to provide~~have~~ a minimum ~~capacity~~ of 12 ~~air exchanges per~~complete air exchanges per hour and be constructed of corrosion-~~-~~resistant material.

(iii) ~~The design of a wet well must reduce odor potential in a populated area.~~ An owner shall implement odor control measures necessary to prevent a

wet well from becoming a nuisance, based upon the potential of the wet well to generate hydrogen sulfide throughout the 50-year design life cycle of the collection system. An owner shall consider the source of potential odor, turbulence, residence time, and other factors that contribute odor at a lift station when selecting odor control measures.

(iv) All mechanical and electrical equipment in a wet well with mechanical ventilation must be constructed in compliance with explosion requirements in the National Fire Protection Association 70 National Electric Code.

(e) Wet Well Slopes.

(1) A wet well floor must have a smooth finish and minimum slope of 10% to a pump intake.

(2) A wet well design must prevent deposition of solids, grease, and debris under normal operating conditions.

(3) A lift station with greater than 5.0 million gallons per day firm pumping capacity must have anti-vortex baffling.

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(f) Hoisting Equipment. A lift station must have permanent hoisting equipment or be accessible to portable hoisting equipment for removal of pumps, motors, valves, pipes, and other similar equipment.

(g) Valve Vault Drains. A floor drain from a valve vault to a wet well must prevent gas from entering a valve vault by including flap valves, "P" traps, submerged outlets, or a combination of these devices.

(h) Dry Well Sump Pumps.

(1) Pumps.

(A) A dry well must use dual sump pumps, each with a minimum capacity of 1,000 gallons per hour and capable of handling the volume of liquid pumped by the dry well pumps ~~generated~~ during peak pumping operations.

(B) A sump pump must have a submersible motor and watertight wiring.

(C) A dry well floor must slope toward the sump. ~~a~~A sump must include sump pumps sized for proper drainage.

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(D) The minimum sump depth is 6.0 inches. The sump must be designed to~~and must~~ prevent standing water from accumulating on a dry well floor under normal operation.

(E) A sump pump must operate automatically by use of a float switch or another ~~other~~ level-detecting device.

(2) Pipes.

(A) A sump pump must use ~~separate pipes~~independent piping that is capable of discharging more than the maximum liquid level of an associated wet well at a rate that will prevent overflow.

(B) A sump pump outlet pipe must be at least 1.5 inches in diameter and have at least two check valves in series.

§217.61. Lift ~~Left~~ Station Pumps.

(a) General Requirements. A raw wastewater pump, with the exception of a grinder pump, must:

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(1) be designed to prevent clogging;

(2) be capable of passing a sphere of 2.5 inches in diameter or greater; and

(3) have greater than 3.0 inch diameter suction and discharge openings.

(b) Submersible and Non-submersible Pumps.

(1) A non-submersible pump must have inspection and cleanout plates on both the suction and discharge sides of each pumping unit that facilitate locating and removing blockage-causing materials, unless the pump design accommodates easy removal of the rotation elements.

(2) A pump support for a submersible or non-submersible pump must prevent movement and vibration during operation.

(3) A submersible pump must use a rail-type pump support system with manufacturer-approved mechanisms designed to allow personnel to readily remove and replace any single pump without entering or dewatering the wet well.

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(4) Submersible pump rails and lifting chains must be constructed of a material that performs to at least the standard of Series 300 stainless steel.

(5) All lift station pumps and associated appurtenances must be designed to prevent the discharge of wastewater from the lift station and at all points in the upstream collection system.

(c) Lift Station Pumping Capacity. A lift station must have at least two pumps. The firm pumping capacity of a lift station must handle the ~~expected~~ peak flow.

(d) Pump Head Calculations.

(1) An owner must~~shall~~ select a pump based upon analysis of the system head and pump capacity curves. The owner must ~~that~~ determine the pumping capacities and pressure head requirements of a single pump operating alone, and with other pumps. ~~as the total dynamic head increases due to additional flows pumped through a force main.~~

(2) The report must include pipe head loss calculations, using the American National Standards Institute's Hydraulic Institute Standards~~,~~ pertaining to head losses through pipes, valves, and fittings~~, must be included in the report~~.

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(3) The report must include the ~~selected~~ friction coefficient (Hazen-Williams "C" value) used in friction head loss calculations. The selected friction coefficient must be based on the pipe material. ~~selected.~~

(4) For a lift station with more than two pumps, a force main in excess of one-half mile, or a lift station with a firm pumping capacity of 100 gallons per minute or greater, the report must include system curves ~~must be provided~~ for both the normal and peak operating conditions at friction coefficient values (C values) for the force main pipe~~proposed and existing pipe~~.

(e) Flow Control.

(1) A lift station or a transfer pumping station located at or discharging directly to a wastewater treatment facility ~~system~~ must have a peak pump capacity equal to or less than the peak ~~design~~ flow, unless equalization is provided.

(2) A wastewater treatment facility ~~system~~ with a peak flow that is greater than 300,000 gallons ~~gallon~~ per day must use three or more pumps at all lift stations discharging directly to the wastewater treatment facility, unless duplex, automatically controlled, variable capacity pumps are provided.

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(3) A wastewater treatment facility with a peak flow that is less than or equal to 300,000 gallons per day must use at least two pumps at each lift station discharging directly to the wastewater treatment facility.

(f) Self-Priming Pumps.

(1) A self-priming pump must be capable of priming without relying on~~reliance upon~~ a separate priming system, an internal flap valve, or any other external method~~means~~ for priming.

(2) A self-priming pump must use a suction pipe that produces flow with velocity of at least 3.0 feet per second but not more than 7.0 feet per second.~~,~~ A self-priming pump ~~and~~ must have ~~incorporate~~ its own suction pipe.

(3) A self-priming pump must vent air back into the wet well during priming.

(g) Vacuum-Priming Pumps.

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(1) A vacuum-primed pump must be capable of priming by using a separate positive priming system with a dedicated vacuum pump for each main wastewater pump.

(2) A vacuum-priming pump must produce~~use~~ a suction pipe velocity within a range of ~~at least~~ 3.0 feet per second to ~~but less than~~ 7.0 feet per second. A vacuum priming pump ~~and~~ must have its own suction pipe.

(h) Vertical Positioning of Pumps. A raw wastewater pump must maintain~~have~~ positive static suction head during normal on-off cycling.~~,~~ A~~except a~~ submersible pump with "no suction" pipes, a vacuum-primed pump, or a self-priming unit capable of satisfactory operation under any negative suction head anticipated for the lift station is not required to have positive static suction head during normal on-off cycling.

(i) Individual Grinder Pumps. A grinder pump is not subject to the requirements of this subchapter if:

(A) the grinder pump is not part of an alternative collection system as defined by this chapter;

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(B) the grinder pump only serves a single residential or commercial structure; and

(C) the structure served by the grinder pump is privately owned.

~~serving only one residential or commercial structure that is privately owned, maintained, and operated is not subject to the rules of this chapter.~~

(j) Pump for Low-Flow Lift Station. A pump used for a lift station with a peak flow of less than 120 gallons per minute must be submersible and include a grinder.

§217.62. Lift Station Pipes.

(a) Horizontal Pump Suctions.

(1) Each lift station pump must have a separate suction pipe that uses an eccentric reducer.

(2) Pipes in a wet well must have a turndown-type flared intake.

(b) Valves.

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(1) The discharge side of each lift station pump must be followed by a full-closing isolation valve and must also have a check valve.

(A) A check valve must be a swing type valve with an external lever or external position indicator to show its open and closed positions.

(B) An isolation~~A~~ valve must include an external~~a~~ position indicator to show its open and closed positions, unless a full-closing valve is a rising-stem gate valve.

(2) A grinder pump installation may use a rubber-ball check valve or a swing-type check valve.

(3) A butterfly valve, tilting-disc check valve, or any other valve using a tilting-disc in a ~~flow~~ pipe is prohibited.

(c) Pipes.

(1) A lift station pipe must have flanged or flexible connections to allow for removal of pumps and valves without interruption of the lift station operations.

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(2) Wall penetrations must allow for pipe flexure while excluding exfiltration or infiltration.

(3) Pipe suction velocities must be at least 3.0 feet per second but not more than 7.0 feet per second.

§217.63. Emergency Provisions for Lift Stations.

(a) A lift station must be designed to prevent the discharge of wastewater from the lift station and at all points in the upstream collection system during electrical power failures.

(b) A lift station must include an audiovisual alarm system. The audiovisual alarm system must transmit alarm conditions through use of an auto-dialer system, Supervisory Control and Data Acquisition (SCADA) system, or telemetering system connected to a continuously monitored location. At a minimum, the alarm system must automatically activate to give warnings for power outages, pump failures, and high water levels. Audiovisual alarms are not required if the SCADA system alerts the operator about communication loss, in addition to the alarm conditions.

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(c) An alarm system must include self-testing capability at the control panel.

~~(a)~~(d) An owner shall determine the reliability of the existing commercial power service for a lift station using records from the past 60 consecutive months from the appropriate electric utility. The entire record must be used if 60 months of records are not available. The owner must provide the power outage records and the reliability determination in the report. The records must:

(1) be in writing;

(2) be on the utility's letterhead and bear a signature of an electric utility employee;

(3) identify the location of the lift station;

(4) list the total number of outages that have occurred during the past 60 consecutive months; and

(5) indicate the date and duration of each recorded power outage.

(e) Systems for preventing the discharge of wastewater must be designed to operate for a duration at least equal to the longest power outage on record for the past

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60 months, or at least 20 minutes, whichever is longer. The design must consider peak flows, inflow, and infiltration.

(f) For calculation purposes, the owner must assume that the lift station wet well is full to the pump activation level when the power outage period begins.

(g) Systems for preventing discharge of wastewater may include any combination of alternate power sources, on-site generators, portable generators, gravity relief sewers, bypass pumps, collection system storage, spill containment structures, and other systems approved by the executive director.

(1) The system or combination of systems must accommodate the firm pumping capacity of the lift station.

(2) The use of collection system storage as a sole system for preventing discharge is prohibited.

(3) The use of a spill containment structure as a sole system for preventing discharge is prohibited.

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(4) Portable generators and pumps may only be used to guarantee service used if:

(A) a tested quick-connect mechanism or a transfer switch properly sized to connect to a portable generator is provided where the generator will be used; and

(B) a licensed operator that is knowledgeable in operation of the portable generators and pumps will be on call 24 hours per day every day.

(5) If portable generators and pumps are used to guarantee service, the report must include:

(A) the storage location of each generator and pump;

(B) the amount of time that will be needed to transport each generator or pump from the storage location to the furthest lift station that will be served by the generator or pump;

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(C) the number of lift stations for which each generator or pump is dedicated as a backup; and

(D) the type of routine maintenance and upkeep planned for each portable generator and pump to ensure that they will be operational when needed.

(h) Systems for preventing discharge of wastewater at a lift station must be permanent features of the lift station or must be deployable during any electrical power outage. Deployable systems must be operational before any unauthorized discharge occurs. The owner must describe how a temporary power system will be deployed and operated in the report, and must address deployment during all types of weather events that might reasonably cause power outage at the lift station.

(i) Spill containment structures must be able to be cleaned and must have an intruder-resistant fence that meets the requirements in §217.59(b) of this title (relating to Security). The report must include a detailed management plan for cleaning and maintaining each spill containment structure.

(j) A lift station must be fully accessible during a 25-year 24-hour rainfall event.

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(k) Lift station pump controls must prevent over-pumping and surcharge upon resumption of normal power after a power outage.

~~(a) A collection system lift station must be equipped with a tested quick-connect mechanism or a transfer switch properly sized to connect to a portable generator, if not equipped with an onsite generator.~~

~~(b) Lift stations must include an audiovisual alarm system and the system must transmit all alarm conditions through use of an auto-dialer system, Supervisory Control and Data Acquisition system, or telemetering system connected to a continuously monitored location.~~

~~(c) An alarm system must self-activate for a power outage, pump failure, or a high wet well water level.~~

~~(d) A lift station constructed to pump raw wastewater must have service reliability based on:~~

~~(1) Retention Capacity.~~

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~~(A) The retention capacity in a lift station's wet well and incoming gravity pipes must prevent discharges of untreated wastewater at the lift station or any point upstream for a period of time equal to the longest electrical outage recorded during the past 24 months, but not less than 20 minutes.~~

~~(B) For calculation purposes, the outage period begins when a lift station pump finished its last normal cycle, excluding a standby pump.~~

~~(2) On-Site Generators. A lift station may be provided emergency power by on-site, automatic electrical generators sized to operate the lift station at its firm pumping capacity or at the average daily flow, if the peak flow can be stored in the collection system.~~

~~(3) Portable Generators and Pumps.~~

~~(A) A lift station may use portable generators and pumps to guarantee service if the report includes:~~

~~(i) the storage location of each generator and pump;~~

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~~(ii) the amount of time that will be needed to transport each generator or pump to a lift station;~~

~~(iii) the number of lift stations for which each generator or pump is dedicated as a backup; and~~

~~(iv) the type of routine maintenance and upkeep planned for each portable generator and pump to ensure that they will be operational when needed.~~

~~(B) An operator that is knowledgeable in operation of the portable generators and pumps shall be on call 24 hours per day every day.~~

~~(C) The size of a portable generator must handle the firm pumping capacity of the lift station.~~

~~(e) Spill Containment Structures.~~

~~(1) The use of a spill containment structure as a sole means of providing service reliability is prohibited.~~

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~~(2) A lift station may use a spill containment structure in addition to one of the service reliability options detailed in this in subsection (a) of this section.~~

~~(3) The report must include a detailed management plan for cleaning and maintaining each spill containment structure.~~

~~(4) A spill containment structure must have a locked gate and be surrounded an intruder resistant fence that is 6.0 feet high chain link, masonry, or board fence with at least three strands of barbed wire or 8.0 feet high chain link, masonry, or board fence with at least one strand of barbed wire.~~

~~(f) A lift station must be fully accessible during a 25-year 24-hour rainfall event.~~

~~(g) Lift station system controls must prevent over-pumping upon resumption of normal power after a power failure. Backup or standby units must be electrically interlocked to prevent operation at the same time that other lift stations pumps are operating only on the resumption of normal power after a power failure.~~

§217.64. Materials for Force Main Pipes.

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(a) Force main pipe material must withstand the pressure generated by instantaneous pump stoppage due to power failure under maximum pumping conditions.

(b) The use of pipes ~~pipe~~ or fittings rated at a working pressure of less than 150 pounds per square inch is prohibited.

(c) Force main pipe materials ~~Pipe~~ must be identified in the specifications~~technical specifications~~ with the appropriate specification number for both quality control and installation from the American Society For Testing And Materials (ASTM), American National Standards Institute (ANSI), or American Water Works Association (AWWA).

(d) Pipe material specified for a force main must have an expected life equal to or longer than that of the lift station and must be non-corrosive.~~suitable for the material being pumped.~~

§217.65. Force Main Pipe Joints.

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(a) An underground force main pipe joint must include either push-on rubber gaskets or mechanical joints with a pressure rating equal to or greater than that of the force main pipe material.

(b) Exposed force main pipe joints must be flanged or flexible and adequately secured to prevent movement due to wastewater surges.

(c) American Society for Testing and Materials, American Water Works Association, or other widely accepted national reference standards ~~standard~~ for the joints must be included in the project specifications.

§217.66. Identification of Force Main Pipes.

(a) A detectable underground warning~~detector~~ tape must be laid in the same trench as a force main pipe. The detectable underground warning~~detector~~ tape must be located above and parallel to the force main.

(b) The detectable underground warning~~detector~~ tape must bear the label "PRESSURIZED WASTEWATER" continuously repeated in at least 1.5 inch tall letters.

§217.67. Force Main Design.

(a) Velocities.

(1) A force main must be a minimum of 4.0 inches in diameter, unless it is used in conjunction with a grinder pump station.

(2) For a lift station with two pumps~~duplex pump station~~, the minimum velocity is 3.0 feet per second with one pump in operation.

(3) For a lift ~~pump~~ station with three or more pumps:

(A) the minimum velocity in a force main is 2.0 feet per second with only the smallest pump operating at full speed~~in operation~~; and

(B) a minimum flushing velocity of 5.0 feet per second or greater must occur in a force main at least twice ~~once~~ daily.

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(4) The report must certify that a pipeline with a velocity greater than 6.0 feet per second can withstand high and low negative surge pressures in the event of sudden pump failure.

(b) Detention Time.

(1) ~~A~~ F~~f~~orce main detention time calculations must be included in the report.

(2) ~~The~~ F~~f~~orce main detention time calculations must be performed using a range of flow rates that represent the flows expected to be delivered to a force main by an upstream pump station during any 24-hour period.

(c) Water Hammer. A force main design must include effective surge control measures to manage pressure due to water hammer that may exceed the working strength of a force main pipe.

(d) Connection to Gravity Main.

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(1) A force main must terminate ~~in an appropriate structure and either~~ at a collection system manhole ~~on the wastewater collection system~~ or at a manhole or preliminary treatment unit at a wastewater treatment facility.

(2) The discharge end of a force main inside a manhole must be restrained to prevent movement ~~remain steady~~ and must produce non-turbulent flow.

(3) A ~~receiving wastewater~~ collection system receiving wastewater from a force main must be designed to accept the maximum pump discharge from the force main without surcharging.

(e) Pipe Separation. A separation distance between a force main and any water supply ~~water~~ pipe must meet the minimum separation requirements established in §217.53(d) of this title (relating to Pipe Design).

(f) Odor Control.

(1) A force main must terminate below a manhole invert with the top of the pipe matching the water level in the manhole at design flow.

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(2) A force main must be designed to abate ~~any~~ anticipated odor. An owner shall implement odor control measures necessary to prevent a collection system from becoming a nuisance, based upon the potential of the collection system to generate hydrogen sulfide throughout the 50-year design life cycle of the system.

(g) Air Release Valves in Force Mains.

(1) Any high point along the vertical force main alignment must include an air release valve or a combination of air release and air vacuum valves.

(2) An air release valve must have an isolation valve between the air release valve and the force main.

(3) An air release valve must be inside of a vault that is at least 48 inches in diameter and has a vented access opening of at least 30 inches in diameter.

(4) An air release valve must be made of corrosion-resistant material.

(h) Valves. A force main must have valves spaced at no more than 2,000 foot intervals to facilitate initial testing and subsequent maintenance and repairs.

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(i) Fatigue Life. The report must include calculations that show the strength of the force main pipe at the end of the 50 year design life. The calculations must consider the fluctuations between a pressurized and depressurized operating state.

(j) Alignment Changes.

(1) Bending a force main pipe is prohibited.

(2) Force main alignment changes must be accomplished using manufactured bend fittings.

(3) Force main pipe joints must include mechanical joint restraints or thrust blocks at all bends unless pipe vibration calculations justify the absence of a joint restraint or thrust block.

§217.68. Force Main Testing.

(a) The final plans and specifications must include the pressure testing procedures.

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(b) A pressure test must use 50 pounds per square inch above the normal operating pressure of a force main.

(c) A temporary valve for pressure testing may be installed near the discharge point of a force main and must be removed after a test is successfully completed.

(d) A pump isolation valve may be used as an opposite termination point.

(e) A test must involve filling a force main with water.

(f) A pipe must hold the designated test pressure for a minimum of 4.0 hours.

(g) The leakage rate must not exceed 10.0 gallons per inch of diameter per mile of pipe per day.

§217.69. Maintenance, Inspection, and Rehabilitation of the Collection System

(a) The owner of a collection system shall develop a maintenance and inspection program for its collection system with the assistance of an engineer and licensed operators. The owner is responsible for ensuring that the maintenance and inspection

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program includes all the information necessary to ensure efficient and safe operation, maintenance, inspection, and recordkeeping by the licensed collection system operators. The inspection program must include, at a minimum:

(1) a schedule for inspections, cleaning, and maintenance;

(2) methods for inspecting each unit within the collection system;

(3) methods for estimating the current condition and life expectancy of each unit; and

(4) a requirement to estimate the structural integrity of each collection system unit, including the thickness of the walls for all corrodible pipes, and the integrity of any coatings.

(b) The plans and specifications for a rehabilitation project must include, at a minimum:

(1) a surface preparation plan that includes:

(i) a cleaning plan to remove all contaminants;

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(ii) references for the cleaning method;

(iii) dewatering or bypassing provisions; and

(iv) field preparation and application logs;

(2) a plan for managing volatile chemicals and dust in confined spaces; and

(3) a requirement to follow the manufacturer's installation procedures and specifications;

(4) a requirement to re-inspect the rehabilitation project, including the underlayment and coating, between six months and 11 months after installation; and

(5) a requirement to re-inspect the rehabilitation project, including the underlayment and coating, 18 months after installation.

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(c) The owner must maintain records of all activities related to collection system inspection, maintenance, cleaning, and rehabilitation. The records must be made immediately available to the executive director upon request.

§217.70. ~~§217.69.~~ Reclaimed Water Facilities.

(a) In accordance with §217.6 of this title (relating to Submittal Requirements and Review Process), the design of a distribution system that will convey reclaimed water to a user must be submitted, reviewed, and approved in writing by the executive director before the distribution system may be used.

(b) A municipality may be the review authority in accordance with §217.8 of this title (relating to Municipality Reviews), and may approve a reclaimed water distribution system.

(c) A distribution system designed to transport Type II reclaimed water, as defined by §210.33(2) of this title (relating to Quality Standards for Using Reclaimed Water), must comply with Subchapter C of this chapter (relating to Conventional Collection Systems), as applicable to the project.

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(d) A distribution system designed to transport Type I reclaimed water, as defined by §210.33 (1) ~~§210.33~~ of this title (relating to Quality Standards for Using Reclaimed Water) ~~must meet the following requirements~~.~~:~~

(e)~~(1)~~ Type I reclaimed water gravity pipes must comply with §§217.53 - 217.55, 217.58, and 217.59 of this title (relating to Pipe Design; Criteria for Laying Pipe; Manholes and Related Structures; Testing Requirements for Manholes; and Lift Station Site Requirements).~~.~~

(1)~~(2)~~ Type I reclaimed water pipe ~~A~~ design must prevent pipe and bedding displacement. ~~.~~

(2)~~(3)~~ The design of a gravity Type I reclaimed water pipe must prevent the deposition of solids in the~~a~~ gravity pipe.

(f)~~(e)~~ Each appurtenance designed to handle reclaimed water must be identified in the plans and the report.

(1) An above-ground hose bib, spigot, or other hand-operated connection is prohibited, except ~~excepted~~ in secured areas of a wastewater treatment facility ~~facility~~ that are only accessible to authorized personnel. ~~trained staff has access to.~~

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(2) An underground hose bib must: ~~be:~~

(A) either be located in a locked, below-grade vault~~s~~, ~~and clearly labeled "NON-POTABLE WATER";~~ or be

~~(B)~~ operated only by a special tool in a non-lockable, underground service box~~es clearly labeled as non-potable water~~;

(B) be clearly labeled "NON-POTABLE WATER, DO NOT DRINK" and "NO BEBA EL AGUA";

(C) be purple; and

(D) be designed to prevent a connection to a standard water hose.

(3) Reclaimed water storage areas, hose bibs, and spigots ~~faucets~~ must include signs in both English and Spanish reading "NON-POTABLE WATER, DO NOT DRINK" and "NO BEBA EL AGUA."~~"NON-POTABLE WATER, DO NOT DRINK" and "El AGUA NO-POTABLE, NO BEBE."~~

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(f) Cross Connection Control and Separation Distances.

(1) A T~~t~~ype I reclaimed water pipe must be at least 4.0 feet from a potable water pipe, as measured from the outside surface of each of the respective pipes, unless a separation distance of less than 4.0 feet is justified in the report.

(2) A physical connection between a potable water pipe and a reclaimed water pipe is prohibited.

(3) Backflow prevention ~~An appurtenance~~ must be provided for all potable water connections to prevent any possibility of reclaimed water entering a drinking water system according to the requirements of §217.330 of this title (relating to Public Drinking Water Supply Connections).

(4) Where a 4.0 foot separation distance cannot be achieved, a reclaimed water pipe must meet the ~~following~~ requirements of subparagraph (4)(A) of this paragraph if the reclaimed water pipe runs parallel to the potable water pipe or subparagraph (4)(B) of this paragraph if the reclaimed water pipe crosses the potable water pipe. ~~:~~

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(A) If a new Type I reclaimed water pipe is installed parallel to an existing potable water pipe, the reclaimed water pipe must:

(i) be located below the potable water pipe and maintain a horizontal separation distance of no less than 3.0 feet; ~~with a potable water pipe at the same level or above a reclaimed water pipe;~~

(ii) have a minimum pipe stiffness of 115 pounds per square inch (psi) with compatible joints, or a pressure rating of 150 psi for both pipe and joints; and

(iii) be ~~is~~ embedded in cement stabilized sand that meets the requirements of subparagraph (4)(E) of this paragraph. ~~, if parallel to a potable water pipe, is placed in the same benched trench as a reclaimed water pipe; and~~

~~(iv) if cement-stabilized sand is used, the sand must:~~

~~(I) have a minimum of 10% cement, based on loose dry weight volume;~~

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~~(II) be a minimum of 6.0 inches above and one quarter of the pipe diameter on either side and below a reclaimed water pipe.~~

(B) If a new Type I reclaimed water pipe crosses a potable water pipe, the design of the reclaimed water pipe must: ~~New Type I Reclaimed Water Pipe - Crossing Pipes.~~

(i) ~~If a new Type I reclaimed water pipe is installed crossing an existing potable water pipe,~~ include one full segment of ~~a Type I~~ reclaimed water pipe that is ~~must be~~ centered on the ~~a~~ potable water pipe such that the joints of the reclaimed water pipe are equidistant from the center point of the potable water pipe;~~.~~

(ii) cross the potable water pipe at a point that is equidistant ~~A crossing of the two pipes must be centered~~ between the joints of the potable water pipe; and~~.~~

(iii) have a separation of at least six inches between the outsides of the pipes.

(C) A Type I reclaimed water pipe must have either a pressure rating of 150 psi for both pipe and joints or a pipe stiffness of at least 115 psi with compatible joints for a minimum distance of 4.0 feet in each direction, as measured

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perpendicularly from any point on the potable water pipe to the Type I reclaimed water pipe.

~~(D) The minimum distance between a reclaimed water pipe and any potable water pipe is 6.0 inches.~~

(D)~~(E)~~ All ~~Any~~ portions of reclaimed water pipe within 4.0 feet of a potable water pipe must be embedded in cement stabilized sand that: ~~.~~

(I) has a minimum content of 10% cement, based on loose dry weight volume;

(II) is installed a minimum of 6.0 inches above and one quarter of the pipe diameter on either side and below a reclaimed water pipe.

~~(F) The cement stabilized sand must comply with the requirements listed in subparagraph (A) of this paragraph.~~

(g) Site Selection of Type I Reclaimed Water Pump Stations. A design must comply with §217.59(a) - (c) of this title (relating to Lift Station Requirements).

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(h) Design of Type I Reclaimed Water Pump Stations. A design must comply with §§217.60(d) and (g), 217.61(d), and 217.62(a) and (c) of this title (relating to Lift Station, Wet Well, and Dry Well Designs; Lift Station Pumps; and Lift Station Pipes), and paragraphs (1) - (3) of this subsection.

(1) Pump Controls.

(A) All electrical equipment must be ~~operable during~~protected from a 100-year flood event and be protected from potential flooding from a wet well.

(B) Motor control centers must be mounted at least 4.0 inches above grade to prevent water intrusion and corrosion from standing water in the enclosure.

(2) Pumps.

(A) A pump support must prevent movement or vibration during operation.

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(B) A submersible pump must use a rail-type pump support incorporating manufacturer-approved mechanisms designed to allow an operator to readily remove and replace any single pump without first entering or dewatering the wet well.

(C) Submersible pump rails and lifting chains must be made of a material that is equivalent to Series 300 stainless steel at minimum.

(3) Pump Station Valves.

(A) The discharge side of each pump must include a check valve followed by a full-closing isolation valve.

(B) Check valves must be swing type with an external lever or external position indicator.~~.~~

(C) All valve types other than rising stem gate valves must include a position indicator to show its ~~their~~ open ~~or~~ and closed positions~~position~~.

(i) Force Main Pipe for Type I Reclaimed Water. A force main pipe for Type I reclaimed water must comply with sections §§217.54, 217.64, 217.65, 217.67(a) - (c) and

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(e), and 217.68 of this title (relating to Criteria for Laying Pipe; Materials for Force Main Pipes; Force Main Joints; Force Main Design; and Force Main Testing) and the following:

(1) A valve casing for an underground isolation valve must include "REUSE" or "NPW" cast into its lid.

(2) A force main pipe must either be purple in color or be contained in an 8.0 mils thick ~~millimeter~~ purple polyethylene sleeve conforming to American Water Works Association C105, Class C. ~~and~~ I~~i~~n-line isolation valves for reuse pipes must open clockwise to distinguish them from potable water isolation valves.

§217.71. ~~§217.70.~~ Storage Tanks for Reclaimed Water.

Ground level storage tanks and elevated storage tanks for reclaimed water must be designed, installed, and constructed in accordance with the American Water Works Association standards with reference to materials and construction practices, except for health-based standards strictly related to potable water storage and contact practices.

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SUBCHAPTER D: ALTERNATIVE COLLECTION SYSTEMS

§§217.90 – 217.100 ~~§§217.91 - 217.100~~

§217.90. Applicability.

This subchapter applies to the design, construction, operation, and testing standards for or alternative collection systems. Conventional collection systems and reclaimed water conveyance systems are covered in Subchapter C (relating to Conventional Collection Systems). This subchapter does not apply to individual private grinder pumps or septic tank effluent pumps that discharge directly into a conventional collection system and are not part of an alternative collection system.

§217.91. Edwards Aquifer.

An owner who plans to install an alternative ~~wastewater~~ collection system located over the recharge zone of the Edwards Aquifer, as "recharge zone" is defined in Chapter 213 of this title (relating to Edwards Aquifer), must design and install the alternative collection system in accordance with Chapter 213 of this title (relating to Edwards Aquifer) in addition to these rules.

§217.92. Component Sizing.

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(a) The components of an alternative collection system must be sized based on existing flow data from a ~~similar~~ system and service area with similar characteristics, if such data is available. Similar characteristics for sizing alternative collection systems include:

(A) location;

(B) inflow and infiltration characteristics;

(C) peak flows;

(D) pipe materials;

(E) customer base, including types of sources and percent contribution; and

(F) any other characteristics required by the executive director.

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(b) If flow data from a similar service area with a conventional ~~wastewater~~ collection system is used, the report must include the expected effects of inflow and infiltration on the peak flow of the system.

(c) Design and construction of an alternative ~~wastewater~~ collection system must minimize excess flows from inflow and infiltration.

(d) Roof drains, street drains, or other types ~~type~~ of drains ~~drain~~ that allow ~~permit~~ entrance of stormwater ~~storm water~~ into an alternative ~~a wastewater~~ collection system are ~~is~~ prohibited.

(e) In the absence of existing data, the sizing of on-site components in an alternative ~~wastewater~~ collection system must ~~use~~ be based on Figure: 30 TAC §217.32(a)(3), Table B.1 of this title (relating to Organic Loadings and Flows), in conjunction with the following equation:

Figure: 30 TAC §217.92(e)

Equation D.1.

$$Q = X \times (1 + B)$$

Where:

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Q = flow in gallons per day
X = per capita wastewater production in gallons per day
B = number of bedrooms

(f) Design of the off-site components must be based on the maximum flow rate expected, calculated using the following equation:

Figure: 30 TAC §217.92(f)

Equation D.2.

$$Q = (A \times N) + B$$ $$Q = A \times (N + B)$$

Where:
Q = Design flow rate (gallons ~~gallon~~ per minute)
A = Design coefficient, typically 0.5
N = Number of equivalent dwelling units ~~EDUs~~ served by the off-site component
B = Safety factor, assumed to be 20.0

(1) An equivalent dwelling unit (EDU) is assumed to have an occupancy of 3.5 people. For EDU populations ~~population~~ greater than 3.5, the following equation must be used:

Figure: 30 TAC §217.92(f)(1)

Equation D.3.

$$Q = (A_1 \times P) + B$$ $$Q = A_1 \times (P + B)$$

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Where:
Q = Design flow rate (gallon per minute)
A_1 = Derived from A in Figure: 30 TAC §217.92(f), Equation D.2, typically 0.15
P = Population to be served
B = Safety factor, assumed to be 20.0

(2) The safety factor, "B", may be adjusted if higher wastewater flows are anticipated. A discharge from commercial or institutional dischargers must be measured directly or calculated under this subsection.

§217.93. General Requirements.

(a) Except where specifically stated in this subchapter, the design of an alternative ~~wastewater~~ collection system must comply with the applicable requirements of Subchapter C of this chapter (relating to Conventional Collection Systems).

(b) An owner shall obtain from an engineer:

(1) an operation and maintenance manual ~~covering~~ that specifies the recommended operating procedures and maintenance practices for the alternative collection system; and

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(2) as-built drawings indicating the location of all on-site components of the alternative ~~wastewater~~ collection system.

(c) An owner shall certify by letter to the executive director that the requirements in subsection (b) of this section have been met. The letter must include the permit number and name(s) of the owner(s) of the associated wastewater treatment facility.

(d) An intersection of three or more collection pipes must have a manhole.

(e) A manhole must not be located in the flow path of a watercourse, or in an area where surface water accumulates. ~~ponding of surface water is probable.~~

~~**§217.94. Management.**~~

(f)~~(a)~~ An alternative collection system must discharge to a wastewater treatment facility that is permitted by the commission or to a collection system that flows to a permitted wastewater treatment facility.

(g) An alternative collection system owner shall develop and implement a maintenance and inspection program in accordance with §217.68 of this title (relating to Maintenance, Inspection, and Rehabilitation of the Collection System).

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~~(b) An owner of an alternative collection system shall comply with one of the following:~~

~~(1) An owner of an alternative wastewater collection system may operate the collection system and contract with another entity permitted by the commission for wastewater treatment; or~~

~~(2) An owner of an alternative collection system may contract for management and operation of the collection system with a public or private service provider and a permitted entity for treatment.~~

~~(A) A contract must address the responsibility for management and operation of the alternative collection system.~~

~~(B) An owner may terminate a contract at any time if the service provider's services are in conflict with the owner's requirements, the wastewater permit, the requirements of this chapter, or other commission requirements.~~

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~~(c) This section does not apply to grinder pumps or septic tank effluent pumps discharging directly into a conventional collection system.~~

§217.94. ~~§217.95.~~ Alternative Collection System Service Agreements.

(a) An alternative collection system service agreement must be executed between the alternative ~~a~~ collection system owner and each real ~~a~~ property owner served by the alternative collection system. The service agreement must authorize the collection system owner to place and maintain alternative collection ~~that allows for the placement and maintenance of~~ system components ~~located~~ on private property.

(b) The on-site components may be owned by the property owner or by the alternative collection system owner. An alternative collection system service agreement must specify which entity is responsible for the ~~proper~~ construction and ~~competent~~ maintenance of the on-site components.

(c) An alternative ~~A~~ collection system owner shall submit a copy of the ~~an~~ alternative collection system service agreement to the executive director with the summary transmittal letter required in §217.6~~(a)~~ of this title (relating to Submittal Requirements and Review Process), for the executive director to review.

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(d) An alternative collection system service agreement must include: ~~the following provisions.~~

(1) a requirement that the alternative collection system owner shall ensure that all ~~Any~~ existing alternative collection system components and ~~component or~~ building laterals ~~lateral~~ that will ~~is to~~ be incorporated into a new~~,~~ or altered ~~expanded or materially altered~~ alternative collection system must be cleaned, inspected, tested, repaired, modified, or replaced, as necessary, to the satisfaction of the ~~a~~ collection system owner before connecting ~~connection of~~ the alternative collection system component to the collection system;~~.~~

(2) a requirement that the alternative collection system owner shall approve all materials and equipment before incorporating the materials and equipment into any construction or repair of an alternative collection system component;~~.~~

(3) a requirement that the alternative collection system owner shall have an engineer inspect and approve the installation of all alternative collection system components in a new or altered potion of an alternative collection system before placing the system into service;~~.~~

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(4) a provision that the alternative collection system owner shall have access at all reasonable times to inspect on-site alternative collection system components;.

(5) a provision that the alternative collection system owner has the right to make an emergency repair and perform emergency maintenance to any alternative collection system component, including building laterals and utility-owned on-site collection system components;.

(6) a statement of whether the alternative collection system owner or the property owner is responsible for non-emergency maintenance of on-site components;

(7) a statement of whether the alternative collection system owner or the property owner is responsible for paying repair and maintenance costs for on-site components, or how the costs to each party will be determined if responsibility is shared; The cost of any such repair or maintenance may be charged to the owner of the property, as determined in the service agreement.

(8)(6) a statement of whether the collection system owner or the property owner is responsible for paying the electrical power cost of operating an on-site component, or how the costs to each party will be determined if responsibility is shared;

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~~For an alternative collection system design with any component that uses power, the service agreement must state which entity, the property owner or the collection system owner, is responsible for power costs.~~

(9) a schedule of payment and method for recovering costs the property owner is responsible for paying;

(10) a provision that authorizes the alternative collection system owner to inspect and approve pretreatment units before installation;

~~(7) The ownership and responsibility for the operation and maintenance of an alternative collection system must be agreed to by the collection system owner and the property owner.~~

~~(A) An agreement must provide:~~

~~(i) to whom the cost of any repair or maintenance will be charged;~~

~~(ii) a means to determine the cost of any repair or maintenance;~~

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~~(iii) a schedule of payment; and~~

~~(iv) a methodology to recover costs.~~

~~(B) An agreement must grant the collection system owner:~~

~~(i) a right to inspect and approve the installation of any pre-treatment unit;~~

~~(ii) access for inspection and maintenance; and~~

~~(iii) a right to make an emergency repair or perform emergency maintenance when required to protect the integrity or operation of the alternative collection system.~~

(11) ~~(8)~~ a requirement that an ~~Any~~ on-site component owned by the collection system owner must have an upstream isolation valve;~~.~~

(12) ~~(9)~~ a requirement that an ~~Any~~ on-site component ~~component owned by the owner of the property serviced by a collection system~~ must have a service

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isolation valve located downstream on a service pipe from an on-site component to the collection system;.

(13) (10) a provision that A service isolation valves valve must be accessible to the alternative collection system owner at all times, through an easement or other legal agreement or contract between granted by the property owner to the collection system owner; and.

(14) (11) a provision that the alternative A collection system owner shall have the ability to collect, transport, and dispose of any residual material.

§217.95. §217.96. Small Diameter Effluent Sewers.

(a) Interceptor tank design. Septic tanks used as interceptor tanks must be designed and constructed according to in accordance with §285.32(b)(1) of this title (relating to Criteria for Sewage Treatment SystemsSeptic Tanks).

(1) An outlet of an interceptor tank must have a commercially available effluent filter designed to remove particles larger than 1/16 inch.

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(2) The volume of an equivalent dwelling unit (EDU) interceptor tank must be based on the criteria in Chapter 285 of this title (relating to On-Site Sewage Facilities).

(3) The volume of a multiple equivalent dwelling unit (MEDU) interceptor tank ~~tanks size~~ must be calculated using the following equations:

Figure: 30 TAC §217.96(a)(3)

Equation D.4.

$$VT = VR + VN$$

Where:
VT = Total Volume
VR = Reserve Volume = 0.75 x average daily flow (ADF)
VN = Nominal Volume

Equation D.5.

$$VN = VIE + VCZ + VSO$$

Where:
VIE = Volume in gallons between elevation of a tank inlet and a tank outlet (≤0.165 ~~average daily flow (~~ADF~~)~~)
VCZ = Volume in gallons of the clear zone between maximum sludge depth and scum accumulation (1.0 ADF)
VSO = Volume in gallons dedicated to scum and sludge storage (1.85 ADF)

(b) Pre-treatment units.

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(1) An MEDU must provide a method for trapping and removing fats, oils, and grease (FOG) from the wastewater before the wastewater enters an interceptor tank.

(2) A pretreatment unit must have at least two compartments.

(3) The primary compartment volume must equal at least 60% of the total tank volume.

(4) Construction of a grease trap must meet the same requirements as an interceptor tank with regard to water tightness, materials of construction, and access to contents.

(5) FOG retention capacity, in pounds, must be ~~equal to~~ at least twice the pretreatment unit's flow capacity, in gallons per minute. The FOG retention capacity of a grease trap is the amount of FOG that it can hold before its efficiency drops below 90%.

(6) Plumbing for a pretreatment unit must be designed to prevent wastes, other than FOG, from entering the pretreatment unit.

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(7) A pretreatment unit must be designed to allow ~~capable of~~ monitoring the sludge and FOG levels.

(c) Service pipe design.

(1) Pipe materials used for service pipe must meet or exceed the performance characteristics of American Society for Testing and Materials (ASTM) D 2241 Class 200 polyvinyl chloride (PVC) pipe.

(2) An interceptor tank must include a pumping unit if the interceptor tank's ~~its~~ outlet elevation is below the main pipe elevation or if the hydraulic grade line ~~in~~ is within a depressed section of a main pipe.

(3) A service pipe for an EDU or MEDU must be sized to transport the highest flow expected from ~~meet the hydraulic requirements of~~ the building, but must not be less than ~~at least~~ 2.0 inches in diameter.

(4) The diameter of a service pipe must be no greater than the diameter of the collection pipe it is connected to.

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(5) A service pipe of an interceptor tank that is subject to periodic backflow must include a check valve that:

(A) is located immediately adjacent to the collection pipe;

(B) is made from a corrosion-resistant material; and

(C) provides an unobstructed flow way.

~~(6) A collection pipe must have in-line odor control devices that are accessible for maintenance.~~

(d) Collection system design.

(1) Hydraulic design.

(A) A small diameter effluent sewer (SDES) system with open channel flow must use a design depth of flow of 100% of the pipe diameter.

(B) The minimum flow ~~low~~ velocity in a collection pipe must be no less than ~~at least~~ 1.0 foot per second (fps).

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(C) The maximum flow velocity in any portion of an SDES system is 8.0 fps without thrust restraint ~~velocity protection~~ and 13.0 fps with thrust restraint. ~~velocity protection.~~

(D) The report must include velocity calculations for each pipe segment.

(E) The elevation of the hydraulic grade-line at peak flow must be lower than an outlet invert of any upstream interceptor tank, unless the interceptor tank has on-site conveyance equipment.

(F) The report must include an analysis for each pipe showing the hydraulic grade line, energy grade line, and ground elevation in relationship to the outlet elevation of each interceptor tank being served by a collection pipe.

(G) The report must include an engineer's analysis of each segment of a variable grade effluent sewer.

(H) Open pipe flow design must use a Manning's "n" value of 0.013.

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(I) Pressure flow design must use a Hazen-Williams "C" value of 120.

(J) No pipe in an ~~a~~ SDES may be smaller than 2.0 inches in diameter.

(2) Vertical Alignment.

(A) The vertical alignment of an SDES may be variable; however, the overall downhill gradient must allow the pipe to transport the design ~~expected~~ peak flow.

(B) Venting must be provided upstream and downstream of pipe segments that are below the hydraulic grade line.

(C) The pipes must have a uniform profile (i.e., ~~with~~ no abrupt or sharp changes).

(D) A collection pipe must have a cleanout that extends to ground level and terminates in a watertight valve box at:

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(i) an upstream terminus;

(ii) a minor junction;

(iii) a change in pipe diameter; and

(iv) intervals of no more than 1,000 feet.

(E) Venting at a collection pipe summit must use a wastewater service air release valve or a combination air release and vacuum valve. The valve must be constructed of corrosion--resistant material and located in a vault.

(F) Pipe material used in a collection system must meet the performance requirements of ASTM D 3034 SDR 26 PVC pipe, except for any segment under pressure flow conditions. Under pressure flow conditions, pipe material must meet the performance requirements of ASTM D 2241 Class 200 PVC pipe.

(3) Odor Control. A collection pipe must have permanent odor control devices attached to the line. Odor control devices must be accessible for maintenance.

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§217.96. ~~§217.97.~~ Pressure Sewers.

(a) Pumps. A pressure sewer system must include a grinder pump or a septic tank effluent pump (STEP).

(b) Exceptions. Except where this section specifically states otherwise, the requirements of this section apply to both grinder pumps and STEPs.

(c) Service Pipe Requirements.

(1) A pressure sewer service pipe that is buried less than 30 inches below ground must incorporate a check valve and a fully closing gate or ball valve at the junction of a collection pipe and a service pipe to allow isolation of the service pipe.

(2) A check valve must allow an unencumbered flow when fully open.

(3) A valve must be made of corrosion--resistant material and must have a position indicator to show its open and closed position.

(4) The minimum size service pipe for an equivalent dwelling unit (EDU) is 1.25 inches.

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(5) The minimum size service pipe for a multiple equivalent dwelling unit (MEDU) is 1.5 inches.

(6) A junction to collection pipes must be made with a tee or service saddle and may use solvent weld fittings.

(7) The diameter of a service pipe must be no greater than the diameter of the collection pipe it is connected ~~connects~~ to.

(8) Material used in a service pipe must have performance characteristics that are at least ~~be~~ equivalent to ~~the performance characteristics of~~ American Society for Testing and Materials (ASTM) D 2241 Class 200 polyvinyl chloride (PVC) pipe.

(d) On-Site Mechanical Equipment Requirements.

(1) Pump discharge rates must allow the capacity of the pump and the volume of the wet~~-~~ well dedicated for flow attenuation and storage to accommodate the expected peak flow.

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(2) A single pumping unit may be used for an EDU. The report must include an analysis that justifies the size of the selected pump(s).

(3) A~~n~~ MEDU must be served by at least two pumps capable of pumping the peak flow with the largest pump out of service. The report must include an analysis that justifies the size of the selected pumps.

(4) The calculations in the report must show that all lift stations and pump chambers are protected against buoyancy forces.

(5) Control panels for all pumps must be at least 2.0 feet above the ground floor elevation of the structure being served by the equipment.

(6) All pipes and appurtenances within a wet well must be corrosion resistant.

(7) A wet well must include an audiovisual alarm system.

(A) An alarm for an EDU must activate at the high water level specified in the engineering report, plans, or specifications for the project.

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(B) An alarm for a MEDU must activate in the event of unit failure or a high water level.

(8)~~(7)~~ An EDU wet well must have a reserve volume of at least 100 gallons after the activation of a high water alarm. ~~level.~~

(9)~~(8)~~ The reserve volume of an MEDU wet well must equal the volume accumulated during an average two-hour period or 100 gallons, whichever is greater.

(10)~~(9)~~ A pump located in a STEP chamber that is integrated ~~integral~~ with an interceptor tank may use the reserve volume of the interceptor tank for the required reserve volume.

(10) A housing that contains mechanical equipment or controls must be watertight if immersion of the mechanical equipment or controls would cause failure.

~~(11) A wet well must include a visual and audio alarm.~~

~~(A) An alarm for an EDU must activate at a specified high water level.~~

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~~(B) An alarm for an MEDU must activate in the event of unit failure or a high water level.~~

(12) A control panel or other electrical enclosure must:

(A) be constructed of corrosion-resistant materials;

(B) be watertight;

(C) prevent the migration and venting of odor to the panel or enclosure;

(D) prevent the migration and venting of corrosive or explosive gases to the panel or enclosure; and

(E) bear the seal of the Underwriter Laboratory, Inc. or comply with the National Electric Code.

(13) STEP system equipment.

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(A) A pump ~~On-site mechanical equipment~~ used in a STEP system may be housed either in an interceptor tank or in a separate stand-alone unit.

(B) A pump housed in the interceptor tank of a ~~used in a~~ STEP system must be located in separate chamber from the influent chamber. ~~a hydraulically independent chamber.~~

(C) The water level in a STEP system pump chamber must not affect the water level in the ~~be hydraulically connected to an~~ interceptor tank, to prevent the disturbance of settleable and floatable solids in the interceptor tank. ~~to allow the liquid elevation in the pumping chamber to be independent of the liquid elevation in the interceptor tank.~~

(D) A design that allows a variable liquid elevation in an interceptor tank is prohibited.

(14) Housing for on-site mechanical equipment and any associated control mechanisms must be:

(A) lockable and ~~or~~ tamper-resistant;

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(B) constructed of corrosion--resistant material; and

(C) designed to last at least 50 years.

(15) A vault, chamber, wet- well, or other structure used to contain wastewater must be:

(A) watertight;

(B) able to withstand any expected structural loading;

(C) constructed of corrosion--resistant material; and

(D) designed to last at least 50 years.

(e) Discharge Pipe Requirements.

(1) A discharge pipe and connections used to join on-site mechanical equipment to a service pipe must be pressure rated at a minimum of 2.5 times the maximum system design pressure.

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(2) Pipe material and valves must be corrosion-resistant.

(3) A discharge pipe for a pressure system must include a check valve, a pipe union, and a full closing gate valve or ball valve. A check valve must precede a full closing gate valve.

(4) A ball or gate valve must have a position indicator to show its open and closed positions.

(5) A valve used at an ~~in an~~ MEDU must be located in a valve box separate from the on-site mechanical equipment.

(f) Collection System Design.

(1) The velocity of wastewater in a grinder pump pressure system main pipe must reach at least 3.0 feet per second at least once per day in each part of the system.

(2) The velocity of wastewater in a grinder pump pressure system main pipe must not be less than 2.0 feet per second or exceed 8.0 feet per second.

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(3) The velocity in a STEP system main pipe must reach at least 1.0 foot per second at least once per day.

(4) A collection system head loss calculation must use a Hazen-Williams "C" factor appropriate to the pipe material.~~,~~ The use of ~~but~~ a "C" factor ~~of~~ greater than 140 is prohibited.

(5) The ~~size of the~~ pipe used in a pressure collection system must be at least 1.5 inches in diameter.

(6) Pipe material must have the performance characteristics at least equivalent to ASTM D 2241 Class 200 PVC pipe.

(7) A pipe equal to or greater than 3.0 inches in diameter requires elastomeric pipe joints.

~~(8) A location where air may accumulate due to a difference in flow conditions requires an air release.~~

(8)~~(9)~~ A pumping unit affected by less than full flow conditions must incorporate an anti-siphon device.

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(9)~~(10)~~ An isolation valve must be located at:

(A) each intersection of a collection system main pipe;

(B) both sides of a stream crossing;

(C) both sides of ~~areas of~~ an area of unstable soil; and

(D) maximum intervals of 2,500 feet.

(10)~~(11)~~ An isolation valve must be:

(A) a resilient seated gate valve or ball valve with a position indicator;

(B) constructed from corrosion-~~-~~resistant materials; and

(C) located in a locked valve box.

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(11)~~(12)~~ Each peak in elevation and each location where air may accumulate due to a difference in flow conditions requires a wastewater air release valve.

(A) A valve orifice must be at least ~~not be less than~~ 0.25 inches in diameter.

(B) An air release valve within 50 feet of a residence or ~~public~~ building must control odor. ~~released by its operation.~~ An owner shall implement odor control measures necessary to prevent a collection system from becoming a nuisance, based upon the potential of the collection system to generate hydrogen sulfide throughout the system's 50-year design life cycle.

(12)~~(13)~~ When intermediate pumping of wastewater is required, the design of a collection system lift station must meet the requirements of Subchapter C of this chapter (relating to Conventional Collection Systems).

§217.97. ~~§217.98.~~ Vacuum Sewer Systems.

(a) A vacuum sewer system is a nonconforming technology. The executive director may review a vacuum sewer in accordance with §217.7(b)(2) of this title

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(relating to Types of Plans and Specifications Approvals) and the criteria described in this section.

(b) On-Site Component Design.

(1) A building lateral must be constructed using pipe material that has performance characteristics at least equivalent ~~is at least equivalent in performance~~ to American Society for Testing and Materials (ASTM) D 2241 Class 160 polyvinyl chloride (PVC) pipe.

(2) A building lateral must use a screened auxiliary vent no less than 4.0 inches in diameter and located no closer than 10.0 feet to a vacuum valve.

(3) A vacuum valve control must be in a tamper-resistant, watertight, and corrosion-resistant structure.

(4) A vacuum valve pit must be watertight to prevent surface and groundwater inflow.

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(5) A control mechanism that uses a pressure differential must use atmospheric air supplied by a screened breather on the lateral line. ~~vented externally to the equipment housing.~~

(6) A vacuum valve must have a minimum capacity of 30 gallons per minute.

(7) A service pipe must be at least ~~a minimum of~~ 3.0 inches in diameter.

(8) The performance characteristics of a service pipe must ~~have performance characteristics~~ meet or exceed the performance characteristics of ~~at least equivalent to~~ ASTM D 2241 Class 200 PVC pipe.

(9) A service pipe joint must be made using ~~by~~ either vacuum-rated elastomeric gasket or ~~by~~ solvent welding.

(10) A vacuum valve and a main pipe must be separated by at least 5.0 feet of service pipe. ~~must be between a vacuum valve and a main pipe.~~

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(11) If ~~When~~ there is a vertical profile change in a service pipe, the vacuum sewer system must have at least ~~incorporate a minimum of~~ 5.0 feet between the vacuum valve and the first profile change, and between the last profile change and the main pipe.

(12) A service pipe must have a minimum slope of ~~between the vacuum valve and main collection pipe or between vertical profile change that is equal to or greater than:~~

~~(A) a 2.0 inch drop; or~~

~~(B) a~~ 0.2%. ~~slope.~~

(13) The connection of a service pipe to a main pipe must use a wye and a long radius elbow, oriented so that the invert of the service pipe is higher than the crown of the collection pipe, and must not be located ~~made~~ within 6.0 feet of a collection pipe vertical profile change.

(c) Vacuum Sewer ~~Collection~~ System Design.

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(1) The performance characteristics of a pipe in a vacuum sewer must meet or exceed ~~be at least equivalent to~~ the performance characteristics of ASTM D 2241 Class 200 PVC pipe.

(2) A pipe joint must have a vacuum-rated rubber gasket or be solvent welded.

(3) A ~~The minimum~~ pipe ~~size~~ in a vacuum sewer must be at least 4.0 inches in diameter. ~~, except for~~ A service pipe must be at least ~~that may be~~ 3.0 inches in diameter.

(A) The length of a 4.0 inch diameter vacuum pipe must not exceed 2,000 feet.

(B) The maximum length of a pipe larger than 4.0 inches in diameter must be determined by the amount of friction and lift head loss.

(4) The total available head loss from the farthest input point in a system is 18 feet; 5 ~~five~~ feet to operate the vacuum valve and 13 feet available for wastewater transport.

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(5) A vacuum sewer system must be laid out in a branched pattern designed to balance pressures within the system. A pipe must have a saw-tooth profile that slopes toward a vacuum station.

(6) The design of an upgrade main line transport pipe must reduce the risk of blocking a pipe with trapped sewage.

(7) A collection pipe that is depressed in order to avoid an obstruction must have at least a ~~a minimum~~ 20 foot segment centered on the obstruction.

(8) An intersection of collection pipes must include a division valve at both sides of a watercourse crossing, ~~and~~ at both sides of an area of unstable soil, and at intervals of no more than 1,500 feet.

(A) A division valve must be either a plug valve or a resilient-seated gate valve~~,~~ capable of sustaining a vacuum of 24 inches of mercury. ~~may be used.~~

(B) A gauge tap must be located ~~provided~~ downstream of each ~~a~~ division valve.

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(d) Vacuum station design. The vacuum pump capacity must be the greater of the capacities calculated using the following equations, but not less than 150 gallons per minute:

Figure: 30 TAC §217.97(d) ~~§217.98(d)~~

Equation D.6.

$$Q_{vp} = \frac{A \times Q_{max}}{7.5 g/cf} + B \times N$$

Where:
Q_{vp} = Minimum vacuum pump capacity
A = Variable based on pipe length
Q_{max} = Station peak flow (gpm.)
B = Bleed rate of vacuum valve controller (square feet per minute.)
N_v = Number of vacuum valves in system
g/cf = gallons per cubic feet

The value of A must be as follows:

Longest Pipe Length (feet.)	A
0-3,000	5
3,001-5,000	6
5,001-7,000	7
7,001-10,000	8
10,001-12,000	9
12,001-15,000	11

Equation D.7.

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$$Q = \frac{V}{PDT} \times \log \frac{H_1}{H_2}$$

Where:
Q = Flow rate of vacuum pump (cubic feet per second)
PDT = Time to reduce head from H_1 to H_2 (seconds)
V = Volume of closed system (cubic feet)
H_1 = Initial absolute pressure head (inches of mercury)
H_2 = Final absolute pressure head (inches of mercury)

(e) Vacuum Pumps.

(1) A vacuum pump must be capable of evacuating ~~evacuate~~ the system in less than 180 seconds.

(2) The design of a vacuum system ~~-~~must include duplicate vacuum pumps. ~~,~~ Each vacuum pump must be ~~each~~ capable of delivering 100% of the required airflow and be capable of operating continuously. ~~continuous duty.~~

(3) A vacuum pump may be either liquid-ring or sliding-vane type. Liquid-ring pumps must be sized at least 15% larger than the necessary vacuum pump capacity.

(4) The transfer pipe must have an electrically or pneumatically controlled plug valve between the collection tank and the reservoir to prevent ~~carry over~~carryover of liquid into the pump.

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(f) Duplicate discharge pumps.

(1) Duplicate discharge pumps are required and must have the capacity to deliver the peak flow with one pump out of service.

(2) A discharge pump must be:

(A) designed for vacuum sewage duty;

(B) equipped with ~~have~~ equalizing pipes;

(C) capable of passing a 3.0 inch sphere; and

(D) constructed from corrosion-~~-~~resistant material.

(3) A discharge pump must use double mechanical shaft seals and have shut-off valves on both the suction and discharge pipes.

(4) The total dynamic head calculation must include the head attributed to overcoming the vacuum in the collection tank.

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(5) The available net positive suction head must be greater than the required net positive suction head for the expected vacuum operating range.

(6) The pump suction pipe must be sized 2.0 inches larger than the discharge pipe to prevent wastewater from forming a vortex in the collection tank.

(7) The pump design calculations and pump curves must be included in the report.

(g) Vacuum Reservoir.

(1) A vacuum system that requires a collection tank of 1,600 gallons or more must also include a vacuum reservoir tank with a capacity of at least 400 gallons.

(2) Liquid from a vacuum pump must be piped to the top of the vacuum reservoir tank.

(3) A vacuum reservoir tank must include internal access for periodic cleaning and inspection.

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(4) All main pipes must connect to the collection tank.

(5) The wastewater pump suction pipe must lie at the lowest point on the collection tank and away from the main pipe inlet.

(6) The main pipe must enter at the top of the collection tank with the inlet elbows inside the tank turned at an angle away from the pump suction opening.

(7) The collection tank must include probes for liquid level sensing for operation of the discharge pumps.

(8) A vacuum pump must include automatic vacuum switch controls, which must be located in the reservoir tank.

(9) The collection tank and low system vacuum must include an alarm for high liquid level.

(h) An owner shall include a description of the alternative collection system's anti-corrosive protection in the report.

§217.98. ~~§217.99.~~ Testing Requirements.

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(a) Components of an alternative ~~wastewater~~ collection system must be tested for water tightness by one of the methods shown in the following table:

Figure: 30 TAC §217.98(a) ~~§217.99(a)~~

Table D.1. - Testing Requirements for an Alternative ~~Wastewater~~ Collection System

Component	Type of Test(s)
Interceptor Tank	Hydrostatic head test for tanks (HHT) or Vacuum test for tanks (VTT)
Buffer Tank	HHT or VTT
Vault, Pit, Wet Wells	HHT or VTT
Service Pipe (Pressure)	Pressure line test (PLT)
Service Pipe (SDES)	Hydrostatic head test for pipe (HHP)
Collection Pipe (Pressure)	PLT
Collection Pipe (SDES)	Low pressure air test for pipe (LPA) or HHP

(b) Hydrostatic Head Test for Pipe. The total infiltration or exfiltration, as determined by the hydrostatic head test, must not exceed 10 gallons per inch diameter per mile of pipe per 24 hours at a minimum head of 2.0 feet. If the quantity of infiltration or exfiltration exceeds the maximum quantity specified, the owner shall take

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remedial action to reduce the infiltration or exfiltration to an amount within the specified maximum limits.

(c) Hydrostatic Head Test for Tanks. The test consists of filling the tank to the top and holding the water for 24~~-~~ hours to determine whether the tank is leaking. ~~with no leakage.~~

(1) The hydrostatic head ~~heat~~ test must demonstrate that the tank is not leaking ~~is required~~ before the placement of backfill around a ~~rigid~~ tank.

(2) The hydrostatic head test for a tank constructed from flexible or semi-rigid material is required after placement and backfilling according to the tank manufacturer's recommendations.

(d) Low-Pressure Air Test. The low-pressure air test must conform to the requirements of §217.57 of this title (relating to Testing Requirements for Installation of Gravity Collection System Pipes).

(e) Pressure Pipe Test.

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(1) The test pressure must be a minimum of 25 pounds ~~pound~~ per square inch or 1.5 times the maximum pipe design pressure, whichever is larger. The ~~calculations for the~~ maximum allowable leakage must be calculated using ~~use~~ the following equation:

Figure: 30 TAC §217.99(e)(1)

Equation D.8.

$$L = \frac{S \times D \times \sqrt{P}}{133200}$$

Where:
L = Leakage (gallons per hour)
S = Length of pipe (feet)
D = Inside diameter of pipe (inches)
P = Pressure (pounds per square inch), gage

(2) If the leakage exceeds the maximum amount calculated, the owner shall take remedial action to reduce the leakage to an amount within the allowable limit from subparagraph (e)(1) of this paragraph.

(f) Vacuum Test for a Tank.

(1) The test may begin only after establishing an initial stable vacuum of 4.0 inches of mercury.

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(2) The total vacuum loss during a vacuum test must not exceed 1.0 inch loss of mercury vacuum after five ~~5~~ minutes.

(3) A tank constructed of flexible or semi-rigid material must not allow more than a ~~exceed the~~ 3% change in tank dimensions in any direction while under vacuum.

(4) If the quantity of vacuum loss or if tank deformation equals or exceeds the maximum quantity specified in subparagraph (f)(2) of this paragraph, then the owner shall take remedial action to reduce the amount of vacuum loss or amount of deformation to comply with this subsection.

§217.100. Termination.

(a) An alternative collection system must terminate at a wastewater treatment facility or into a manhole that is part of a conventional collection system.

(b) Release of gases must be controlled by minimizing turbulence in the discharge into a manhole.

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(c) A discharge into a manhole that is made up of flows from an alternative collection system and a conventional collection system must have the majority of the flow from the conventional collection system.

(d) An alternative ~~wastewater~~ collection system that terminates ~~discharges~~ at a wastewater treatment facility must discharge below the liquid level at the headworks or the influent lift station.

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SUBCHAPTER E: PRELIMINARY TREATMENT UNITS

§§217.120~~217.121~~ - 217.129

§217.120. General Preliminary Treatment Requirements.

(a) A wastewater treatment facility must be designed with provisions for removing fats, oils, and grease in the wastewater before the wastewater reaches the headworks.

(b) The headworks of a wastewater treatment facility must have a screening device or a grinding device.

(1) Screening devices include coarse screens and fine screens.

(2) Grinding devices include grinder pumps and other grinding devices approved by the executive director.

(c) A screening device or grinding device must not be housed in the same structure as an office or any other work area unless the area housing the screening device or grinding device is separated from the rest of the structure by an air-tight partition.

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(d) Each enclosure that houses a screening device or grinding device and is accessible to individuals must have a vent fan capable of providing at least 30 complete air exchanges per hour.

(e) Each screening device or grinding device must be readily accessible for maintenance and screenings removal.

(f) Any screening device located 4.0 or more feet below ground level must include mechanical equipment capable of lifting the screenings to ground level.

§217.121. Coarse Screens. ~~Screening Devices.~~

(a) A wastewater treatment facility must use a coarse screen, ~~screening device,~~ unless all flow entering a facility is processed through a grinder pump or grinding device. ~~stated otherwise in this subchapter.~~

(b) A coarse screen ~~screening device~~ must include an emergency overflow ~~a bypass channel~~ sized to handle the peak flow of the wastewater treatment facility.

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(c) A coarse screen ~~screening device~~ must include a way to divert ~~means of diverting~~ flow to the emergency overflow. ~~bypass channel.~~

(d) If the primary channel uses a mechanically cleaned coarse screen, ~~screening device,~~ the emergency overflow ~~bypass channel~~ must also have a coarse screen. ~~screening device, either manually or mechanically cleaned.~~

~~(e) Location Requirements.~~

~~(1) Any enclosed structure that houses a coarse screening device and contains other equipment or an office must have an entrance that is separated from the other areas by a gas tight partition.~~

~~(2) Each coarse screening device enclosure must have a vent fan capable of providing at least 30 air exchanges per hour if staff entry is allowed.~~

~~(3) Each coarse screening device must be readily accessible for maintenance and screenings removal.~~

~~(4) Any coarse screening device located 4.0 or more feet below ground level must include equipment capable of lifting the screenings to ground level.~~

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(e)~~(f)~~ Coarse Screen ~~Openings~~Design.

(1) For a manually cleaned coarse screen, the clear openings between the bars ~~bar openings~~ must be at least 0.5 inch but not more than 1.0 inch. ~~1.75 inches.~~

(2) For a mechanically cleaned coarse screen, the clear openings between the bars ~~bar openings~~ must be at least 0.25 inch but not more than1.0 inch. ~~1.75 inches.~~

(3) A manually cleaned coarse screen must use a bar rack sloped at least 30 degrees but not more than 60 degrees from horizontal.

(4) A manually cleaned coarse screen must be attached to a horizontal platform that allows draining and temporary ~~has provisions to drain and temporarily store the~~ screenings storage.

(5) A mechanically cleaned coarse screen must be designed with equipment that automatically collects and disposes of screenings.

(f)~~(g)~~ Coarse Screen Hydraulics.

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(1) The velocity of wastewater through a ~~the~~ coarse screen ~~bar racks~~ must be at least 1.0 foot per second, but not more than 3.0 feet per second at design flow.

(2) The inlet channel for a coarse screen ~~screening device~~ must be designed to minimize the deposition of solids.

(3) The flow line of the inlet channel must not exceed 6.0 inches below the invert elevation of the ~~incoming~~ influent.

(h) Corrosion Resistance. A coarse screen screening device and ~~any~~ related structures ~~structure~~ must be designed to resist the effects of a corrosive environment, including long-term exposure to hydrogen sulfide.

§217.122. Fine Screens. ~~Screening Devices.~~

(a) A fine screen may be used in lieu of a coarse screen. ~~screening device.~~

(b) The clear openings in a fine screen must be ~~A fine screen is any screen with a clear opening~~ less than 0.25 inch.

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(c) Any 5-day biochemical oxygen demand (BOD_5) reduction percentage claimed for a fine screen must be developed through a study conducted on actual full-scale operation of the proposed fine screen. The BOD_5 reduction percentage claimed must not exceed 35 percent. ~~The use of a fine screen in lieu of a primary sedimentation unit is acceptable only if the design of any downstream treatment unit is based on the amount of five-day biochemical oxygen demand (BOD5) reduction expected by the fine screen. The BOD_5 reduction percentage must be developed through a study conducted on actual full-scale operation of the proposed fine screen unit.~~

(d) The report must justify ~~include the justification for~~ any reduction in the size of a ~~any~~ treatment unit that is based on removal of BOD_5 by ~~the use of~~ a fine screen.

(e) An owner who claims a BOD_5 reduction credit must include a sufficient number of fine screen units so that any BOD_5 reduction claimed will be met ~~may occur~~ with the largest fine screen unit out of service.

(f) A design may include a single fine screen unit only if the design includes an emergency overflow ~~a bypass~~ channel with a coarse screening device to accept flow when the fine screen is out of service. No BOD_5 removal credit is allowed with a single fine screen design.

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(g) A coarse screen ~~course screening device~~ must be provided ahead of a fine screen when the manufacturer of a fine screen recommends prescreening before the fine screen.

~~(h) A wastewater treatment facility must be designed with equipment or means located A collection system equipment prior to the fine screen must be operated to minimize fats, oils, and grease in the wastewater before the wastewater reaches the headworks if fine or micro screens are used.~~

(h)~~(i)~~ A moving or rotating fine screen must use a continuous cleaning device, such as water jets or wiper blades.

(i)~~(j)~~ A fine screen unit must automatically convey the screenings to a storage area or processing unit that complies with §217.123 of this title (relating to Screenings and Debris Handling).

(j)~~(k)~~ A fine screen must meet the ~~its~~ manufacturer's recommendations ~~recommendation~~ with respect to velocity and head loss through the fine screen.

(k)~~(l)~~ A fine screen must ~~may~~ use either a bar rack or a perforated plate.

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§217.123. Screenings and Debris Handling.

(a) A screening device must have a minimum storage capacity of one-day of screenings and debris.

(b) A container for screenings and debris must have a tight-fitting cover designed to reduce vector attraction, or must use an alternative method of reducing vector attraction approved by the executive director.

(c) A storage area for screenings and debris must drain to the headworks or the influent lift station ~~head of the facility~~ and must ~~-~~include runoff control.

(d) All ~~Any~~ screenings and debris ~~collected~~ must be managed and disposed of in accordance with Chapter 330 of this title (relating to Municipal Solid Waste).

§217.124. Grit Removal Systems.

(a) A wastewater treatment system using anaerobic digestion must have a grit removal system. A grit removal system is optional for all other facilities.

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(b) A grit removal system includes ~~those~~ units and processes capable of removing inert, non-biodegradable particles.

(c) A grit removal system must include at least two units ~~dual processes~~ capable of operating at the ~~permitted~~ peak flow of the wastewater treatment facility when grit removal is required by paragraph (a) of this section.

(d) Each grit removal system ~~unit~~ must include:

(1) an emergency overflow ~~a bypass channel~~ to accept flow when a grit removal unit is off-line; and

(2) a means of diverting flow to the emergency overflow. ~~a bypass channel.~~

§217.125. Design Requirements for Grit Chambers.

(a) Horizontal Flow Grit Chambers.

(1) Velocity through a horizontal flow grit chamber must range from ~~at least~~ 0.8 feet per second to no ~~but not~~ more than 1.3 feet per second.

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(2) A horizontal flow grit chamber channel must minimize turbulence and provide uniform velocity across the channel.

(3) The channel size of a horizontal flow grit chamber must accommodate the grit removal equipment capacity and grit storage.

(b) Aerated Grit Chambers.

(1) The ~~An~~ air diffuser and baffle arrangement in an aerated grit chamber ~~design~~ must not interfere with the removal of particles with the design particle size and density. ~~separate the size of grit planned for removal.~~

(2) The aeration equipment must be capable of varying ~~vary~~ air feed rates along the length of an aerated ~~a~~ grit chamber from 3.0 standard cubic feet per minute ~~seconds per cubic foot per meter~~ (scfm) per linear foot to no ~~but not~~ more than 8.0 scfm per linear foot.

(3) An aerated ~~A~~ grit chamber must have a hydraulic detention time of at least 3.0 minutes.

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(4) An aerated ~~A~~ grit chamber must include a grit hopper located under an air diffuser.

(c) Mechanical Grit Chambers.

(1) The velocity through mechanical grit chambers must be no greater than 1.0 foot per second at ~~the~~ design flow.

(2) Each mechanical grit chamber ~~A~~ channel must include a grit hopper at the side of a tank contiguous to a grit removal mechanism.

(3) An inlet must include baffles to prevent short-circuiting.

(4) Grit removal must be provided by one of the following mechanisms:

(A) reciprocating rake;

(B) screw conveyor; or

(C) air lift pump.

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(d) Cyclonic Degritters.

(1) A cyclonic degritter must prevent an inlet-to-outlet ~~entry-to-overflow~~ short circuit.

(2) A cyclonic degritter must include an adjustable apex with a quick disconnect assembly to remove any oversized object.

(3) Detention time in a cyclonic degritter must be at least 1.0 minute at the design flow.

(4) The flow velocity in a cyclonic degritter must be at least 1.0 foot per second but not more than 2.0 feet per second at the design flow.

(5) A screening unit must be installed upstream of a cyclonic degritter.

(e) Vortex Grit Chamber.

(1) An inlet channel must include a straight length in order to deliver smooth flow into the vortex grit chamber.

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(2) The inlet velocity ~~Minimum initial inlet velocity at the peak flow~~ must be at least 2.0 feet per second at peak flow.

(3) A vortex system must include rotating paddles in the center of the ~~a~~ grit chamber, and must rotate at a maximum of 21 revolutions per minute.

(4) An outlet channel must maintain a constant elevation.

(5) Grit removal from a grit storage chamber must be achieved using ~~by~~ pumps specifically designed to handle grit.

§217.126. Grit Handling.

(a) A grit washing unit or grit storage area must be designed to return recycled water and drainage to the headworks of the wastewater treatment facility. ~~The recycle water and the drainage from a grit washing unit or a grit storage area must return to the head of the facility.~~

(b) A grit chamber located below ground level must include mechanical grit handling equipment.

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(c) Grit must be stored in a container with a tight-fitting cover and must be managed and disposed of in accordance with §217.123 of this title (relating to Screenings and Debris Handling).

§217.127. Pre-aeration Units.

(a) Pre-aeration units may be used at a wastewater treatment facility to:

(1) control odor;

(2) reduce septicity;

(3) separate grease; or

(4) promote uniform distribution of solids to clarifiers.

~~for odor control, flocculation of solids, reducing septicity, grease separation, and promoting uniform distribution of solids to clarifiers.~~

(b) The report must include the basis for the design of a ~~any~~ pre-aeration system. ~~design.~~

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§217.128. Flow Equalization Basins.

(a) A wastewater treatment facility must be designed with ~~use~~ a flow equalization basin if:

(1) the ~~A facility's~~ total daily influent flow volume or total daily influent organic loading occurs during a period ~~of time~~ less than or equal to ten hours; or ~~of a per day for any given day of a any week;~~

(2) the wastewater treatment facility ~~A facility experiences periods of time when it~~ receives an influent flow of less than 10% of its design flow ~~capacity~~ or an influent organic loading less than 10% of its design organic loading during ~~for~~ a period of time equal to or greater than 48 hours in any period of seven consecutive days. ~~one week; or~~

~~(3) organic or hydraulic loading exceeds the design loading capacity by At any time that flow equalization is necessary to minimize random or cyclic peaking of organic or hydraulic loadings.~~

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(b) A flow equalization basin must have an upstream screening device or grinding device.

(c) A flow equalization basin must include an aeration system sized to maintain a dissolved oxygen level of at least 1.0 milligram per liter (mg/l) throughout ~~in~~ the flow equalization basin.

(d) A flow equalization basin must include a mixing system sufficient to prevent solids from settling.

(e) The size of a flow equalization basin must be based on diurnal flow variations and the size and capacity of downstream process units. The report must include the calculations justifying the size of a flow equalization basin.

(f) For pumped flow to an equalization basin, the effluent from the ~~a~~ basin must be controlled by a flow-regulating device capable of maintaining a flow rate that allows downstream process units to operate as designed. ~~properly.~~

(g) For pumped flow from an equalization basin, a variable-speed pump or multiple pumps are required to deliver a constant flow to downstream treatment ~~processing~~ units.

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§217.129. Primary Clarifiers.

(a) Inlets.

(1) A primary clarifier inlet must provide uniform flow and stilling.

(2) Vertical flow velocity through an inlet stilling well must not exceed 0.15 feet per second at peak flow.

(3) An inlet distribution channel must not have a dead-end corner and must prevent the settling of solids in the channel.

(4) An inlet structure must allow floating material to enter the clarifier.

(b) Scum removal.

(1) A primary clarifier must have scum baffles and a means of collecting and disposing of scum.

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(2) A primary clarifier must discharge scum to a sludge digester or must use an alternative ~~another~~ method of disposal approved by the executive director.

(3) The discharge of scum to any open drying area is prohibited.

(4) A primary clarifier with a design flow equal to or greater than 25,000 gallons per day (gpd) must include a mechanical skimmer.

(5) A primary clarifier with a design flow less than 25,000 gpd must use a mechanical skimmer or ~~may use~~ hydraulic differential skimming. If hydraulic differential skimming is used, it must be ~~, only if the scum pickup is~~ capable of removing scum from the entire operating surface of the clarifier.

(6) A pump used for pumping scum ~~pump~~ must be specifically designed to pump scum. ~~for this purpose.~~

(c) Effluent weirs.

(1) An effluent weir must be designed to prevent turbulence or localized high vertical flow velocity in the primary clarifier.

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(2) An effluent ~~A~~ weir must be designed ~~be located~~ to prevent hydraulic short circuiting ~~flow~~ through a primary clarifier.

(3) An effluent ~~A~~ weir must be designed to be adjustable for leveling.

(4) Effluent weir loading~~,~~ must not exceed 20,000 gallons per day at peak flow per linear foot of weir length for a wastewater treatment facility with a design flow of 1.0 million gallons per day ~~(mgd)~~ or less.~~, must not exceed 20,000 gpd per linear foot of weir length.~~

(5) Weir loading must not exceed 30,000 gallons per day at peak flow per linear foot of weir length for a wastewater treatment facility with a design flow greater than ~~in excess of~~ 1.0 million gallons per day.~~mgd must not exceed 30,000 gpd peak flow per linear foot of weir length.~~

(d) Primary clarifier basin sizing.

(1) The surface area of a ~~facility's~~ primary clarifier~~(s)~~ must be used to determine ~~determines~~ the proper weir overflow rates.

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(2) The actual primary clarifier size must be ~~is~~ based on the larger of ~~the~~ two surface area calculations: peak flow rate and ~~or~~ design flow surface loading rate.

(3) Surface loading rates and detention times ~~The design criteria~~ for a primary a clarifier in subparagraphs (A) and (B) of this paragraph are based upon a minimum side water depth of 10.0 feet.

(A) Surface loading rates, excluding recirculation flow, must not exceed: ~~Maximum surface loading:~~

(i) ~~must not exceed~~ 1,800 gpd per square foot at peak flow; and

(ii) ~~must not exceed~~ 1,000 gpd per square foot at design flow. ~~; and~~

~~(iii) does not include recirculation flow.~~

(B) Detention Time.

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(i) Detention time at peak flow must be at least ~~no less than~~ 54 minutes (0.9 hour).

(ii) Detention time at design flow must be at least 108 minutes (1.8 hours).

(iii) ~~Overflow rate and~~ Side water depth ~~(SWD)~~ may be adjusted from a minimum of 10 feet to a maximum of 18 feet, as long as the detention time remains unchanged.

(iv) The detention time must be based on the effective volume and the weir overflow rate of a circular or rectangular clarifier.

(I) The effective volume includes all liquid above the sludge blanket.

(II) For a cone bottom tank, the top of the sludge blanket is considered to be at the top of the cone.

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(III) The design of ~~For~~ a flat bottom tank must include additional depth for~~,~~ a sludge blanket with a thickness of 3.0 feet. ~~must be allowed for development of maximum return sludge concentration.~~

(e) Side Water Depth. ~~SWD.~~ The minimum side water depth ~~SWD~~ for primary clarifiers is 10.0 feet.

(1) For a primary clarifier, the side water depth is defined as:

(A) the water depth from the top of the cone in a cone bottom tank to the water surface; or

(B) the water depth from 2.0 feet above the bottom of a flat bottom tank to the water surface.

(f) Freeboard. The walls of a primary clarifier must extend at least 6.0 inches above the surrounding ground surface and must provide a minimum freeboard of 12.0 inches at peak flow.

(g) Drains.

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(1) A primary clarifier must have the capability of draining completely without bypassing secondary treatment.~~to an appropriate point in the facility.~~

(2) A portable dewatering pump may be used ~~is acceptable~~ for complete dewatering.

(h) Accessibility. A primary clarifier must be accessible for ~~to facilitate~~ routine operation and maintenance.

(i) ~~Five-day biochemical oxygen demand (~~BOD_5~~)~~ Removal. The ~~A~~ design of a primary clarifier must ~~shall~~ be based on no greater than 35% BOD_5 reduction, unless a higher efficiency is justified by a pilot study or data from a similar full-scale operation.

(j) Sludge Transfer.

(1) A primary clarifier unit must include mechanical sludge collection equipment designed to ~~rapidly~~ remove sludge in a manner that will minimize odor development and transfer the sludge ~~it~~ for subsequent processing.

(2) A gravity sludge transfer pipe must be at least 8.0 inches in diameter.

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SUBCHAPTER F: ACTIVATED SLUDGE SYSTEMS

§§217.151 - 217.164

§217.151. Requirements for an Aeration Basin.

(a) Unless designed for advanced nutrient removal, an aeration basin must be designed to maintain a minimum dissolved oxygen concentration of 2.0 milligrams per liter (mg/l) throughout the aeration basin at the maximum diurnal organic loading rate determined in §217.32(a)(3) and Figure: 30 TAC §217.32(a)(3) of this title (relating to Organic Loading and Flows).

(b) ~~An activated sludge system may use~~ T~~t~~he volume of~~in~~ aerated influent wastewater channels and aerated mixed liquor transfer channels of an activated sludge system may be used to meet aeration basin volume requirements, provided the activated sludge system uses aeration by diffused air and the diffuser depth conforms to the requirements of §217.155(b)(5)(A) of this title (relating to Aeration Equipment Sizing).

(c) The use of a contact stabilization system for nitrification is prohibited.

§217.152. Requirements for Clarifiers.

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(a) Inlets.

(1) A clarifier must have an inlet valve or gate.

(2) A clarifier inlet must provide uniform flow and stilling.

(3) A transfer pipe must not trap or entrain air.

(4) Vertical flow velocity through an inlet stilling well must not exceed 0.15 feet per second at peak flow.

(5) An inlet distribution channel must be designed to prevent the settling of solids in the channel.

(b) Pumped Inflow.

(1) For a wastewater treatment facility with pumped inflow, a clarifier must be able to accommodate all flow without overloading or overtopping the clarifier effluent weir.

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(2) A clarifier must hydraulically accommodate peak flows without adversely affecting treatment in the clarifier or in subsequent treatment units.

(c~~b~~) Scum removal.

(1) A clarifier must include scum baffles and a means for scum ~~the~~ collection and disposal ~~of scum~~.

(A) A clarifier at a wastewater treatment facility with a design flow equal to or greater than 10,000 gallons per day (gpd) must use a mechanical skimmer.

(B) A clarifier at a wastewater treatment facility with a design flow less than 10,000 gpd may use hydraulic differential skimming if the scum pickup is capable of removing scum from the entire operating surface, or a mechanical skimmer must be used.

(2) Scum collected from a clarifier in a ~~facility~~wastewater treatment facility using an activated sludge process ~~and~~ or an aerated lagoon must be routed through a preliminary treatment unit, and then be: ~~may be~~

(A) discharged to an aeration basin or digester;~~,~~ or

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(B) ~~may~~ disposed of using any~~use another disposal~~ method that complies with Chapter 312 of this title (relating to Sludge Use, Disposal, and Transportation).

(3) Scum collected from a clarifier must be routed through a preliminary treatment unit to remove solids before being discharged to:

(A) an aeration basin; or

(B) a digester.

(4~~3~~) Scum collected from a clarifier in a ~~facility~~wastewater treatment facility not using an activated sludge process and not using an aerated lagoon must be discharged to a sludge digester or must be disposed of using any ~~may use another~~ disposal method that complies with Chapter 312 of this title(relating to Sludge Use, Disposal, and Transportation).

(5~~4~~) Discharge of scum to a~~n open~~ drying area that is open to the atmosphere is prohibited.

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(6) Storage or holding of scum in a containment vessel that is open to the atmosphere is prohibited. Scum must be contained in a vessel that is not open to the atmosphere or must be routed to a treatment unit in the wastewater treatment facility for further processing.

~~(5) A system with a design flow equal to or greater than 10,000 gallons per day (gpd) must use a mechanical skimmer.~~

~~(6) A system with a design flow less than 10,000 gpd may use hydraulic differential skimming if the scum pickup is capable of removing scum from the entire operating surface.~~

(7) A pump used for pumping scum ~~pump~~ must be specifically designed to pump scum.

(d~~e~~) Clarifier Effluent ~~w~~Weirs.

(1) A~~n~~ clarifier effluent weir must prevent turbulence or ~~a~~ localized high vertical flow velocity in a clarifier.

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(2) A clarifier effluent weir must be located a minimum of 6.0 inches from an outer wall or baffle and must prevent the short-circuiting of flow throughout the~~through a~~ clarifier.

(3) A clarifier effluent weir must be adjustable to allow leveling of the weir and to provide for minor changes to the water surface elevation in the~~a~~ clarifier.

(4) For a ~~facility~~wastewater treatment facility with a design flow of less than 1.0 million gallons per day (mgd), the clarifier effluent weir loading must not exceed 20,000 gpd at the peak flow per linear foot of weir length.

(5) For a ~~facility~~wastewater treatment facility with a design flow equal to or greater than 1.0 mgd, the clarifier effluent weir loading must not exceed 30,000 gpd at the peak flow per linear foot of weir length.

(6) A center-feed circular clarifier must have ~~overflow~~ effluent weirs around the entire perimeter of the clarifier.

(e~~d~~) Sludge Pipes.

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(1) The~~Sludge~~ transfer of sludge from a clarifier to a treatment or ~~subsequent~~ processing unit must not negatively affect treatment efficiency of the unit that receives the sludge.

(2) A sludge pipe must be a minimum of 4.0 inches in diameter.

(3) The flow velocity in a sludge pipe must be greater than 2.0 feet per second for a wastewater treatment facility with a design flow greater than 150,000 gallons per day (gpd). For a wastewater treatment facility with a design flow of 150,000 gpd or less, the flow velocity in the sludge pipe must be greater than 0.5 feet per second, and the sludge pipes must be accessible for cleaning if the design flow velocity is less than 2.0 feet per second.

(4) A means to remove a blockage from all sludge pipes must be provided at the wastewater treatment facility. ~~Each sludge pipe must have a means to remove any blockage.~~

(f~~e~~) Sludge Collection Equipment.

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(1) A clarifier that ~~must include mechanical sludge collecting equipment if it~~ is part of a wastewater treatment facility with a design flow of 10,000 gpd or greater must include mechanical sludge collecting equipment.

(2) A clarifier that is part of a wastewater treatment facility with a design flow of less than 10,000 gallons per day must include manual equipment designed to move settled sludge to the sludge collection pipe, unless mechanical sludge collecting equipment is provided.

~~(f) Pumped Inflow.~~

~~(1) For a facility with pumped inflow, a clarifier must be able to accommodate all anticipated flow without overflow.~~

~~(2) A facility must hydraulically accommodate peak flows without adversely affecting the treatment processes.~~

(g) Side Water Depth ~~(SWD)~~.

(1) For a secondary clarifier, the side water depth ~~The SWD~~ is defined as:

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(A) the water depth from the top of the cone in a cone bottom tank to the water surface; or

(B) the water depth from 2.0 feet above the bottom of a flat bottom tank ~~with a hydraulic sludge removal mechanism~~to the water surface.

(2) The minimum for a ~~A~~ clarifier with a mechanical sludge collector ~~and a surface area~~is:

(A) 10.0 feet if the surface area is equal to or greater than 300 square feet ~~(sf) must have a minimum SWD of 10.0 feet~~.

(B) 8.0 feet if the surface area is less than 300 square feet. ~~sf must have a minimum SWD of 8.0 feet.~~

(3) A clarifier with a hopper bottom must have a minimum side water depth of 5.0 feet or the depth determined ~~determine the SWD~~ using the following equation, whichever is greater:

Figure: 30 TAC §217.152(g)(3)

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Equation F.1.

$$SWD = 160Q + 4$$

Where:
SWD = side water depth required (feet)
Q = annual average flow in million gallons per day, as determined in §217.31(a) of this title (relating to Applicability)

(4) The upper two-thirds of the hopper portion of a hopper bottom clarifier must not be included in the side water depth. A ~~An~~ SWD computed using Equation F.1 in paragraph (3) of this subsection excludes the hopper portion of a clarifier. The upper one-third of the hopper- portion of a hopper bottom clarifier may be counted as part of the side water depth ~~SWD~~ only if the surface area of the hopper bottom clarifier is increased by 15% over the surface area determined from the design surface loading calculated using Figure: 30 TAC §217.154(c)(1), Table F.2 of this title (relating to Aeration Basin and Clarifier Sizing--Traditional Design), and if an activated sludge ~~facility~~wastewater treatment facility includes a flow equalization basin. ~~The SWD of a hopper bottom clarifier must never be less than 5.0 feet.~~

(h) Restrictions on Hopper Bottom Clarifiers.

(1) A hopper bottom clarifier ~~without mechanical sludge collection equipment~~ is prohibited for use in a ~~facility~~wastewater treatment facility with a ~~maximum~~ design flow equal to or greater than 10,000 gpd.

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(2) Each hopper cell of a hopper bottom clarifier must have individually controlled sludge removal equipment.

(3) A hopper bottom clarifier must have a smooth wall finish.

(4) A hopper bottom clarifier must have an upper hopper slope of not less than 60 degrees from horizontal.

(i) Restrictions on Short Circuiting. The influent stilling baffle and effluent clarifier weir must be designed to prevent short circuiting.

(j) Return Sludge Pumping Capacity.

(1) The capacity of a return sludge -pumping ~~unit~~ system must be calculated based on the area of the ~~an~~ activated sludge clarifier or clarifiers, ~~clarifier(s),~~ including the stilling well area.

(2) The return sludge pumping capacity ~~is~~ must be equal to or greater than the clarifier underflow rate in gallons per day per square foot (gpd/sf).

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(3) A return sludge pumping system must be capable of pumping at least 200 gpd/sf but not more than 400 gpd/sf.

(4) The return sludge pumping capacity must ~~may~~ be controlled via throttling, variable speed drives, or multiple pump operation.

§217.153. Requirements for Both Aeration Basins and Clarifiers.

(a) Construction. Construction material for ~~an~~ aeration basins and ~~a~~ clarifiers must be resistant to~~resist~~ the effects of a corrosive wastewater environment.

(1) Aeration basins and clarifiers must not be buoyant when empty.

(2) Structures using a common wall must be designed to accommodate the stresses generated when one basin is full and an adjacent basin is empty.

(3) Aeration basin and clarifier walls must be watertight.

(b) Freeboard.

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(1) An aeration basin must have a minimum freeboard of 18 inches at the peak flow.

(2) A clarifier must have a minimum freeboard of 12 inches at the peak flow.

(c) Redundancy and Flow Control.

(1) A ~~facility~~wastewater treatment facility with a design flow ~~of~~ equal to or greater than 0.4 million gallons per day (mgd) must have a minimum of two aeration basins and two clarifiers. ~~,~~Aeration basins are exempt from this requirement if ~~unless~~ the aeration equipment ~~is~~ and diffusers are removable without taking the aeration basin out of service.

(2) Internal and interconnecting pipes must be capable of hydraulically ~~passing~~ handling the peak flow without overflow while ~~and with~~ either the largest clarifier or the largest aeration basin is out of service.

(3) Each aeration basin and clarifier must have gates or valves to allow it to be hydraulically isolated.

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(4) Each aeration basin and clarifier must have a dedicated means for draining~~dewatering~~.

§217.154. Aeration Basin and Clarifier Sizing--Traditional Design.

(a) This section applies to the traditional approach for sizing an aeration basin and clarifier, and is based on values that have been used historically as standard engineering practice.

(b) Aeration Basin Sizing.

(1) Unless designed for advanced nutrient removal, an aeration system must be designed to maintain a minimum dissolved oxygen concentration of 2.0 milligrams per liter (mg/l) throughout the aeration basin at the maximum diurnal organic loading rate determined in §217.32(a)(3) and Figure: 30 TAC §217.32(a)(3) of this title (relating to Organic Loading and Flows). ~~A aeration reactor must be sized using the organic load calculated in §217.32 of this title (relating to Organic Loading and Flows).~~

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(2) Based on the calculated ~~this~~ organic load, the aeration basin volume must be designed to ensure that the organic loading on the aeration basin does not exceed the organic loading rates in the following table:

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Figure: 30 TAC §217.154(b)(2)

Table F.1 - Design Organic Loading Rates for Sizing Aeration Basins Based on Traditional Design Methods				
Process	**Applicable Permit Effluent Sets** *Concentration milligrams per liter (mg/l)*			**Maximum Organic Loading Rate** *Pounds BOD_5/day/1,000 cubic feet (lbs/day/1,000cf)*
	BOD_5	**TSS**	**Ammonia Nitrogen**	
Conventional activated sludge process without nitrification	10	15	NA	45
	20	20	NA	
Conventional activated sludge process with nitrification when reactor temperatures exceed 15° C	10	15	3, 2, or 1	35
Conventional activated sludge process with nitrification ~~W~~when ~~R~~reactor ~~T~~temperatures are 13° to 15° C	10	15	3, 2, or 1	25
Conventional activated sludge process with nitrification when reactor temperatures are 10° to 12° C	10	15	3, 2, or 1	20
Extended aeration basins including oxidation ditches (~~MCRT~~ mean cell residence time over 20 days)	10	15	3, 2, or 1	15

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(3) When identifying the aeration basin ~~reactor~~ temperature for the process design in Table F.1 in paragraph (2) of this subsection, the owner must use the average of the lowest consecutive seven-day mean aeration basin~~reactor~~ temperature from a ~~similar~~ wastewater treatment facility. ~~located within 50 miles of the proposed site must be used. ,~~ For purposes of this subsection, a similar wastewater treatment facility:

(A) is located within 50 miles of the wastewater facility where the planned aeration basin or system will be installed;

(B) uses the same placement of the aeration basin (in-ground or above-ground); and

(C) has any other characteristics required by the executive director.

(c) Clarifier Sizing.

(1) The following table establishes the maximum surface loading rates and the minimum detention times used to determine the size of a ~~an activated sludge~~ clarifier:

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Figure: 30 TAC §217.154(c)(1)

Table F.2. - Maximum Clarifier Weir Overflow Rates Based Upon Traditional Design Methods						
Applicable Permit Effluent Sets *concentration milligrams per liter (mg/l)*			**Aeration Basin Organic Loading** *(five-day biochemical oxygen ~~demand (BOD5 lbs/day)~~ ~~(from~~demand, from* Table F.1)	**Process - Treatment Level**	**Maximum Weir Overflow Rate at 2-Hour Peak Flow** *(gallons/day/ square foot)*	**Minimum Detention Time at 2-Hour Peak Flow** *(hours)*
BOD_5	**TSS**	**NH_3-N**				
20	20		45	Fixed film - secondary or enhanced secondary	1200	1.8
10	15					
20	20		45, 35, 25 or 20	Activated sludge - secondary, enhanced secondary, or secondary with nitrification	1200	1.8
10	15					
10	15	3				
20	20		15	Extended air - secondary	900	2.0
10	15	3	15	Extended aeration - enhanced secondary	800	2.2

(2) A clarifier must meet both the detention time and weir overflow rate criteria in Figure: 30 TAC §217.154(c)(1).

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(A) When calculating weir overflow rates for a ~~proposed~~ clarifier, ~~sludge recycle~~ return activated sludge flow must not be used in the calculation of the maximum weir overflow rate, in compliance with Table F.2 in paragraph (1) of this subsection.

(B) When calculating the weir overflow rate for a ~~proposed~~ clarifier, the surface area of the stilling well may be included as part of the clarifier surface area.

§217.155. Aeration Equipment Sizing.

(a) Oxygen Requirements (O_2-R) of ~~w~~Wastewater.

(1) An aeration system must be designed to provide a minimum dissolved oxygen concentration in the aeration basin of 2.0 milligrams per liter (mg/l).

(2) Mechanical and diffused aeration systems must supply the O_2-R calculated by Figure: 30 TAC §217.155(a)(2), Equation F.2 located in paragraph (3) of this subsection or use the recommended values presented in Figure: 30 TAC §217.155(a)(2), Table F.3, whichever is greater. ~~in paragraph (3) of this subsection.~~

(3) The O2 R values in Table F.3 in the following figure use concentrations of 200 mg/l five-day biochemical oxygen demand (BOD5) and 45 mg/l ammonia-nitrogen (NH3 -N) in Equation F.2 in the following figure:

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Figure: 30 TAC §217.155(a)(3)

Equation F.2.

$$O_2R = \frac{1.2(BOD_5) + 4.3(NH_3 - N)}{BOD_5}$$

Where:
O_2R = Oxygen requirement, lb O_2/lb BOD_5
BOD_5 = BOD_5 concentration, mg/L
NH_3-N = Ammonia nitrogen, mg/L

Table F.3 - Minimum O_2R for Lower BOD_5 Loadings	
Process	**O_2R, pounds (lbs) O_2/lb BOD_5**
Conventional Activated Sludge Systems that are not Intended to Nitrify	1.2
Conventional Activated Sludge Systems that are Intended to Nitrify and Extended Aeration Systems (including all Oxidation Ditch Treatment Systems)	2.2

(b) Diffused Aeration System. An airflow design must be based on either paragraph (1) or (2) of this subsection.

(1) Design Airflow Requirements - Default Values. A diffused aeration ~~air~~ system may use the following table to determine the airflow for sizing aeration system components:

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Figure: 30 TAC §217.155(b)(1)

Table F.4. - Minimum Airflow Requirements for Diffused Air	
Process	**Airflow/BOD_5 load** *standard cubic feet (SCF)/day/lb*
Conventional activated sludge systems that are not intended~~<~~ to~~>~~ nitrify	1800*
~~Conventional Activated Sludge Systems that are Intended to Nitrify; and,~~ Extended aeration systems and all other activated sludge systems that are intended to nitrify, including all oxidation ditch treatment systems	3200*
*These values were calculated using Equation F.3 in Figure: 30 TAC §217.155(b)(2)(A)(iv) with the following assumptions: a transfer efficiency of 4.0% in wastewater for all diffused air activated sludge processes; a diffuser submergence of 12 feet; a wastewater temperature of 20°C; and the oxygen requirements in Figure: 30 TAC §217.155(a)(3), Table F.3.	

(2) Design Airflow Requirements - Equipment and Site Specific Values. A diffused aeration ~~air~~ system may be based on~~base~~ calculations of the airflow requirements for the diffused aeration ~~air~~ equipment in accordance with subparagraphs (A) - (D) of this paragraph.

(A) Determine Clean Water Oxygen Transfer Efficiency.

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(i) A diffused aeration ~~air~~ system design may be based on~~have~~ a clean water oxygen transfer efficiency greater than 4%, only if the clean water oxygen transfer efficiency is supported by full scale diffuser performance data. Full scale performance data must be developed by an accredited ~~from a certified~~ testing laboratory or ~~sealed by~~ an independent licensed professional engineer. Data developed by a professional engineer must be sealed by the engineer. ~~demonstrates the diffuser's transfer efficiency.~~

(ii) A testing laboratory or licensed engineer shall use the oxygen transfer testing methodology described in the most current version of the American Society of Civil Engineers (ASCE) publication, A Standard for the Measurement of Oxygen Transfer in Clean Water.

(iii) A diffused aeration ~~air~~ system with a clean water transfer efficiency greater than 18% for a coarse bubble system or ~~and~~ greater than 26% for a fine bubble system is considered an innovative technology and is subject to §217.7(b)(2) of this title (relating to Types of Plans and Specifications Approvals).

(iv) A design for clean water transfer efficiencies obtained at temperatures other than 20 degrees Celsius must be adjusted for a diffused aeration ~~air~~

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system to reflect the approximate transfer efficiencies and air requirements under field conditions by using the following equation:

Figure: 30 TAC §217.155(b)(2)(A)(iv)

Equation F.3.

$$FTE = (T_e) \times \left(\frac{WOTE}{CWOTE}\right) \times 1.024^{T-20} \times \left(\frac{C_f}{C_t}\right)$$

Where:
T_e = Test Efficiency
FTE = Field Transfer Efficiency (decimal)
WOTE = Wastewater Oxygen Transfer Efficiency (decimal)
CWOTE = Clean Water Oxygen Transfer Efficiency (decimal)
T = Temperature (degrees C)
C_f = Oxygen Saturation in Field (Includes temperature, dissolved solids, pressure, etc.)
C_t = Oxygen Saturation in Test Conditions

(B) Determining Wastewater Oxygen Transfer Efficiency (WOTE).

(i) The WOTE must be determined from clean water test data by multiplying the clean water transfer efficiency by 0.65 for a coarse bubble diffuser or ~~and~~ by multiplying the clean water transfer efficiency by 0.45 for a fine bubble diffuser.

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(ii) The executive director may require additional testing and data to justify actual WOTE for a ~~facility~~wastewater treatment facility treating wastewater containing greater than 10% industrial wastes.

(C) Determining Required Airflow (RAF). The RAF must be calculated using the following equation to determine the size needed for a diffuser submergence of 12.0 feet. If the diffuser submergence is other than 12.0 feet, a diffused aeration ~~air~~ system must correct the RAF, as detailed in subparagraph (D) of this paragraph.

Figure: 30 TAC §217.155(b)(2)(C)

Equation F.4.

$$RAF = \frac{(PPD\ BOD_5) \times (O_2/lb\ BOD_5)}{WOTE \times 0.23 \times 0.075 \times 1440}$$

Where:
RAF = Required Airflow R~~r~~ate (standard cubic feet per minute (SCFM))
PPD BOD_5 = Influent Organic Load in Pounds per Day
0.23 = lb O_2/lb air @ 20° C
1440 = minutes/day
0.075 = lb air/cubic foot (cf)
WOTE = Wastewater Oxygen Transfer Efficiency (decimal)
If the design inlet temperature is above 24° C, the specific weight of air must be adjusted to the specific weight at the intake temperature.

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(D) Corrections to RAF based on varying diffuser submergence depths. The engineer shall provide the manufacturer's laboratory testing data if the diffuser submergence depth in the design is the same as the diffuser submergence depth in the manufacturer's testing. The engineer shall apply a correction factor from Table F.5 to the required airflow rate calculated using Equation F.3 if the manufacturer's laboratory testing data is not available for the design diffuser submergence depth. Interpolation is allowed for diffuser submergence depths not shown in the Table F.5. ~~If the diffuser submergence is not 12.0 feet, the design must specify the adjustment of the minimum airflow rate as calculated in subparagraph (C) of this paragraph by multiplying the calculated values by the factors in the following table:~~

Figure: 30 TAC §217.155(b)(2)(D)

Table F.5. - Diffuser Submergence Correction Factors	
Diffuser Submergence Depth *(feet)*	**Airflow Rate Correction Factor**
8	1.82
10	1.56
12	1.00
15	0.91
18	0.73
20	0.64

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(3) Mixing Requirements for Diffused Air. The air requirements for mixing must be calculated using an airflow rate:

(A) from *Design of Municipal Wastewater Treatment Plants*, *Fifth Edition*, Chapter 11, a joint publication of the ASCE and the Water Environment Federation, for mixing requirements; or

(B) ~~provide mixing air at a rate~~ greater than or equal to 20 standard cubic feet per minute (scfm) per 1,000 cubic feet ~~scfm/1000 cf~~ for a coarse bubble diffuser and greater than or equal to 0.12 scfm per ~~/~~ square foot ~~(sf)~~ for a fine bubble diffuser.

(4) Blowers and Air Compressors.

(A) A blower and an air~~a~~ compressor system must ~~have sufficient capacity to~~ provide the required design airflow ~~aeration~~ rate for biological treatment and mixing, based on §§217.155(b)(1) through 217.155 (b)(3) of this title (relating to Design Airflow Requirements - Equipment and Site Specific Values; Design Airflow Requirements - Default Values; and Mixing Requirements for Diffused Air), and the air requirements of all other ~~any~~ supplemental units ~~unit~~ where air must be supplied.

(B) The report must include blower ~~or~~ and air compressor calculations that show the maximum ~~actual~~ air requirements for the expected temperature range, including both summer and winter conditions, and the impact of the ~~actual~~ site elevation on the air supply.

(C) A diffused aeration ~~air~~ system must have multiple compressors arranged to provide an adjustable air supply to meet the variable organic load on the ~~facility~~wastewater treatment facility.

(D) The air compressors must be capable of handling the maximum design air requirements with the largest single ~~unit~~ air compressor out of service.

(E) A blower unit and a compressor unit must restart automatically after a power outage, or have a telemetry system or an auto-dialer with battery backup ~~must~~ to notify an operator of any outage.

(F) The~~A~~ design of a blower and air compressor system must specify blowers ~~or~~ and air compressors with sufficient capacity to handle air intake temperatures that may exceed 100 degrees Fahrenheit (38 degrees Celsius), and pressures that may be less than standard (14.7 pounds per square inch absolute).

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(G) The~~A~~ design of a blower and air compressor system must specify the capacity of the ~~a~~ motor drive necessary to handle air intake temperatures that may be 20 degrees Fahrenheit (-7 degrees Celsius) or less. ~~in a location that experiences temperatures below 20 degrees Fahrenheit (-7 degrees Celsius).~~

(H) A blower must include a governor or other means to regulate airflow.

(5) Diffuser Systems - Additional Requirements.

(A) Diffuser Submergence.

(i) For a new wastewater treatment facility, the~~A~~ submergence depth for any diffuser must meet the minimum depths in the following table~~, for a new facility~~:

Figure: 30 TAC §217.155(b)(5)(A)(i)

Table F.6. - Minimum Diffuser Submergence Depth	
Design Flow *(mgd)*	**Minimum Submergence Depth**

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	(feet)
<0.01	8.0
0.01 to 0.10	9.0
>0.10	10.0

(ii) For an alteration or expansion of an existing wastewater treatment facility, the diffuser submergence depth ~~A diffuser submergence depth for any material alteration or expansion of an existing facility~~ may vary from the values in Table F.6 in clause (i) of this subparagraph to match existing air pressure, delivery rate, and hydraulic requirements.

(iii) A submerged depth for a diffuser of less than 7.0 feet is prohibited for any facility with a design flow of 5,000 gallons per day or greater. A facility with a design flow of less than 5,000 gallons per day may have a diffuser submergence depth of less than 7.0 feet, but only if approved by the executive director.

(B) Grit Removal. A ~~facility~~wastewater treatment facility that uses diffusers and has wastewater with concentrations of grit that would interfere with the operation of a diffuser ~~high concentrations of grit~~ must either include a grit removal unit upstream of an aeration process, or ~~must~~ include multiple aeration basins~~trains~~ so that one basin may be taken out of service to allow for grit removal.

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(C) Aeration System Pipes.

(i) Each diffuser header must include an open/close or throttling type control valve that can withstand the heat of compressed air.

(ii) A~~n~~ ~~air header~~diffuser header must be able to withstand temperatures up to 250 degrees Fahrenheit~~F~~.

(iii) The capacity of an air diffuser system, including pipes and diffusers, must equal 150% of design air requirements.

(iv) The design of an aeration system must minimize head loss. The report must include a hydraulic analysis of the entire air pipe system that quantifies head loss through the pipe system and details the distribution of air from the blowers to the diffusers.

(v) An aeration system may use non-metallic pipes only in the aeration basin, but the pipes must be a minimum of 4.0 feet below the average water surface elevation in the aeration basin.

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(c) Mechanical Aeration Systems.

(1) Required Airflow - Equipment and Site Specific Values. The airflow requirements for a mechanical aeration system must be calculated in accordance with subparagraphs (A) and (B) of this paragraph.

(A) ~~Determine~~ Clean Water Oxygen Transfer Efficiency.

(i) The report must include the clean water oxygen transfer efficiency rate for the mechanical equipment.

(ii) The clean~~Clean~~ water oxygen transfer efficiency~~rate~~ must not exceed 2.0 pounds of oxygen per horsepower-hour~~,~~ unless justified by full scale performance data. Full scale performance data must be developed by an accredited ~~conducted by a certified~~ testing laboratory or ~~sealed by~~ an independent~~,~~ licensed professional engineer. Data developed by a professional engineer must be sealed by the engineer. Full scale performance tests must follow~~using~~ the oxygen transfer testing methodology described in the most current version of the ASCE publication, A Standard for the Measurement of Oxygen Transfer in Clean Water.

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(iii) A technology with a proposed clean water oxygen transfer efficiency in excess of 2.0 pounds of oxygen per horsepower-hour is innovative technology and subject to the requirements of §217.7(b)(2) of this title (relating to Types of Plans and Specifications Approvals).

(B) ~~Determine~~ Wastewater Oxygen Transfer Efficiency.

(i) The report must include the actual wastewater oxygen transfer efficiency and data to justify the actual wastewater oxygen transfer efficiency.

(ii) If a wastewater treatment facility will receive more than 10% industrial wastewater by volume, all mechanical aeration equipment must be sized based on a wastewater oxygen transfer efficiency of no more than 0.65 times the clean water oxygen transfer efficiency. ~~A design must include an estimate of the wastewater transfer efficiency from the clean water transfer efficiency by multiplying the clean water transfer efficiency by 0.65 for all mechanical aeration equipment for a facility treating greater than 10% industrial wastes.~~

(2) Mixing Requirements.

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(A) A mechanical aeration device must provide ~~sufficient~~ mixing to prevent ~~deposition of~~ mixed liquor suspended solids (MLSS) deposits under any flow condition.

(B) A mechanical aeration device must be capable of re-suspending the MLSS after a shutdown period.

(C) Mechanical aeration devices with a channel or basin layout must have a minimum of 100 horsepower per million gallons of aeration basin volume or 0.75 horsepower per thousand cubic feet of aeration basin volume.

(3) Mechanical Components.

(A) Process ~~r~~Reliability.

(i) Each aeration basin must include a minimum of two mechanical aeration devices.

(ii) A mechanical aeration device must meet the maximum design requirements for oxygen transfer with the largest single unit out of service.

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(iii) A mechanical aeration device must either automatically restart after a power outage, or have a telemetry system or an auto-dialer with battery backup to notify an operator of any outage.~~or a telemetry system with battery backup or an auto-dialer with battery backup must notify a facility operator or owner.~~

(B) Operation and maintenance.

(i) A mechanical aeration device must have two-~~-~~speed or variable-~~-~~speed drive units, unless another means of varying the output is provided.

(ii) To vary the output, a mechanical aeration device may use single-speed drive units with timer-controlled operation~~,~~ if the device also includes an independent means of mixing.

(iii) A ~~facility~~wastewater treatment facility must be designed such that an operator is~~must be~~ able to perform routine maintenance on the aeration equipment without ~~the potential of~~ coming into contact with ~~raw or partially treated~~ wastewater.

(iv) Any bearing, drive motor, or gear reducer must be accessible to an operator for maintenance and must be equipped with a splash

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prevention device. A splash prevention device must be designed to protect the operator from contact with wastewater and to prevent wastewater from escaping the basin.

(v) Any gear reducer must have a drainage system to prevent operator contact with mixed liquor.

§217.156. Sequencing Batch Reactors.

(a) System Sizing and Reliability.

(1) A sequencing batch reactor (SBR) must meet the reliability requirements in §217.155(b) and (c)(3) of this title (relating to Aeration Equipment Sizing), and power source reliability requirements in §217.36 of this title (relating to Emergency Power Requirements).

(2) ~~A SBR~~An SBR must have a minimum decantable volume that is sufficient to pass the design flow without changing cycle times with the largest basin out of service.

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(3) A two-basin ~~treatment facility~~wastewater treatment facility without removable aeration devices is required to have aerated storage of mixed liquor separate from the SBR tank(s).

(4) An SBR with a fixed level decanter must have more than two basins and additional decantable storage volume. ~~because of the added settling time before a discharge may occur.~~

(5) An equalization basin is required for ~~An~~an SBR with fixed decant equipment and decant volumes that do not accommodate the ~~design~~ peak flow ~~requires an equalization basin~~.

(6) Organic ~~space~~ loadings must conform to the values in Figure: 30 TAC §217.154(b)(2), Table F.1 of this title (relating to Aeration Basin and Clarifier Sizing--Traditional Design). Organic ~~Maximum space~~ loadings must be below 35 pounds of five-day biochemical oxygen demand ~~(CBOD5)~~ per 1,000 cubic feet of tank volume.

(7) The reactor mixed liquor suspended solids (MLSS) level at the normal operating level must range ~~be~~ from at least 3,000 milligrams per liter (mg/l) ~~but~~to not more than 5,000 mg/l.

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(8) The minimum depth of the MLSS during a react phase is 9.0 feet.

(9) The minimum side water depth of an SBR ~~a~~ tank is 12 feet.

(10) An SBR must include sludge digestion pursuant to the requirements in Subchapter J of this chapter (relating to Sludge Processing~~Treatment Units~~).

(b) Decanter Design.

(1) A decanter design must control the velocity at an inlet port or at the edge of submerged weirs to prevent vortexing, disturbance of the settled sludge, and entry of floating materials.

(2) The entrance velocity to a decanter must not exceed 1.0 foot per second.

(3) A decanter must draw effluent from below the water surface and include a device that excludes scum.

(4) A decanter must maintain a zone of separation between the settled sludge and the decanter of no less than 12 inches.

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(5) A decanter must prevent solids from entering the decanter during a react cycle by using one the following methods:

(A) recycling ~~Recycle~~ treated effluent to wash out solids trapped in a decanter;

(B) mechanically closing ~~Mechanically close~~ a decanter when it is not in use; or

(C) filling ~~Fill~~ a decanter with air except during a decant period.

(6) A ~~The design of a~~ decanter and related pipes and valves must prevent ~~include freeze protection, if located in a location subject to~~ freezing.

(7) A fixed decanter is prohibited in a basin where simultaneous fill and decant may occur.

(8) For any system of tanks that is fed sequentially, the size of the decant system must accommodate the design flow with a constant cycle time with the largest tank out of service.

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(9) An SBR system utilizing more than two basins must allow the decanting of at least two tanks simultaneously.

(10) If units downstream of an SBR are not capable of accepting the peak flow rate of the decanting cycle, flow equalization must be provided between the decanter and the downstream units.

(c) SBR Tank Details.

(1) An SBR requires multiple tanks.

(2) An SBR with two tanks or an SBR system operating with a continuous feed during settling and decanting phases must include influent baffling and physical separation from the decanter.

(3) An elongated tank must be used for an SBR system if influent baffling is required.

(4) An SBR tank must have a minimum freeboard of 18 inches at the maximum liquid level.

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(5) An SBR tank must not be ~~resist~~ buoyant ~~uplift~~ when empty.

(6) Structures using a common wall must be designed to accommodate the stresses generated when one basin is full and an adjacent basin is empty.

(7) Each SBR wall must be watertight.

(8) A sump must be provided in any basin with a flat bottom.

(9) An SBR system must have a dedicated means of transferring sludge between aeration basins.

(10) An SBR system must include a means of scum removal in each aeration basin.

(11) Each SBR tank must include a dewatering system and an emergency overflow to another aeration tank~~(s)~~ or a storage tank.

(12) At a ~~facility~~wastewater treatment facility that is not staffed 24-hours per~~each~~ day, a manually operated SBR tank must include a high-level alarm that notifies

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~~facility~~wastewater treatment facility staff~~,~~ in accordance with §217.161 of this title (relating to Electrical and Instrumentation Systems).

(13) A design must specify the means and frequency for removal of grit and other debris from the SBR tanks~~basins~~.

(14) All equipment must be accessible for inspection, maintenance, and operation. The entire surface area of each SBR tank must be accessible for inspection and process control sampling. Each SBR tank must include a walkway that bisects the tank.

(15) An SBR may use fine screens pursuant to §217.122 of this title (relating to Fine Screens~~Screening Devices~~).

(16) An SBR preceded by a primary clarifier may use a comminutor.

(17) An SBR must have a sufficient number of tanks to operate at design flow with ~~one~~ the largest tank out of service.

(d) Aeration and Mixing Equipment.

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(1) In addition to the requirements of §217.155 of this title (relating to Aeration Equipment Sizing), aeration equipment must handle the cyclical operation in an SBR.

(2) The aeration and mixing equipment must not interfere with settling.

(3) The oxygen transfer rate for the aerators at average water depth during a fill cycle must provide a residual of 2.0 mg/l dissolved oxygen in the tank~~basin~~.

(4) The ~~A~~ design must specify the blower discharge pressure at the maximum water depth.

(5) An~~A~~ SBR used for biological nutrient removal or reduction must meet the design requirements of §217.163 of this title (relating to Advanced Nutrient Removal).

(6) The design of an SBR must allow for the removal of air diffusers or mechanical aeration devices without dewatering the tank.

(e) Control Systems.

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(1) The motor control center must include programmable logic controllers (PLC) ~~with~~ that are able to operate with limited operator adjustment and be programmed to meet the required effluent limitations for the design loadings. A facility must have the ability to run in full manual mode.

(2) A hard-wired backup means of operating the SBR is required.

(3) The PLC must include battery backup. A duplicate set of all circuit boards must be kept at the ~~facility~~wastewater treatment facility.

(4) Adequate controls for the separate operation of each ~~reactor~~ tank must be provided.

(5) A tank level system must include floats or pressure transducers.

(A) A float system must be protected from prevailing winds and freezing.

(B) A bubbler system in a tank level system is prohibited.

(6) The control panel switches must include the following switches~~at least~~:

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(A) ~~P~~pumps - hand/off/automatic;

(B) ~~V~~valves - open/closed/automatic;

(C) ~~B~~blowers or aerators - hand/off/automatic; and

(D) ~~S~~selector switch for tank(s) - in operation/standby.

(7) The control panel visual displays must include:

(A) a ~~M~~mimic diagram of the process that shows the status and position of all~~any~~ pumps, valves, blowers, ~~or~~ aerators, and mixers;

(B) ~~P~~process cycle and time remaining;

(C) ~~I~~instantaneous and totalized influent flow to the ~~facility~~wastewater treatment facility and effluent flow of the final discharge;

(D) ~~T~~tank level gauges or levels;

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(E) ~~S~~sludge pumping rate and duration; and

(F) ~~A~~airflow rate and totalizer.

(8) The annunciator panel must include the following~~required~~ alarm condition indicators: ~~for an annunciator panel must include:~~

(A) ~~H~~high and low water levels in each tank;

(B) ~~F~~failure of all automatically operated valves;

(C) ~~D~~decanter failure;

(D) ~~B~~blowers, if used - low pressure, high temperature, and failure;

(E) ~~M~~mechanical aerator, if used - high temperature and failure;

(F) ~~P~~pump - high pressure and failure; and

(G) ~~M~~mixers, if used - failure.

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§217.157. Membrane Bioreactor Systems.

(a) Applicability.

(1) This section contains criteria for low-pressure, vacuum, and gravity ultrafiltration or microfiltration membrane bioreactors.

(2) Other types of membrane bioreactors (MBRs) are considered innovative technology and are subject to the requirements of §217.7(b)(2) of this title (relating to Types of Plans and Specifications Approvals).

(b) Definitions

(1) Flat plate system—A membrane bioreactor that arranges membranes into rectangular cartridges with a porous backing material that provides structural support between two membranes.

(2) Gross flux rate—The volume of water that passes through a membrane, measured in gallons per day per square-foot of membrane area at a standard temperature of 20 degrees Centigrade.

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(3) Hollow fiber system—A membrane bioreactor composed of bundles of very fine membrane fibers, approximately 0.5-2 millimeters in diameter, held in place at the ends with hardened plastic potting material, and supported on stainless steel frames or rack assemblies. The outer surface of each fiber is exposed to the mixed liquor with filtrate flow from outside to inside through membrane pores.

(4) Net flux rate—The gross flux rate adjusted for production lost during backwash, cleaning, and relaxation.

(5) Transmembrane pressure—The difference between the average pressure on the feed side of a membrane and the average pressure on the permeate side of a membrane.

(6) Tubular system—A system in which sludge is pumped from an aeration basin to a pressure driven membrane system outside of a bioreactor where the suspended solids are retained and recycled back into the bioreactor while the effluent passes through a membrane.

(~~b~~c) Performance Standards.

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(1) MBR performance standards for conventional pollutants and nutrients are shown in the following table:

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Figure: 30 TAC §217.157(c)(1) ~~§217.157(b)(1)~~

Table F.7. Performance Standards for Conventional Pollutants and Nutrients		
Parameter	**Units**	**Expected Value**
$CBOD_5$	*milligrams per liter (mg/l)*	5
TSS	*mg/l*	1
Ammonia	*mg/l as N*	1
Total Nitrogen (with only preanoxic zone)	*mg/l*	10
Total Nitrogen (with preanoxic and postanoxic zones)	*mg/l*	3
Total Phosphorous (with chemical addition)	*mg/l*	0.2
Total Phosphorous (with bio-P removal)	*mg/l*	0.5
Turbidity	*nephelometric turbidity units (NTU)*	0.2
Bacteria	*log removal*	≤ 6 log (99.9999%)
Viruses	*log removal*	≤ 3 log (99.9%)

(2) The executive director may require ~~A~~an owner ~~may be required~~ to submit a pilot study report or data from a similar ~~facility~~wastewater treatment facility if a proposed ~~facility~~wastewater treatment facility is designed to achieve higher quality effluent than the performance standards listed in the table in paragraph (1) of this

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subsection. A similar wastewater treatment facility must have similar characteristics including:

(A) climate region;

(B) peak flows;

(D) customer base, including sources and percent contribution; and

(E) other characteristics required by the executive director

(~~e~~d) ~~Facility~~Wastewater Treatment Facility Design.

(1) Pretreatment.

(A) Each MBR system must have fine screening to prevent damage from abrasive particles or fibrous, stringy material.

(i) Fine screens must be rotary drum or traveling band screens with either perforated plates or wire mesh. ~~with~~

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(ii) Fine screens for hollow fiber or tubular systems must have an opening size of 0.5 - 2.0 millimeter (mm).

(iii) Fine screens for flat plate systems must have ~~for hollow fiber systems and tubular systems and~~ an opening size of 2.0 - 3.0 mm ~~for flat plate systems~~.

(iv)~~(ii)~~ Bypass of a fine screen must be prevented ~~with either~~by use of a duplicate fine screen, emergency overflow to a wet well, or an alternative method that has been approved by the executive director.

(v)~~(iii)~~ A fine screen must be designed to prevent bypass~~overflow~~ at the peak flow.

(vi)~~(iv)~~ Coarse screens ~~followed by fine screens may be used in larger facilities~~may be used ahead of fine screens to ~~minimize~~ reduce the complications of fine screening.

(B) The economic feasibility of primary ~~clarification~~ sedimentation must be evaluated for facilities designed for an average daily flow of 5.0 million gallons

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per day (mgd) or more. The economic feasibility evaluation must be included in the report.

(C) Fat, oil, ~~Oil~~ and grease removal is required if the levels of fat, oil, and grease ~~oil and grease levels~~ in the influent may cause damage to the membranes. The specific detrimental concentration must be determined by the equipment manufacturer. ~~However, i~~Influent concentrations of fat, oil, and grease equal to or more than 100 milligram per liter (mg/l) must have fat, oil, and grease removal.

(D) The necessity of grit removal must be evaluated for a ~~facility~~wastewater treatment facility that has a collection system with excessive inflow and infiltration. Excessive grit accumulation is characterized by grit accumulation in any treatment unit following the headworks. An evaluation must be included in the report.

(2) Biological Treatment.

(A) The reactor volume ~~for any biological treatment zone~~ must be determined using rate equations for substrate utilization and biomass growth in a manner similar to determining basin sizes for conventional activated sludge processes in §217.154 (relating to Aeration Basin and Clarifier Sizing—Traditional Design).

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(B) The design sludge retention time (SRT) for an MBR must be at least 10 days, but not~~no~~ more than 25 days.

(C) The design operational range of mixed liquor suspended solids (MLSS) concentration ~~(MLSS)~~ must be:

(i) at least 4,000 mg/l but not more than 10,000 mg/l in the bioreactor; and

(ii) at least 4,000 mg/l but not more than 14,000 mg/l in the membrane tank.

(D) An MBR ~~A~~ system designed for an SRT or MLSS outside the ~~theses~~ ranges in subparagraph (2)(C) of this paragraph requires a pilot study in compliance with paragraph (8) of this subsection~~,~~ or data from a similar ~~facility~~wastewater treatment facility that demonstrates that the design parameters are sustainable and can achieve the expected performance.

(3) Aeration.

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(A) An aeration system in an MBR ~~a bioreactor~~ must be capable of maintaining dissolved oxygen levels as listed in subparagraph (C) of this paragraph.

(B) An aeration system in an MBR ~~A bioreactor aeration system~~ must compensate for ~~a~~ low oxygen transfer efficiency associated with ~~due to~~ the higher MLSS concentrations. ~~with a justified alpha value of 0.5 or lower.~~ The alpha value used to determine design oxygen transfer efficiency must be 0.5 or lower.

(C) The ~~design~~ oxygen concentration range used for sizing aeration systems for treatment zones must be:

(i) ~~Anoxic:~~ not more than 0.5 mg/l for anoxic basins;

(ii) ~~Aerobic:~~ at least 1.5 mg/l but not more than 3.0 mg/l for aerobic basins; and

(iii) ~~Membranes:~~ at least 2.0 mg/l but not more than 8.0 mg/l for membrane basins.

(D) An MBR design must include dissolved oxygen monitoring and an alarm to notify an operator ~~of~~if ~~potential or actual~~ dissolved oxygen

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~~depravation~~levels are outside of the design operating range, or if there is a rapid change in dissolved oxygen. Alarm systems must comply with §217.161 of this title (relating to Electrical and Instrumentation Systems).

(4) Recycle Rates. Facilities without advanced ~~treatment~~ nutrient removal must be designed with recycle rates sufficient to sustain the design mixed liquor concentrations~~;~~ (typically from 200% to 400% of the ~~facility~~wastewater treatment facility's influent flow).

(5) Nutrient ~~r~~Removal.

(A) A system designed for ~~enhanced~~ advanced nutrient removal must include an isolated tank or baffled zone ~~for~~ to separate anoxic ~~treatment~~, anaerobic ~~treatment~~, ~~or~~ and aerobic treatment zones~~both~~.

(B) The engineer shall submit calculations to support the sizing of the reactor volumes. ~~Calculations for sizing the reactor volumes must be based on one of these models for nutrient removal:~~

~~(i) Bardenpho;~~

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~~(ii) modified Ludzak-Etinger;~~

~~(iii) University of Capetown; or~~

~~(iv) an alternative approved by the executive director.~~

(C) If recycled activated sludge is returned to an anoxic or anaerobic basin, ~~A facility~~a wastewater treatment facility designed for total nitrogen or ~~biological~~ advanced nutrient removal must contain a deoxygenation basin, a larger anoxic basin, or another method of decreasing dissolved oxygen concentration approved by the executive director. ~~of decreasing dissolved oxygen concentration, if the recycled activated sludge is returned to an anoxic or anaerobic basin.~~

(D) An advanced nutrient removal system must be designed with recycle rates sufficient to sustain the designed mixed liquor concentrations in both the aeration, ~~and~~ anoxic, and anaerobic basins~~;~~ (sufficient recycle rates are typically ~~totaling~~ 600% or more of the influent flow).

(6) Use of Membranes.

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(A) Use of a membrane system other than a hollow fiber system, tubular system, or a flat plate system is~~must be~~ considered innovative treatment technology and is subject to §217.7(b)(2) of this title (relating to Approval of Innovative and Nonconforming Technologies).

(B) The report must provide justification for the use~~Use~~ of a membrane material other than one of the following: ~~must be justified in the report:~~

(i) polyethersulfone (PES);

(ii) polyvinylidene fluoride (PVDF);

(iii) polypropylene (PP);

(iv) polyethylene (PE);

(v) polyvinylpyrrolidone (PVP); or

(vi) chlorinated polyethylene (CPE).

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(C) The nominal pore size used in an MBR for microfiltration membranes must be at least 0.10 micrometers (microns) but not more than 0.4 microns.

(D) The nominal pore size used in an MBR for ultrafiltration must be at least 0.02 microns but not more than 0.10 microns.

(E) Any chemical used for cleaning must not adversely affect the membrane material.

(7) Membrane Design Parameters.

(A) MBRs must be designed for:

(i) an average daily net flux rate equal to or less than~~of not more than~~ 15 gallons per day per square-foot of membrane area; ~~(gfd);~~

(ii) a peak daily net flux rate equal to or less than 1.25 times the average daily net flux rate; and

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(iii) a two-hour peak net flux rate equal to or less than 1.5 times the average daily net flux rate.

(B) The executive director may approve larger net flux rates if the rates are substantiated with a pilot study or data from a similar ~~facility~~wastewater treatment facility that substantiates~~substantiate~~ the proposed duration, frequency, and recovery time from peak flow.

(C) An MBR~~A~~ system with a peak flow rate that is greater than 2.5 times the average daily flow must use an equalization basin~~volume~~, off-line storage, or reserve membrane capacity to accommodate the higher peak flow.

(D) Hollow Fiber Transmembrane Pressure (TMP).

(i) The operational transmembrane pressure of a hollow fiber MBR ~~range must~~system must be at least 2.0 pounds per square inch (psi) but not more than 10.0 psi.

(ii) The transmembrane ~~maximum~~ pressure of a hollow fiber MBR system must not exceed 12.0 psi.

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(E) Flat Plate TMP.

(i) The operational transmembrane pressure of a flat plate MBR system ~~range~~ must be at least 0.3 psi but not more than 3.0 psi.

(ii) The transmembrane ~~maximum~~ pressure of a flat plate MBR system must never ~~not~~ exceed 4.5 psi.

(F) Tubular, Out of Basin TMP.

(i) The operational transmembrane pressure range of a tubular, out of basin MBR system must be at least 0.5 psi but not more than 5.0 psi.

(ii) The transmembrane ~~maximum~~ pressure of a tubular, out of basin MBR system must never~~not~~ exceed 10.0 psi.

(8) Supporting Data. An owner must provide pilot study reports or data from similar facilities for a facility that is either:

(i) required to meet stricter standards than in Table F.7 in subsection (c)(1) of this section; or

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(ii) designed to operate outside normal operating parameters defined within this section~~Pilot study reports or data from similar facilities must be provided if a facility is designed to achieve better than the performance standards in Table F.7 in subsection (b)(1) of this section, or outside normal operating parameters defined within this section~~.

(A) A pilot study must be ~~operated~~ conducted for at least 30 days after the initial start-up and acclimation period.

(B) A pilot study must be designed to evaluate the membrane performance ~~during~~ under actual operational conditions, including flow variations and influent wastewater characteristics.

(C) The treatment and pretreatment processes evaluated in a pilot study or similar ~~facility~~wastewater treatment facility must be equivalent to the processes that will be used in the proposed ~~facility~~wastewater treatment facility.

(D) The results of the pilot study must include the following recommendations:

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(i) net flux rates for design flow~~average, peak day,~~ and peak ~~two-hour design~~flow ~~net flux rates~~;

(ii) average and maximum transmembrane pressure~~TMP~~;

(iii) cleaning and backwash intervals;

(iv) expected percent chemical recovery after chemical cleaning;

(v) dissolved oxygen concentrations for reactors and membrane basins;

(vi) MLSS concentrations for reactors and membrane basins;

(vii) SRTs for reactors and membrane basins; and

(viii) expected effluent concentrations of conventional pollutants and nutrients, including the pollutants and nutrients that will be limited or monitored in the ~~facility~~wastewater treatment facility's wastewater permit.

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(9) Redundancy.

(A) A ~~facility~~wastewater treatment facility must be able to operate at normal operating parameters and conditions for design ~~daily average~~ flow with the largest ~~one~~ MBR unit or train out of service.

(B) Acceptable methods of providing redundancy are additional treatment trains, additional treatment units, or storage. The report must include calculations that ~~must be included in the report to~~ demonstrate adequate redundancy within the wastewater treatment facility.

(10) Other Components.

(A) Mixers.

(i) Unaerated (deoxygenation, pre/post anoxic, and anaerobic) zones must have a submersible ~~mixers~~ mixing system or an alternative ~~mixer~~ mixing system that has been approved by the executive director.

(ii) Coarse bubble air diffusers may be used for mixing in a pre-anoxic tank.

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(B) Scum and Foam Handling.

~~(i)~~ An MBR must be designed to control ~~S~~scum and foam and must ~~not interfere with treatment~~prevent unauthorized discharge of scum or foam ~~or overflow a~~ from a treatment unit.

~~(ii) Surface wasting of excess mixed liquor or skimmers may be used to control scum and foam.~~

~~(iii) Surface wasting may be performed in a aerated basin, a membrane basin, or both.~~

(C) Cranes and Hoists. A crane, hoist or ~~some~~ other process or mechanism approved by the executive director must be provided for periodic cleaning and maintenance of the membranes.

(11) Disinfection.

(A) An owner may request and the executive director may approve ~~grant~~ decreased ultraviolet light or chlorine dosing requirements for MBR effluent.

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(B)

the design for ultraviolet light disinfection for MBR effluent that is based on greater than 75% transmissivity must be justified in the report.

(d) MBR operation.

(1) Membrane cleaning. The following methods may be used to clean membranes:

(A) air scouring of at least 0.01 standard cubic feet per minute of air per square foot of membrane area, but not more than 0.04 standard cubic feet per minute of air per square foot of membrane area;

(B) a mixture of air scouring as described in subparagraph (1)(A) of this paragraph and~~with~~ mixed liquor jet feed;

(C) back-flushing;

(D) relaxation~~,~~; ~~which is short periods of air scouring without filtration;~~ or

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(E) chemical cleaning.

(2) Operational Control Parameters.

(A) In-line continuous turbidity monitoring of filtrate from each membrane train or cassette ~~or an equivalent~~ must be provided for operational control and indirect membrane integrity monitoring. An alarm must be provided ~~If turbidity is used for indirect integrity monitoring,~~to notify the wastewater treatment facility operator of turbidity greater ~~the value that indicates problems must be less~~ than or equal to 1.0 nephelometric turbidity units (NTU).

(B) An owner must follow the manufacturer's recommended frequency for MBR component inspection, testing, and maintenance. The manufacturer's recommended inspection, testing, and maintenance procedures and frequencies must be included in the ~~facility~~wastewater treatment facility's operation and maintenance manual.

(C) An owner must provide a ~~facility~~wastewater treatment facility operator access to any specialized tool necessary for the operation or maintenance of an MBR system. A description of all specialized tools and instructions for their use must be

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included in the~~a~~ operation and maintenance manual for the ~~facility~~wastewater treatment facility.

(3) Control instrumentation.

~~(A)~~ A ~~facility~~wastewater treatment facility must have the ability to ~~run~~ operate in full manual mode ~~in case of an automatic control failure~~.~~; or~~

~~(B) An operational backup programmable logic control center (PLC) is required if manual control is not possible.~~

(e) Chemical Use and Disposal.

(1) The chemicals used in treatment and maintenance must not harm the MBR system or interfere with treatment.

(2) The chemicals used in treatment and maintenance, including concentrations of the chemicals and chemical disposal methods, must be identified in the report.

(f) Training.

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(1) ~~Key staff must be trained to operate the particular MBR at a facility.~~ The individuals trained to operate an MBR system ~~They~~ must be familiar with the sequencing and set points of all operations and actions typically controlled by automated systems and be able ~~in order~~ to identify and respond to irregularities.

(2) Proposals for staff training must be included in the report.

(g) Warranty and Bonds.

(1) ~~The~~ All membranes must have a warranty of at least five years.

(2) The executive director may require a performance bond that meets the requirements of §217.7(b)(2)(E) of this title (relating to performance bond requirements).

§217.158. Solids Management.

(a) Solids Recycling and Monitoring.

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(1) A return sludge system must operate ~~satisfactorily~~ as designed in all flow conditions.

(2) A monitoring and control system must provide a means to control return and waste sludge flows from each clarifier, to control return sludge flows into each aeration basin, to meter return sludge flows, and to measure waste sludge flows.

(b) Solids Wasting. The ~~A design~~ solids management system must be ~~adequate~~ designed to store and process the waste activated sludge under all flow conditions.

(c) Return Activated Sludge (RAS) Pump Design.

(1) A centrifugal sludge pump must have a positive suction head, unless the pump is self-priming.

(2) An airlift pump must comply with requirements of §217.162 of this title (related to Air Lift Pump Design)~~allow for cleaning without removal from a basin~~.

(3) An ~~A~~ RAS system must have sufficient pumping units to maintain the maximum design return pumping rate with the largest single pumping unit out of service.

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(d) Waste Activated Sludge Pump Design. A waste activated sludge pumping system requires at least two pumping units and must be sized to prevent excessive solids accumulation in the clarifiers.

(e) Sludge Piping System.

(1) The design of a sludge piping system must accommodate cleaning and flushing.

(2) The design of a sludge piping system must accommodate ~~be sized for~~ a minimum velocity of ~~3.0~~2.0 feet per second at the maximum wasting rate~~e~~ ~~or return rate~~ to prevent solids from settling. The velocity in a sludge piping system ~~and~~ must prevent scouring. ~~at anticipated normal operating conditions.~~

(3) A sludge pipe must have a minimum diameter of 4.0 inches.

§217.159. Process Control.

(a) Solids Retention Time Control.

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(1) A ~~facility~~wastewater treatment facility design must include ~~the necessary~~ equipment for a ~~facility~~wastewater treatment facility operator to control the solids retention time (SRT) in the aeration tanks by wasting a measured volume of surplus activated sludge. ~~from either a mixed liquor tank, a sludge re-aeration tank, or the return sludge.~~

(2) The report and the operation and maintenance ~~operating~~ manual must provide the formulas used for determining the SRT.

(3) The SRT required for nitrification applies to the aerobic portion of the ~~facility~~wastewater treatment facility.

(b) Aeration System Control. Aeration system control must ~~include~~ regulate the total amount of air supplied and ~~the~~ how air is distributed ~~distribution of air~~ to the aeration tanks.

(1) In order to conserve energy, a wastewater treatment facility design may provide the operator with ~~include~~ the ability to adjust the airflow in proportion to the oxygen demand of the wastewater. ~~facility.~~

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(2) If ~~this~~ an adjustable type of airflow control is installed, the aeration equipment must be field adjustable over the entire range of oxygen demands and must maintain solids in suspension.

(c) The design of a wastewater treatment facility with a design flow greater than 0.4 million gallons per day must provide for totalized flow measurement of the return sludge and waste sludge discharges for process control.

§217.160. Operability and Maintenance Requirements.

(a) All equipment must be designed to operate at the temperature extremes of the ~~facility~~wastewater treatment facility location, or may be designed to operate in a temperature controlled enclosure~~and may require enclosures~~, to allow operation of the equipment at all times.

(b) All equipment must be designed to be accessible for inspection, maintenance, and operation.

(c) A building that houses equipment must be designed with sufficient clearance and working room to safely remove and reinstall equipment. The building must be

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accessible to portable lifting devices or must be equipped with overhead lifting eyes, hoists, trolleys, or cranes to facilitate the safe removal of equipment.

§217.161. Electrical and Instrumentation Systems.

(a) All three-phase motors must have phase failure protection.

(b) Instrumentation and monitoring equipment must have power surge protection.

(c) A ~~facility~~wastewater treatment facility must be designed to conduct fault monitoring and ~~reporting~~ to notify the operator ~~on~~ of high wet well level, power interruption, disinfection failure, blower failure, clarifier failure, ~~and~~ return sludge pumping failure, and any other conditions required by the executive director.

(d) For a ~~facility~~wastewater treatment facility not staffed 24 hours ~~a~~ per day, a telemetry with battery back-up or supervisory control and data acquisition system with battery backup must be able to notify an operator of a malfunction identified in §217.161(c) at any time.

§~~217.162. Internal Process Flow Measurement.~~

~~**A facility with a design flow greater than 0.4 million gallons per day must provide flow measurement of the return sludge and waste sludge discharges for process control.**~~

217.162. Air Lift Pump Design.

(a) Required Calculations.

(1) The report must include calculations to determine static and dynamic pressure head necessary for operation of each air lift pump. Static and dynamic pressure head requirements for the suction line must be considered in the calculations.

(2) Air lift pump systems must be designed to meet the range of required flow rates.

(3) The report must include the number of air lift pumps required and the minimum and maximum:

(A) design airflow rate for each air lift pump;

(B) design flow rate for each air lift pump; and

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(C) design flow rate for the system.

(b) Design.

(1) Air lift pumps may not be used to pump sludge from a primary clarifier.

(2) Air lift pumps must be at least three inches in diameter.

(3) The design air flow rates must be based on the actual submergence of an air lift pump.

(4) The discharge end of an air lift pump must be designed to prevent splashing.

(5) Air lift pumps located inside of a basin must allow for cleaning without removal from the basin.

(6) An air lift pump must provide a way to release trapped air.

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(7) Air lift pump systems for return activated sludge, waste activated sludge, internal recycle, and other systems that affect overall process performance must be designed for a minimum static submergence of 60 percent.

(8) Air lift pump systems for return activated sludge, waste activated sludge, internal recycle, and other systems that affect overall process performance must provide a method for flow measurement using:

(A) an external box with a weir; or

(B) a rotameter or other flow measurement device approved by the executive director on the air line to each pump. When flow is measured on the air line, the report must include a graph correlating the air flow rate in the air line to the liquid flow rate of the air lift pump.

(9) Air lift systems for scum removal, grit removal, or for transfers that do not affect overall process performance must be designed for a minimum static submergence of 30 percent.

(c) Redundancy.

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(1) A backup pump or other means of transfer must be provided for each air lift pump system.

(2) Air lift systems for return activated sludge, waste activated sludge, and internal recycle must be designed to operate at full capacity with the largest pumping unit out of service.

(3) Blowers for an air lift pump system must be sized to provide the maximum design airflow rate required by the system.

§217.163. Advanced Nutrient Removal.

(a) For a wastewater treatment facility designed to provide advanced nutrient removal, the report must specify the process units needed to achieve the effluent limits established in the wastewater treatment facility's wastewater permit. ~~permit's effluent limits.~~

(b) Biological nutrient removal (BNR) using an activated sludge process that does not involve fixed-film treatment, membrane filtration, sand filtration, or a combination of these processes may be used for advanced nutrient removal without applying for the

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executive director's approval under the innovative or nonconforming technology criteria in §217.7(b)(2) of this title (relating to Types of Plans and Specifications Approvals).

(c) If a BNR unit is proposed, the report must include the:

(1) ~~The~~ anticipated food to microorganism ratio in both the anoxic and anaerobic zones;

(2) ~~The~~ volatile fatty acid recycle ratio; and

(3) ~~The~~ design of a foaming control system.

(d) If a chemical addition unit is proposed, it must comply with the chemical containment requirements in Subchapter K of this chapter (relating to Chemical Disinfection). Chemical addition may only be used if approved by the executive director.

~~(e) A fixed film and filtration process must comply with the requirements of Subchapter G of this chapter (relating to Fixed Film and Filtration Units).~~

§217.164. Aeration Basin and Clarifier Sizing--Volume-Flux Design Method.

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(a) A volume-flux design must size an aeration basin and clarifier on the relationship between the volume--flux of solids in the secondary clarifier, the sludge volume index (SVI), and the sludge blanket depth. The following design approach may be used as an alternative to the traditional design approach. If the volume-flux design approach is used, it must be used consistently throughout the design. No other design method may be used in combination with the volume-flux design method.

(1) A design may base the aeration tank volume and the clarifier volume on a mixed liquor suspended solids (MLSS) and floc volume (at SVI of 100) for the required minimum solids retention time.

(2) Larger values of MLSS require less aeration tank volume and greater clarifier volume.

(3) By examining a range of values of the MLSS and the floc volume, the most favorable arrangement for a wastewater treatment facility may be selected.

(4) When using the volume-flux design method, the size of an aeration basin and a clarifier must be in accordance with the requirements of this section.

(b) Design approach.

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(1) Determine the solids retention time (SRT) needed to meet the permit requirement for five-day carbonaceous biochemical oxygen demand ($CBOD_5$) and ammonia-nitrogen (NH_3 -N) effluent limitations.

(2) Select a trial value mixed liquor floc volume, (for example, MLSS at an SVI of 100).

(3) Using the design organic loading rate, the required SRT and yield, and the trial MLSS, determine the aeration tank volume.

(4) Using the trial value of mixed liquor flow volume, determine the clarifier area.

(5) For clarifiers overloaded in thickening at the peak flow, determine the final MLSS during storm flow and the resulting sludge blanket depth.

(6) Observing effluent limitations, determine the side water depth (SWD) and volume of the clarifier.

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(7) Repeat the steps in paragraphs (2) - (6) of this subsection at different mixed liquor floc volumes and select the most favorable conditions for the ~~facility~~wastewater treatment facility design.

(c) Aeration Basin Sizing.

(1) For a ~~facility~~wastewater treatment facility that does not require nitrification, the minimum SRT is as follows:

(A) for a ~~facility~~wastewater treatment facility with an effluent BOD_5 ~~CBOD5~~ monthly average limitation of 20 milligrams per liter (mg/l), the minimum SRT is three days;

(B) for an extended aeration ~~facility~~wastewater treatment facility with an effluent BOD_5 ~~CBOD5~~ monthly average limitation of 20 mg/l, the minimum SRT is 22 days;

(C) for a ~~facility~~wastewater treatment facility with an effluent BOD_5 ~~$CBOD_5$~~ monthly average limitation less than 20 mg/l, the minimum SRT is 4.5 days; and

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(D) for an extended aeration ~~facility~~wastewater treatment facility with an effluent CBOD5 monthly average limitation of less than 20 mg/l, the minimum SRT is 25 days.

(2) For a ~~facility~~wastewater treatment facility that requires nitrification, the minimum SRT is based on the winter reactor temperature as set forth in §217.154(~~a~~b) of this title (relating to Aeration Basin and Clarifier Sizing--Traditional Design) and the values of SRT and net solids production (Y), as listed in Table F.8 in paragraph (3) of this subsection. The maximum CBOD5 ~~monthly average~~ loading limitation for a single-step aeration process ~~facility~~ is 50 pounds (lb) CBOD5 per 1,000 cubic feet (cf) and for the first step of multi-step aeration process ~~two-step~~ facilities is 100 lb CBOD/1,000 cf.

(3) An above-ground steel or fiberglass tank requires 2 degrees Celsius lower minimum operating temperature than a ~~facility~~wastewater treatment facility utilizing a reinforced concrete tank. A ~~facility~~wastewater treatment facility must be designed for an MLSS concentration of at least 2,000mg/l but ~~less~~ no more than 5,000 mg/l. The net solids production, (Y), in the following table includes both coefficients for yield and endogenous respiration:

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Figure: 30 TAC §217.164(c)(3)

Table F.8. - Effect of Temperature on SRT, Net Solids Production, and Food to Mass Ratio			
Temperature, (degrees C)	**SRT, days**	**Net Solids Production, Y = .965-0.013(SRT)**	**Food/Mass Ratio, lbsBOD_5/lbs Suspend Solids/day = 1/(Y*SRT)**
18	4.76	0.90	0.233
17	5.25	0.90	0.212
16	5.79	0.89	0.194
15	6.38	0.88	0.178
14	7.04	0.87	0.163
13	7.77	0.86	0.150
12	8.56	0.85	0.137
11	9.45	0.84	0.126
10	10.42	0.83	0.116
This table uses the maximum growth rate of *Nitrosomonas* calculated using Equations 3-14 from EPA Manual, *Nitrogen Control*, EPA/625/R-93/010, 9/93, p. 90, shown in Figure: 30 TAC §217.164(c)(4), Equation F.5.			

(4) To calculate the SRT, divide the safety factor by the maximum growth rate as shown in the following equation. The safety factor includes the design factor for the ratio of average to maximum diurnal ammonia loading. A value of 3.0, as recommended in the United States Environmental Protection Agency manual~~,~~ "Nitrogen Control", is used in calculating the values in Table F.8 in paragraph (3) of this subsection.

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Figure: 30 TAC §217.164(c)(4)

Equation F.5.

$$SRT = \frac{SF}{0.47\, e^{0.098(T-15)}, days^{-1}}$$

Where:

SF = safety factor

$0.47e^{0.098(T-15)}$ = maximum growth rate ($days^{-1}$)
T = temperature *T* (°C)

(5) To determine the aeration basin volume, select a trial value of MLSS. The aeration basin volume is calculated as the maximum value from the following equations:

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Figure: 30 TAC §217.164(c)(5)

Equation F.6.

$$V_a = \frac{1000000(CBODL)(Y)(SRT)}{62.4MLSS}$$

Where:
V_a = Volume of aeration basin, cubic feet
CBODL = Design CBOD load per day, pounds
Y = yield of solids per unit CBOD removed
SRT = required solids retention time, days
MLSS = mixed liquor suspended solids, mg/l

Equation F.7.

$$V_a = \frac{1000\ (CBODL)}{max\ allowable\ lb\ CBOD/kcf}$$

$$V_a = \frac{1000\,CBODL}{\max\ allowable\,lbCBOD/kcf}$$

Where:
V_a = Volume of aeration basin, cubic feet
CBODL = Design CBOD load per day, pounds
max allowable lb CBOD/kcf = Maximum pounds CBOD load/1000 cubic feet

(d) Clarifier Sizing.

(1) A clarifier basin size is based on volume--flux from the floc volume of solids entering the clarifier.

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(2) Biological solids may occupy different volumes for the same mass of solids as indicated by the SVI.

(3) For purposes of determining weir overflow rates for clarifier sizing, the design flow and the peak flow must include any return flows from units downstream of the clarifier, including flow from skimmers, ~~skimmer,~~ thickeners, and filter backwash.

(4) A clarifier must be sized to prevent overloading under any design condition.

(5) The settling velocity of the mixed liquor solids must equal or exceed the two-hour peak weir overflow rate.

(6) A clarifier must be sized to prevent overloading in the thickening process at the design flow.

(7) The ~~facility~~wastewater treatment facility's operation and maintenance manual must state the design maximum mixed liquor floc volume.

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~~(8) Dimensions for clarifiers not designed for solids storage (i.e., not overloaded in thickening at the peak flow).~~

(e) Determine Weir Overflow Rate and Area. The values in Figure 1: 30 TAC §217.164(e)(2)(I), ~~paragraph (2)(I),~~ Table F.9 of this subsection determine the maximum surface loading rates. The MLSS concentration must include the same concentration used for sizing the ~~an~~ aeration basin. The design must be based on the underflow rate. The design must include calculations for maximum weir overflow rate for the clarifier at the peak flow (Figure 1: 30 TAC §217.164(e)(2)(I), Table F.9) the aeration basin MLSS concentration, and a selected underflow rate. The area of the clarifier is determined by the following equation:

Figure: 30 TAC §217.164(e)

Equation F.8.

$$A_c = \frac{1{,}000{,}000\, Q_p}{OR_p}$$

Where:
A_c = area of the clarifier(s), sf
Q_p = peak flow, mgd
OR_p =weir overflow rate (gpd/sf) from Figure 1: 30 TAC §217.164(e)(2)(I), Table F.9

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(1) Determine Volume of a Clarifier. The volume of a clarifier must exceed the values determined from the minimum side wall depth (SWD) in Equation F.9 located in the following figure or the minimum detention time in Equation F.10: ~~located in the following figure:~~

Figure: 30 TAC §217.164(e)(1)

Equation F.9. Clarifier Volume Based on SWD

$$V_c = A_c\,(minSWD)$$

Where:
V_c, = volume of the clarifier(s), cf, based on minSWD
A_c = Area of the clarifier(s), sf
minSWD = 10 ft, except as allowed in §217.152(g)

Equation F.10. Clarifier Volume Based On Minimum Detention Time

$$V_c = \frac{(Q_p / 24)(minDT)}{(7.48)}$$

Where:
V_c, = volume of the clarifier(s), cf, based on minDT
Q_p = peak flow, gpd
minDT = minimum detention time (hours) from Figure 1: 30 TAC §217.154(c)(1), ~~§217.164(e)(2)(I),~~ Table F.2

(2) Dimensions for clarifiers designed for solids storage capabilities. The design of a clarifier that may be overloaded in thickening at the design flow must include the ability to store solids during peak flow events. The design must be based on the

values in Figure 1: 30 TAC §217.164(e)(2)(I), Table F.9, Figure 2: 30 TAC §217.164(e)(2)(I), Table F.10, and Figure 3: 30 TAC §217.164(e)(2)(I), Table F.11. The process for designing a clarifier based on this concept must be completed ~~is~~ as follows:

(A) Determine the area of a clarifier. The area calculations must be based on the trial MLSS value selected for the sizing of the aeration basin in paragraph (1) of this subsection. The area of a clarifier must exceed the greater of the areas determined by Equation F.11 or Equation F.12 located in the following figure:

Figure: 30 TAC §217.164(e)(2)(A)

Equation F.11. Clarifier Area Based on Design Flow

$$A_c = \frac{Q_d}{OR_{T9}}$$

Where:
A_c = clarifier area (sf) based on max 30 day flow
Q_d = design flow (gpd)
OR_{T9} = weir overflow rate for selected underflow rate and MLSS (gpd/sf) from Figure 1: 30 TAC §217.164(e)(2)(I), Table F.9

Equation F.12 Clarifier Area Based on Peak Flow

$$A_c = \frac{Q_p}{OR_{T10}}$$

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Where:
A_c, = clarifier area (sf), based on ~~2 hr~~ peak flow
Q_p = peak flow, mgd
OR_{T10} = weir overflow rate for selected MLSS (gpd/sf) from Figure 2: 30 TAC §217.164(e)(2)(I), Table F.10

(B) The final MLSS value must be the result of the transfer of solids from an aeration tank to a clarifier at the peak flow. A clarifier design must allow for rates of flow that will transfer solids from an aeration tank to a clarifier if the clarifier becomes overloaded in thickening until the mixed liquor solids are reduced to the concentration that no longer causes the overload.

(C) Using Figure 3: 30 TAC §217.164(e)(2)(I), Table F.11 and the selected underflow rate, the MLSS concentration at peak flow is determined using the following equation:

Figure: 30 TAC §217.164(e)(2)(C)

Equation F.13.

$$MLSS_{pf} = \frac{UR_{T11} * RSSS_{T11}}{OR_{pf} + UR_{T11}}$$

Where:
UR_{T11} = Underflow rate (gpd/sf) from Figure 3: 30 TAC §217.164(e)(2)(I), Table F.11
OR_{pf} = Weir overflow rate at ~~2 hr~~ peak flow (gpd/sf)
$MLSS_{pf}$ = Diluted MLSS during peak flow (mg/l)
$RSSS_{T11}$ = Maximum return sludge concentration for the selected UR (mg/l) from Figure 3: 30 TAC §217.164(e)(2)(I), Table F.11

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(D) Determine depth of sludge blanket at peak flow. The depth of a sludge blanket is determined by the aeration basin volume, the change in MLSS, the area of the clarifier, and the concentration of the blanket solids at the selected underflow rate as shown in the following equation:

Figure: 30 TAC §217.164(e)(2)(D)

Equation F.14.

$$SBD = \frac{V_a(MLSS_{av} - MLSS_{pf})}{(A_c BKSS)} + 1.0$$

Where:
SBD = Sludge Blanket Depth (feet)
V_a = Volume of aeration basins (cf)
A_c = Area of clarifier (sf)
$MLSS_{pf}$ = Diluted MLSS during peak flow (mg/l)
$MLSS_{av}$ = Diluted MLSS during average flow (mg/l)
BKSS = Blanket concentration at the selected underflow rate (mg/l)from Figure 3: 30 TAC §217.164(e)(2)(I), Table F.11
1.0 = Assumed sludge blanket depth during design flow conditions (feet)

(E) Determine the SWD. The SWD of a clarifier is the maximum value resulting from the following conditions:

(i) 10 ft, unless a lower depth is allowed by §217.152(g) of this title (relating to Side Water Depth~~Requirements for Clarifiers~~);

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(ii) 3.0 times the sludge blanket depth; and

(iii) minimum detention time per the following equation:

Figure: 30 TAC §217.164(e)(2)(E)(iii)

Equation F.15.

$$SWD_{DT} = \frac{OR_p(DT)}{180}$$

Where:
OR_p = Weir overflow rate at peak flow (gpd/sf)
DT = Detention time, hours
SWD_{DT} = Side water depth based on detention time, ft

(F) Determine clarifier volume. The volume of a clarifier is the surface area multiplied by the SWD determined in subparagraph (E) of this paragraph.

Figure: 30 TAC §217.164(e)(2)(F)

Equation F.16.

$$V_c = A_c(SWD)$$

Where:

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V_c = Volume of Clarifier, (cf)
A_c = Area of the Clarifier, (sf)
SWD = Side Water Depth determined in subparagraph (E) of this paragraph, (feet)

(G) The formulas for Figure: 30 TAC §217.164(e)(2)(G)(i), Equation F.17; Figure: 30 TAC §217.164(e)(2)(G)(ii), Equation F.18; and Figure 2: 30 TAC §217.164(e)(2)(I), Table F.10; calculate the rates that are equal to the settling velocity of activated sludge at various floc volume concentrations. For values less than 30%, the floc volume is the 30-minute settled volume in an unstirred one-liter graduated cylinder. For values greater than 30%, the sample is diluted so that the settled volume is at least 15% but not more than 30%, and the result multiplied by the dilution factor.

(i) For floc volume less than 40%, use the following equation; ~~or~~

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Figure: 30 TAC §217.164(e)(2)(G)(i)

Equation F.17.

$$OR_{T10} = 5053.8(1 - fv/100)^{3.83}\ gpd/sf$$

Where:
OR_{T10} = Settling velocity(gpd/sf) of Figure 2: 30 TAC §217.164(e)(2)(I), Table F.10
fv = Floc Volume (percent) = SVI(MLSS)/10,000 SVI (ml/g), MLSS (mg/l)

(ii) For floc volume greater than 40%, use the following equation:

Figure: 30 TAC §217.164(e)(2)(G)(ii)

Equation F.18.

$$OR_{T10} = 9003610(fv^{-2.56})gpd/sf$$

Where:
OR_{T10} = Settling velocity(gpd/sf) of Figure 2: 30 TAC §217.164(e)(2)(I), Table F.10
fv = Floc Volume (percent) = SVI(MLSS)/10,000 SVI (ml/g), MLSS (mg/l)

(H) Figure 1: 30 TAC §217.164(e)(2)(I), Table F.9 and Figure 3: 30 TAC §217.164(e)(2)(I), Table F.11 are based on an analysis of the floc volume--flux, i.e. floc volume times settling velocity, calculated from Figure: 30 TAC §217.164(e)(2)(G)(i), Equation F.17 and Figure: 30 TAC §217.164(e)(2)(G)(ii), Equation F.18. Figure 3: 30 TAC §217.164(e)(2)(I), Table F.11 is a tabulation of the maximum concentration of the

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underflow at different underflow rates. The equation for Figure 3: 30 TAC §217.164(e)(2)(I), Table F.11 is as follows:

Figure: 30 TAC §217.164(e)(2)(H)

Equation F.19.

$$RSSS_m = \frac{10170000(UR^{-0.391})}{SVI}$$

Where:
$RSSS_m$ = Return Sludge Suspended Solids (mg/l)
UR = Underflow Rate (gpd/sf)
SVI = Sludge Volume Index (ml/g)

(I) The following table determines the weir overflow rate that, along with the underflow rate and MLSS, determines the same floc volume-flux as shown in Figure 3: 30 TAC §217.164(e)(2)(I), Table F.11:

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Figure 1: 30 TAC §217.164(e)(2)(I)

Table F.9. - Clarifier Loading Rates

Allowable surface loading rates for given underflow rates with no provisions
for sludge storage in the clarifier

OR
The maximum surface loading rate at the design flow for clarifiers designed to
store solids during peak events

MLSS	**Underflow Rate (gpd/sf)**				
mg/l	***200***	***250***	***300***	***350***	***400***
2000	1081	1218	1340	1452	1554
2100	1020	1148	1262	1366	1461
2200	965	1084	1191	1288	1377
2300	914	1026	1126	1217	1299
2400	868	973	1067	1151	1229
2500	825	924	1012	1091	1163
2600	786	879	962	1036	1103
2700	749	837	915	985	1048
2800	715	798	872	937	996
2900	684	762	831	893	948
3000	654	729	793	851	903
3100	627	697	758	812	861
3200	601	667	725	776	821
3300	577	640	694	742	784
3400	554	613	665	710	750
3500	532	589	637	680	717
3750	483	533	575	611	42
4000	441	484	520	551	577
4250	403	441	472	498	520
4500	369	402	429	451	469

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4750	340	368	391	409	423
5000	313	337	356	371	82

Figure 2: 30 TAC §217.164(e)(2)(I)

Table F.10. - Settling Velocities	
Maximum allowable clarifier weir overflow rate allowed for clarifiers that are designed to store solids SVI=100 *(minimum allowable SVI)*	
MLSS	**Surface Loading Rates**
(mg/l)	**(gpd/sf.)**
2000	2000
2150	2000
2200	1952
2300	1858
2400	1767
2500	1680
2600	1596
2700	1514
2800	1437
2900	1362
3000	1290
3100	1220
3200	1154
3300	1090
3400	1029
3500	971
3750	836
4000	715
4250	611

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4500	528
4750	459
5000	403

Figure 3: 30 TAC §217.164(e)(2)(I)

Table F.11. - Values for Use in Determining Sludge Storage Requirements					
Underflow (gpd/sf)	200	250	300	350	400
RSSS maximum (mg/l)	12813	11743	10935	10295	9771
Blanket concentration (mg/l)	7816	7163	6670	6280	5961
Blanket (lb/cf)	0.488	0.447	0.416	0.392	0.372

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SUBCHAPTER G: FIXED FILM AND FILTRATION UNITS

§§217.181 - 217.193

§217.181. Applicability.

This subchapter establishes the requirements for trickling filters, rotating biological contactors, submerged biological contactors, and filtration systems.

§217.182. Trickling Filters--General Requirements.

(a) Trickling filters are classified according to applied hydraulic loading, including recirculation, in million gallons per day (mgd) per acre of filter media surface area and influent organic loadings in pounds of five-day biochemical oxygen demand (BOD_5) per day per 1,000 cubic feet of filter media. The following factors must be used as the basis for the selection of the design hydraulic and influent organic loadings:

(1) strength of the influent wastewater;

(2) effectiveness of pretreatment;

(3) type of filter media; and

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(4) treatment efficiency required.

(b) A trickling filter may be ~~is~~ classified as:

(1) a roughing filter, which provides at least 50%, but not more than 75% removal of soluble BOD_5~~.~~;

(2) a secondary treatment filter, which provides the removal of pollutants required to meet the effluent limits for ~~settled effluent~~ BOD_5 and total suspended solids (TSS) of effluent set 1 or 2 in 30 TAC §309.4 (related to Effluent Limitations for Domestic Wastewater Plants);

(3) a combined BOD_5 and nitrifying filter, which provides the removal of pollutants required to meet the effluent limits for ~~settled effluent~~ BOD_5~~-~~, ammonia-nitrogen (NH3-N~~NH4 -N~~), and TSS of effluent set 2N or 2N1 in 30 TAC §309.4 (related to Effluent Limitations for Domestic Wastewater Plants); or

(4) a tertiary nitrifying filter, which provides ~~the required settled~~removal of ~~effluent~~NH3-N ~~NH4 -N~~, if the influent to the~~a~~ trickling filter is a clarified secondary effluent.

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(c) The following table lists the hydraulic and organic loadings for different classes of trickling filters.:

Figure: 30 TAC §217.182(c)

Table G.1. - Typical Design Loadings					
	Standard Rate	**Intermediate Rate**	**High Rate**	**High Rate**	**Roughing**
Media	***Rock***	***Rock***	***Rock***	***Manufactured***	***Either***
Hydraulic Loading: mgd/acre	1-4	4-10	10-40	15-90	60-180
Hydraulic Loading: gpd/sf	25-90	90-230	230-900	350-1000	1400-4200
*Organic Loading: lb BOD_5/acre-feet/day	200-1000	700-1400	1000-1300	--	--
*Organic Loading: lb BOD_5/day/1000cf	5-25	15-30	30-150	up to 300	≥100
[H]BOD_5 Removal (%)	80-85	0-70	40-80	65-85	40-85
*Does not include recirculation [H]Includes subsequent settling					

(d) Pretreatment.

(1) A trickling filter must have upstream preliminary treatment units that:

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(A) remove grit, debris, suspended solids, oil, and grease;

(B) remove ~~have~~ particles with a diameter greater than three millimeters; and

(C) control the release of hydrogen sulfide.

(2) A primary clarifier equipped with scum and grease removal devices must precede a rock media trickling filter.

(e) Rock Filter Media.

(1) Materials.

(A) Rock filter media composed of ~~using~~ crushed rock, slag, or similar material is prohibited if it contains ~~containing~~ more than 5% of the media, by weight, consists of pieces with their longest dimension measuring more than three times greater than their~~the least~~ shortest dimension ~~is prohibited~~.

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(B) Rock filter media must conform to the following size distribution and grading. Mechanical grading over a vibrating screen with square openings must meet the following:

(i) passing 5.0 inch sieve - 100% by weight;

(ii) retained on 3.0 inch sieve - 95-100% by weight;

(iii) passing 2.0 inch sieve - 0.2% by weight;

(iv) passing 1.0 inch sieve - 0.1% by weight; and

(v) the loss of weight by the~~a~~ 20-cycle ~~sodium~~ test, as described in American Society of Civil Engineers' Manual of Engineering and Engineering Practice No. 13, must be less than 10%.

(2) Placement.

(A) Rock filter media must be at least 4.0 feet deep at the shallowest point.

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(B) Dumping rock filter media directly on a trickling filter is prohibited. Rock media must be placed by hand to a depth of 12 inches above the underdrains. The remainder of the rock filter media may be placed by belt conveyor or an equivalent mechanical method.

(C) Crushed rock, slag, and other similar media must be washed and screened or forked to remove clay, organic material, and fines prior to placement.

(D) The placement of any material must not damage the underdrains.

(E) Vehicles and equipment are prohibited from driving over the rock filter media.

(f) Synthetic (Manufactured or Prefabricated) Media Materials.

(1) Any synthetic media material must be used in accordance with all of the manufacturer's recommendations.

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(2) Synthetic media material may be considered innovative or nonconforming technology and may be subject to §217.7(b)(2) of this title (relating to Types of Plans and Specifications Approvals), and requires executive director approval.

(A) Suitability. The suitability of synthetic media material must be evaluated based on performance data from a facility with similar media operating under ~~experience with an installation treating wastewater under~~ similar hydraulic and organic loading conditions. The report must include a relevant case history involving the use of the synthetic media.

(B) Durability. A synthetic media must be insoluble in wastewater and resistant to flaking, spalling, ultraviolet degradation, disintegration, erosion, aging, common acids and alkalis, organic compounds, and biological attack.

(C) Structural Integrity.

(i) The ~~A~~ structural design of synthetic filter media must support the synthetic media, water flowing through or trapped in voids, and the maximum anticipated thickness of the wetted biofilm.

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(ii) The synthetic filter media must support the weight of an individual~~a person~~, unless a separate provision is made for maintenance access to the entire top of the trickling filter media and to the distributor.

(D) Placing of Synthetic Filter Media. Modular synthetic filter media must be installed with the edges of the modules matched as closely ~~nearly~~ as possible to provide consistent hydraulic conditions within the trickling filter.

(g) Trickling Filter Dosing.

(1) Dosing rates to a trickling filter must be within the design dosing rate range, even if the trickling filter receives flow from a ~~Suitable flow characteristics must be used for the application of wastewater to a filter by~~ siphon, pump, or gravity discharge from a preceding treatment unit.

(2) A trickling filter must be designed to control instantaneous dosing rates under both normal operating conditions and filter-flushing conditions.

(3) The distributor speed and the recirculation rate of a trickling filter must be adjusted for the dosing intensity as a compensatory measure under low-flow

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conditions. The following table provides design ranges of dosing intensity for both normal usage periods and for flushing periods:

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Figure: 30 TAC §217.182(g)(3)

Table G.2 - Trickling Filter Dosing Intensity Ranges (SK)		
BOD_5 loading *kilogram (kg)/m³/day*	**Design SK *mm/pass***	**Flushing SK *mm/pass***
0.25	10-100	≥200
0.50	15-150	≥200
1.00	30-200	≥300
2.00	40-250	≥400
3.00	60-300	≥600
4.00	80-400	≥800

(4) A design may be based on instantaneous dosing intensity for rotary distributors using the equation in the following figure:

Figure: 30 TAC §217.182(g)(4)

<u>Equation G.1.</u>

$$SK = \frac{(q + r) \times (1000mm/m)}{(a) \times (n) \times (60)}$$

<u>Where:</u>
SK = dosing intensity, millimeter (mm)/pass of an arm
q = influent flow/filter top surface area, in cubic meters (m^3)/square meter (m^2)/hour
r = recycle flow/filter top surface area, m^3/m^2/hour
a = number of arms
n = revolutions per minute

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(h) Distribution Equipment.

(1) The ~~A~~ design of a trickling filter must include a rotary, horizontal, or traveling wastewater distribution system that distributes wastewater uniformly over the entire surface of a filter at the design and flushing dosing intensities.

(2) A design must include filter distributors that operate properly at all anticipated flow rates.

(3) A design must not deviate from the design dosing intensity by more than 10%.

(4) A new trickling filter or an upgrade of an existing trickling filter must include an electrically driven, variable speed ~~a~~ filter distributor to allow operation at optimum dosing intensity independent of recirculation pumping.

(5) If an existing rectangular trickling filter is retrofitted with rotary distributors, any filter media that will not be fully wetted must not be considered part of the required effective treatment area.

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(6) The center column of a rotary trickling filter distributor must have ~~adequately sized~~ emergency overflow ports that are sized to prevent water from reaching the bearings in the center column.

(7) A filter distributor must include cleanout gates on the ends of the distributor arms and an end spray nozzle to wet the edges~~edge~~ of the trickling filter media.

(8) The trickling filter walls must extend at least 12.0 inches above the top of the ends of the distributor arms.

(9) The use of a mercury seal in a distributor of a trickling filter is prohibited in a new ~~facility~~wastewater treatment facility. If an existing ~~treatment facility~~wastewater treatment facility is materially altered, any mercury seal in a trickling filter must be replaced with an oil or mechanical seal.

(10) The minimum clearance between the top of the trickling filter media and the distributing nozzles is 6.0 inches.

(11) Rotary distributors must be capable of operating at speeds as low as one revolution per 30 minutes.

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(12) A trickling filter with a height or diameter that does not allow distributors to be removed and replaced by a crane must provide jacking columns and pads at the distributor column.

(i) Recirculation.

(1) Low Flow Conditions.

(A) The ~~A~~ design of a trickling filter must include a mechanism to maintain minimum recirculation during periods of low flow ~~in order~~ to ensure that the biological growth on the filter media remains active at all times.

(B) For all trickling filters with continuous recirculation, the~~A~~ design must include the minimum recirculation rate in the evaluation of the efficiency of the ~~a~~ filter.~~, if it is part of a proposed specified continuous recirculation~~. ~~rate.~~

(C) Minimum flow to the filters must be equal to or greater than 1.0 million gallons per day ~~mgd~~ per acre of filter aerial surface and must ensure the proper operation of ~~keep~~ the distribution nozzles. ~~properly operating.~~

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(D) The minimum flow rate for a trickling filter design using hydraulically driven distributors must keep rotary distributors turning at the minimum design rotational velocity.

(E) For a ~~facility~~wastewater treatment facility designed with a design flow ~~capacity~~ equal to or greater than 0.4 mgd and recirculation for BOD_5 removal, the recirculation system must include variable speed pumps and a method of conveniently measuring the recycle flow rate.

(2) Compensatory Recirculation.

(A) The~~A~~ design of a trickling filter must provide compensatory recirculation to supplement influent flow if design and flushing dosing intensities are not achieved solely by the control of distributor operation.

(B) Controls for the distributor speed and recycle pumping rate must provide optimum dosing intensity under all anticipated influent flow conditions.

(3) Process Calculations. The report must:

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(A) provide design details about ~~describe a design that propose~~ removal of the remaining organic matter by recirculation;

(B) identify the effect of dilution of the influent on the rate of diffusion of dissolved organic substrates into the biofilm; and

(C) identify the effect of reduced influent concentrations on reaction rates in each section of a filter having first order kinetics.

(4) ~~Maximum~~ Recirculation Rate. A recirculation rate may exceed four times the design flow if calculations to justify the higher rate are included in the report.

(5) Configuration.

(A) In a ~~facility~~wastewater treatment facility with influent that has constant organic loadings, ~~a system must use~~ direct recirculation of unsettled trickling filter effluent must be used.

(B) A design must ensure that the distributor nozzles can handle the recirculated sloughed biofilm.

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(C) In a ~~facility~~wastewater treatment facility with variable influent organic loadings, effluent must recirculate from a final clarifier to either a primary clarifier or a trickling filter to equalize organic loading.

(j) Average Hydraulic Surface Loading.

(1) The report must include calculations of the maximum, design, and minimum ~~area cross-section~~ surface loadings on the trickling filters in terms of million gallons per acre of filter area per day for the flow expected in the initial year and at full capacity ~~for the initial year and the design year~~.

(2) The average hydraulic surface loadings of a trickling filter with crushed rock, slag, or similar media: ~~must not:~~

(A) must not exceed 40 mgd per acre based on design flow, except in roughing applications;

(B) must not be less than 1.0 mgd per acre; and

(C) must be within the ranges specified by the manufacturer.

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(k) Underdrain System Design.

(1) A trickling filter must include an underdrain with semicircular inverts that cover the entire floor of the trickling filter.

(2) An underdrain must be constructed of vitrified clay or pre-cast reinforced concrete.

(3) An underdrain constructed of half tile is prohibited.

(4) Underdrain inlet openings must have a gross cross-sectional area greater than 15% of a trickling filter's surface area.

(5) A modular synthetic media design must be supported above a trickling filter floor by beams and grating with support and clearances in accordance with the trickling filter media manufacturer's recommendations. The manufacturer's recommendations must be included in the report.

(l) Underdrain Slopes.

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(1) An underdrain and trickling filter effluent channel floor must have a minimum slope of 1%.

(2) An effluent channel must produce a minimum velocity of 2.0 feet per second at the design flow rate to a trickling filter.

(3) The floor of a new trickling filter using stackable modular or synthetic media must slope toward a drainage channel at a ~~on~~ slope of at least 1% and not more than 5%, based on filter size and hydraulic loading.

(m) Passive Ventilation.

(1) The effluent channels~~channel~~ and effluent pipes~~pipe~~ of an underdrain system or a synthetic media support structure must permit free passage of air.

(2) Any drain, channel, or effluent pipe must have a cross-sectional area with not more than 50% of the area submerged at peak flow plus recirculation.

(3) The effluent channels must accommodate the specified flushing hydraulic dosing intensity and allow the possibility of increased hydraulic loading.

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(4) A passive ventilation system may include an extension of an underdrain through a trickling filter sidewall, a ventilation opening through a sidewall, or~~and~~ an effluent discharge conduit designed as a partially full flow pipe or an open channel.

(5) A vent opening through a trickling filter wall~~s~~ must include hydraulic closure to allow flooding of a trickling filter for nuisance organism control.

(6) A passive ventilation design must provide at least 2.5 square feet (sf) of ventilating area per 1,000 lbs of primary effluent BOD_5 per day.

(7) An underdrain system for a rock media filter must provide at least 1.0 sf of ventilating area for every 250 sf of the trickling filter basin surface ~~plan~~ area.

(8) The minimum required ventilating area for a synthetic media underdrain is the area recommended by the manufacturer. The manufacturer's recommendations must be included in the report.

(9) The ventilating area must be equal to the greater of 1.0 square foot ~~sf~~ per 175 square feet ~~sf~~ of synthetic media area or 2.6 square feet ~~sf~~ per 1,000 cubic feet ~~cf~~ of media volume.

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(n) Forced Ventilation.

(1) Forced ventilation is required for a trickling filter designed for nitrification, for a trickling filter design with a media depth in excess of 6.0 feet, and~~or~~ for any location where seasonal or diurnal temperatures do not provide sufficient difference between the ambient air and wastewater temperatures to sustain passive ventilation of one cubic foot of air per square foot of trickling filter area per minute.

(2) A design must specify the minimum airflow for forced ventilation and optimized process performance, and the report must include all calculations ~~any calculation~~ associated with this determination.

(3) The design of a ~~A~~ down-flow forced ventilation system must include a provision for:

(A) the removal of entrained droplets;~~:~~ or

(B) the return of air containing entrained moisture to the top of a trickling filter; and

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(C) a reversible fan or other mechanism to reverse the airflow when a wide temperature difference between the ambient air and wastewater creates~~create~~ strong updrafts.

(4) A ventilation fan and the associated controls must withstand flooding of a trickling filter without sustaining damage.

(5) The following equation and the values in Table G.3 determine the minimum airflow rate for forced ventilation.~~:~~

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Figure: 30 TAC §217.182(n)(5)

Equation G.2.

$$MAFR = \frac{(R_A) \times (L) \times (P_F)}{1440 \text{min}/day}$$

Where:
MAFR = Minimum airflow rate, scfm
R_A = Aeration rate, scf/lb, Table G.3
L = Loading rate, lb/day, Table G.3
P_F = Loading peaking factor

Table G.3 - Aeration Rate and Loading Rate Factors		
Filter Application	**R_A (scf/lb BOD_5)**	**L (lb BOD_5/1000 cf/day) Loading on the filter**
Roughing Filter at 75-200 lb BOD_5/1000 cf/day	1080	BOD_5
Secondary Treatment Filter at 25-50 lb BOD_5/1000 cf/day	1200	BOD_5
Combined or Tertiary Filter	2400	1.25 * BOD_5 + 4.6 * total Kjeldahl nitrogen (TKN)

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(o) Maintenance.

(1) Cleaning and Sloughing.

(A) A flow distribution device, an underdrain, a channel, and a pipe must allow for maintenance, flushing, and drainage.

(B) A trickling filter system must hydraulically accommodate the specified flushing hydraulic dosing intensity and must facilitate cleaning and rodding of the distributor arms.

(C) A trickling filter system must prevent recirculation of sloughed biomass in pieces larger than the distributor nozzle ~~opening or~~openings or the filter media voids.

(2) Nuisance Organism Control. A trickling filter system must control nuisance organisms by operation of trickling filters at proper design dosing intensities, with periodic flushing at higher dosing intensities.

(A) Filter Flies.

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(i) The structural and hydraulic design of a ~~new~~ trickling filter must enable flooding of the trickling filter for fly control.

(ii) The executive director may approve an alternate method of fly control for a trickling filter that exceeds 6.0 feet in height if the effectiveness of the alternate method is verified at a full-scale installation and documented in the report.

(B) Snails. A trickling filter system must be designed to prevent sludge accumulation that attracts snails.~~minimize areas where sludge may accumulate.~~ A trickling filter ~~The~~ system must include a low-velocity, open channel between a trickling filter and final clarifier for manual removal of snails.

(3) Corrosion Protection. A trickling filter must be designed to prevent ~~design must minimize~~ corrosion. ~~and use~~ Corrosion-resistant materials must be used for all equipment and for construction of a trickling filter, including ventilation equipment and covers.

(p) Flow Measurements. A trickling filter system must include a means to measure the flow to each trickling~~a~~ filter and the recirculation flow of each trickling filter.

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(q) Odor Control. A trickling filter system must use ventilation and ~~with~~ periodic flushing at a higher dosing intensity to minimize potential odor.

(1) Covers.

(A) The executive director may require an owner of a ~~facility~~wastewater treatment facility with prior ~~a history of~~ odor complaints to install a cover over a new or ~~, expanded or materially altered~~altered trickling filter.

(B) A cover must allow access to the entire top of the trickling filter media and to the distributor for maintenance and removal.

(C) A covered trickling filter must have a forced ventilation system with a scrubber or an adsorption column for odor control.

(2) Stripping. A trickling filter with an ~~high~~ influent organic strength ~~loading~~ of BOD_5 greater than 200 milligrams per liter must have forced ventilation in a down-flow mode to minimize odor. Odorous off-gases may be:

(A) recycled through a trickling filter;

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(B) used to ventilate a tertiary nitrifying trickling filter in an up-flow mode;

(C) diffused into an aeration basin; or

(D) treated separately for odor control using a scrubber or an adsorption column.

(r) Final Clarifiers. The size of the final clarifiers for a ~~facility~~wastewater treatment facility with a trickling filter must ensure ~~allow for~~ the required effluent total suspended solids removal at the peak flow ~~maximum influent flow and the maximum recirculation~~ with all recirculation pumps in operation.

(s) Report Requirements.

(1) The report must specify the trickling filter efficiency formula used in the design calculations.

(2) The report must include the operating data from any existing trickling filter of similar construction and operation ~~at the facility~~ to justify the projected

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treatment efficiency, kinetic coefficients, and other design parameters as required in this subchapter.

(3) The report may include more than one set of applicable design equations to allow crosschecking of predicted treatment efficiency.

§217.183. Nitrifying Trickling Filters--Additional Requirements.

(a) Ventilation. A nitrifying trickling filter must include forced ventilation to distribute airflow throughout the underdrain area. The minimum design airflow rate must ~~provide the~~bathe greater of:

(1) 50 pounds of oxygen provided per pound of oxygen required at average organic loading, based on stoichiometry; or

(2) 30 pounds of oxygen provided per pound of oxygen required at peak organic loading, based on stoichiometry.

(b) Temperature. The report must justify the temperature used in the design equations. A design may include deep towers or other means to minimize recirculation

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while providing a design hydraulic dosing intensity that lessens the effects of temperature on removal efficiency.

(c) pH. The report must document ~~verify~~ that the design recirculation rates are appropriate for dealing with the effects of ~~on~~ pH.

(d) Predation. A nitrifying trickling filter must include a means for ~~effective~~ control of biomass predators, such as snails.

(e) Hydraulic Application Rates. A nitrifying trickling filter must operate at a design dosing intensity of at least 1.47 gallons per minute per square foot and provide operational control of dosing intensity.

(f) Media. Cross-flow synthetic media is required for a new tertiary nitrification filter or for the nitrifying section of a new combined nitrification filter.

(g) Tertiary Nitrification Filters. A trickling filter treating influent that has a five-day biochemical oxygen demand (BOD_5) to total Kjeldahl nitrogen (TKN) ratio of equal to or greater than ~~(>)~~ 1.0 and soluble BOD_5 of less than or equal to ~~(<)~~ 12 milligrams per liter (mg/l) is a tertiary nitrification filter.

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(1) Design Justification. The report must include process design calculations and selection criteria of kinetic coefficients for a tertiary nitrification ~~nitrifying~~ trickling filter. The design calculations and selection criteria ~~and~~ must be justified by operating data from an~~any~~ existing trickling filter of similar construction and operation.

(2) Media biotowers. A tertiary nitrification~~nitrifying~~ trickling filter design must minimize pH depression due to recirculation. ~~and by control of influent instantaneous application rates, by means other than compensatory recirculation.~~ A tertiary nitrification~~nitrifying~~ trickling filter must use either:

(A) a single tower at least ~~>~~20 feet tall; or

(B) a series of towers less than 20 feet tall. ~~operating in series if~~ The design must include ~~includes~~ provisions to readily switch the operating sequence of the trickling filters if multiple towers are operated in series.

(h) Combined BOD_5 and Nitrification Filters. A trickling filter intended to perform nitrification and treating influent having a BOD5 to TKN ratio of less than ~~<~~1.0 or soluble BOD5 of less than ~~<~~12 mg/l is a combined BOD5 and ~~/~~nitrification filter.

(1) Design Justification. The report must justify the projected treatment efficiency and other design parameters of a combined BOD_5 and nitrification trickling filter by including operating data from any existing trickling filter of similar construction and operation.

(2) BOD_5 Removal Requirements. A combined BOD_5 and nitrification filter must achieve effluent total BOD_5 of less than >15 mg/l. The design must not take credit for nitrification in sections of the filter having soluble BOD_5 of greater than <20 mg/l.

(3) Recirculation. A combined BOD_5 and nitrification filter design must enable a high recirculation rate with turndown capability.

§217.184. Dual Treatment Using Trickling Filters.

(a) Classification. A trickling filter or other attached-growth treatment unit in series with a suspended-growth process is considered a dual treatment process that is classified as an Activated Biological Filter System, a Trickling Filter/Solids Contact System, a Roughing Filer/Activated Sludge System, an Activated Biological Filter/Activated Sludge System, or a Trickling Filter/Activated Sludge System.one of the following:

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(1) Activated Biological Filter (ABF) System. An ABF system consists of a tricking filter and a final clarifier. An ABF system recirculates settled solids from the final clarifier through the trickling filter with no separate aeration basin or solids contact basin.

(2) Trickling Filter/Solids Contact (TF/SC) System. A TF/SC system consists of a trickling filter sized to remove the majority of the soluble five-day biochemical oxygen demand (BOD_5-), followed by an aerated solids contact basin sized to provide polishing and improved sludge settleability, followed by a final clarifier. A TF/SC system recirculates activated sludge to a solids contact basin. The design of a TF/SC system may include a sludge re-aeration basin.

(3) Roughing Filter/Activated Sludge (RF/AS) System. AnA RF/AS system consists of a trickling filter sized to perform primary treatment, followed by an aeration basin sized to remove the majority of the soluble BOD_5 , followed by a final clarifier. AnA RF/AS system circulates activated sludge to the aeration basin.

(4) Activated Biological Filter/Activated Sludge (ABF/AS) System. An ABF/AS system consists of a trickling filter sized to perform primary treatment, followed by an aeration basin sized to remove the majority of the soluble BOD_5-,

followed by a final clarifier. An ABF/AS system recirculates activated sludge to the trickling filter.

(5) Trickling Filter/Activated Sludge (TF/AS) System. A TF/AS system consists of a trickling filter sized to perform roughing and concentration dampening, followed by an intermediate clarifier, followed by an aeration basin sized to remove the majority of the soluble BOD_5, followed by a final clarifier. A TF/AS system circulates activated sludge to the aeration basin.

(b) Process Design.

(1) Attached and suspended growth sub-processes in a dual treatment system must be designed through ~~in~~ an integrated process that includes the effluent quality from the first stage in determining the design basis of the second stage.

(2) The ~~A~~ design of a dual treatment system must include an estimate of the performance of the second stage of a dual system using data from existing similar installations or applicable pilot studies.

(3) For a dual treatment system ~~process~~ design in which activated sludge is recycled to first-stage trickling filters, the design must not include the reduction of

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oxygen demand to the second-stage aeration basin because of sludge recirculation to the trickling filters.

(4) The~~A~~ design of a dual treatment system may include estimates of the applicable design equations and methodology used for a single stage process.

(c) Treatment Unit Design. The ~~detailed~~ design of a suspended and attached growth system must include all of the features and operational capabilities required for the same treatment unit used for single-process treatment.~~, as well as the following items:~~

The design of a suspended and attached growth system must also include the design for pretreatment, snail control, return sludge, aeration, sludge age, hydraulic residence time, and nitrification design.

(1) Pretreatment. Pretreatment for ~~of~~ a dual treatment system must conform to the requirements for a first-stage process.

(2) Snail Control. A dual treatment system must include a low-velocity channel between the first-~~-~~stage and second-~~-~~stage treatment units for control of snails.

(3) Return sludge.

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(A) A dual treatment system that includes recirculation of activated sludge or sloughing to trickling filters must prevent recirculation of pieces too large to ~~larger than will~~ pass through the distributor nozzles or the trickling filter media voids.

(B) The trickling filters in a dual treatment system that recirculates sludge to the trickling filters must be of a high-rate, vertical flow design that uses~~, and~~ fully corrugated media.

(C) Sludge must be incorporated into the influent prior to application to trickling filters, and must be incorporated into the effluent from first-stage processes prior to being introduced into second-stage aeration basins.

(4) Aeration. An aeration system for second-stage treatment units in a dual system not designed for nitrification must transfer at least 1.2 pounds of oxygen per pound of first stage effluent ~~BOD_5~~ BOD` per day. An aeration system for second-stage treatment units in systems designed for nitrification must transfer sufficient oxygen to meet stoichiometric requirements for:

(A) biomass growth;

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(B) respiration for both carbonaceous material oxidation and nitrification; and

(C) oxygen demand due to biomass sloughing events from the first stage.

(5) Sludge Age.

(A) A ~~design of~~ second-stage suspended growth process~~processes~~ must be designed to operate in a way that varies the age of the sludge.

(B) The mean cell residence time must be:

(i) at least 1.5 days for the suspended growth process for TF/SC systems; or

(ii) at least 3.0 days if the second process is an activated sludge aeration basin.

(C) A nitrifying dual treatment system must maintain a total combined mean cell residence time in the attached and suspended growth systems of at

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least 10.0 days with capability to provide at least 6.0 days mean cell residence time in the suspended growth process alone.

(6) Hydraulic Residence Time. A design of second-stage processes must have a minimum hydraulic residence time of:

(A) 0.5 hour if the second process is an aerated solids contact basin; or

(B) 3.0 hours if the second process is an activated sludge aeration basin.

(7) Nitrification Design. A design for nitrification using a dual treatment system ~~processes~~ must include:

(A) a sludge re-aeration basin if the second process is an aerated solids contact basin; or

(B) an intermediate clarifier if the second process is an activated sludge aeration basin.

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§217.185. Rotating Biological Contactors.

(a) Pretreatment.

(1) Pretreatment to remove grit, debris, and excess oil and grease must precede a~~an~~ rotating biological contactor ~~contractor~~ (RBC) ~~unit~~. Grit, debris, and excess oil and grease must be handled and disposed of in accordance with §§ 217.123 and 217.126 of this title (related to Screenings and Debris Handling and Grit Handling).

(2) The executive director ~~A design~~ may require primary clarifiers, fine screens, or grit removal chambers prior to an RBC to control high levels of grease, oil, grit, or other debris in the influent waste stream.

(3) Hydrogen sulfide concentration must be considered, to determine whether an RBC system requires pre-aeration. ~~A RBC unit must include pre-aeration if influent has a high hydrogen sulfide concentration.~~

(b) Enclosures and Ventilation.

(1) An RBC ~~unit~~ must be covered and must provide at least six complete air exchanges per hour.~~appropriate levels of ventilation.~~

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(2) A cover must have working clearance of at least 30 inches above an RBC ~~unit~~, unless the cover can be removed with on-site equipment.

(3) Enclosures must be constructed of a corrosion-~~-~~resistant material.

(4) An RBC ~~unit~~ must include:

(A) access doors on each end, and

(B) observation ports with covers at 3.0 foot intervals along the RBC. ~~unit.~~

(c) Media Design.

(1) An RBC ~~unit~~ must provide self-cleaning action for the media.

(2) RBC ~~media~~ must be compatible with the wastewater to be treated.

(3) An RBC design using multiple stages must use low-density media material for the first stage.

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(d) Design Flexibility. If included in the design of an RBC, the report must include descriptions of the following:

(1) controlled flow to multiple first stages;

(2) alternate flow and staging arrangements;

(3) removable baffles between stages; and

(4) provisions ~~provision~~ for step feed and supplemental aeration.

(e) Tank Configuration. The ~~A~~ design of an RBC must ensure that each ~~an~~ RBC tank:

(1) minimizes the zones in which solids will settle out; and

(2) includes tank drains to facilitate removal of any accumulated solids.

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(f) Control of Unwanted Growth in the Initial Stages. Chlorine may be added upstream of an RBC system to control the growth of filamentous bacteria that oxidize sulfur compounds (e.g. *Beggiatoa* species).~~beggiatoa.~~

(g) Maintenance Provisions.

(1) An RBC system with a design flow of ~~designed for~~ 1.0 million gallons per day (mgd) or greater must have two or more process trains, each consisting of three or more stages in series. ~~in each process train.~~

(2) An RBC system must be designed to treat the design flow with the largest ~~Each~~ process train out of ~~must be capable of being removed from~~ service for ~~when~~ maintenance or cleaning. ~~is required.~~

(h) Bearing Maintenance. The ~~An RBC system's~~ bearings in each RBC must be easily accessible for inspection and lubrication.

(i) Organic Loading Design Requirements.

(1) The ~~A~~ design of an RBC must be based on the organic loading rate.~~for an RBC system on total five-day biochemical oxygen demand (BOD_5) in the waste.~~

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(2) The maximum loading rate must not exceed 8.0 pounds of BOD_5 per day per 1,000 square feet (sf) of media in any stage.

(3) The ~~A design must require the~~ RBC media area to be adjusted to compensate for the effects of the ratio of soluble BOD_5 to total BOD_5 .

(4) Allowable organic loading for the entire RBC system must not exceed:

(A) 3.0 lbs of BOD_5 per day per 1,000 sf of media area for wastewater treatment facilities required to meet secondary treatment; or

(B) 2.0 lbs of BOD_5 per day per 1,000 sf of media for a ~~facility~~wastewater treatment facility required to meet advanced secondary treatment.

(j) Hydraulic Loading Design Requirements. A wastewater treatment facility using an RBC system must include flow equalization when the peak flow is more than 2.5 times the design flow ~~peak-to-design flow ratio is higher than 2.5 to 1.0~~ to prevent loss of fixed growth from the media.

(k) Stages.

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(1) An RBC system designed for ~~a~~ BOD_5 removal ~~unit~~ must have at least three stages in series, unless the report justifies that equivalent treatment will be achieved with less than two stages. Justification must use ~~a lesser number using~~ operational data from either a full-scale operating ~~facility~~wastewater treatment facility or pilot unit with an appropriate scale-up factor.

(2) The first stage of an RBC system must include a means of spreading the influent flow evenly across the media.

(l) Drive Systems. An RBC drive system must be designed to handle the maximum anticipated media load and may be a variable speed system. An RBC ~~unit~~ may be mechanically driven or air driven.

(1) Mechanical Drive Systems.

(A) A mechanical drive system must have a motor and speed control unit capable of maintaining the required revolutions per minute.

(B) A fully assembled spare mechanical drive unit must be kept on-site for each size of mechanical drive unit used in the RBC. ~~must be on-site.~~

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(2) Air Drive System.

(A) Each RBC ~~unit~~ using an air drive system must have air diffusers mounted below the media and off-center from the vertical axis of the RBC ~~unit~~ and must have air cups mounted on the outside of the media to collect the air.

(B) The blowers must provide the capacity to supply: ~~adequate airflow for:~~

(i) the airflow rate necessary for each RBC ~~unit~~;

(ii) double the airflow rate to any one RBC~~unit~~ while the others are running normally; and

(iii) the required airflow with the largest blower out of service.

(C) The air diffuser pipe to each RBC~~unit~~ must:

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(i) be mounted so that the air diffuser pipe may be removed without draining the tank or without moving the RBC media; and

(ii) include an air control valve to each RBC ~~unit~~.

(m) Dissolved Oxygen.

(1) An RBC system must maintain a minimum dissolved oxygen concentration of 1.0 milligram per liter in all stages under ~~during~~ the maximum organic loading rate.

(2) The executive director may require supplemental aeration.

§217.186. Nitrifying Rotating Biological Contactors.

(a) A rotating biological contactor ~~contractor~~ (RBC) system designed for five-day biochemical oxygen demand (BOD_5~~-~~) removal and nitrification of domestic wastewater in a single system must include four stages and have a maximum overall organic loading rate of 1.6 pounds of BOD_5 per ~~/~~day per ~~/~~1,000 square feet of media.

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(b) A nitrifying RBC must be designed to allow chemical addition if the influent pH is below 7.0 standard units.

(c) The report must justify the nitrification rate of a system using calculations.

(d) A nitrifying RBC system may be subject to the requirements of §217.7(b)(2) of this title (relating to Types of Plans and Specifications Approvals).

§217.187. Dual Treatment Utilizing Rotating Biological Contactors.

(a) A rotating biological contactor ~~contactors~~ (RBC) ~~unit~~ may be used in conjunction with other treatment as a dual treatment system.~~systems.~~

(b) An RBC ~~system~~ may be used as a "roughing" unit, as described in §217.182(b)(1) of this title (relating to Trickling Filters—General Requirements, regarding trickling filter classifications), in series with an activated sludge system. ~~as described in §217.183 of this title (relating to Nitrifying Trickling Filters--Additional Requirements).~~

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(c) The report must include supporting data, calculations, process descriptions, and vendor information to describe how a proposed RBC system will meet the permitted effluent limitations.

(d) Combined systems may be subject to the requirements of §217.7(b)(2) of this title (relating to Type of Plans and Specifications Approvals).

§217.188. Submerged Biological Contactor.

(a) A submerged biological contactor (SBC) ~~system~~ must be air driven and does not require a cover. An SBC is any biological contactor where more than 60 percent of the surface is below the water level at design flow.

(b) An SBC system requires the same pretreatment as a rotating biological contactor system and must meet the criteria in §217.185 of this title (relating to Rotating Biological Contactors), except as described in paragraphs (1) and (2) of this subsection.

(1) Each SBC unit must include two air headers— ~~,~~ one to provide~~for~~ rotation of the unit, and one to provide dissolved oxygen for ~~the~~ biological activity.

(2) Submerged ~~The submerged~~ bearings must be sealed to prevent intrusion of ~~the~~ wastewater.

(c) If an SBC has any moving parts that require lubrication, ~~is required,~~ an SBC ~~unit~~ must have lubrication access above the water level.

§217.189. Dual Treatment Systems Using Submerged Biological Contactor.

(a) A submerged biological contactor (SBC) ~~unit~~ may be used in conjunction with other treatment systems.

(b) An SBC ~~system~~ may be used as a roughing unit, as described in §217.182(b)(1) of this title (relating to Trickling Filters—General Requirements, regarding trickling filter classifications), in series with activated sludge. ~~as described in §217.183 of this title (relating to Nitrifying Trickling Filters—Additional Requirements).~~

(c) SBC units may be installed in existing activated sludge basins to create a combination of fixed and suspended growth processes. ~~process.~~

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(d) If a dual treatment system employs an SBC~~ unit~~, the report must include supporting data, calculations, process descriptions, and vendor information to describe how the proposed dual treatment system will provide the required treatment levels.

(e) These designs may be subject to the requirements of §217.7(b)(2) of this title (relating to Type of Plans and Specifications Approvals).

§217.190. Filtration.

(a) Reasons for Use.

(1) Permit Requirements. A ~~facility~~wastewater treatment facility that requires ~~with~~ tertiary effluent limitations must use filtration as a unit of operation to supplement suspended solids removal. Tertiary effluent limits are any limits less than or equal to five milligrams per liter for five-day biochemical oxygen demand or total suspended solids.

(2) Specific Water Quality Requirements. A~~t~~ ~~facility~~wastewater treatment facility designed for ~~with~~ secondary or advanced secondary treatment effluent limitations may use filtration as a unit of operation to supplement suspended biological

floc removal. Filters may be designed for ~~and~~ intermittent ~~filter~~ operation if filters are not necessary to meet permitted effluent limitations.

(b) Redundancy.

(1) A ~~facility~~wastewater treatment facility using filtration to provide tertiary treatment to comply with ~~for~~ a permit requirement must have a minimum of two independent, fully functional filter basins with independent, fully functional equipment ~~filter units~~.

(2) The design of a filtration system ~~A design~~ must specify the ~~required~~ filter surface area required to treat the ~~based on~~ peak flow ~~through the filters~~ with the largest filter unit out of service.

(3) If a filter is ~~being~~ provided solely to polish wastewater in~~for~~ situations where permit compliance does not depend on the use of a filter, such as in some cases of reclaimed water use,~~usage,~~ one filter is allowed.

(c) Source of Backwash Water. A filtration system must use filtered effluent as the source of backwash water.

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(d) Disposition of Backwash Water. A filtration system must return backwash water containing material cleaned from a filter to the headworks ~~head~~ of the ~~facility~~wastewater treatment facility for processing.

(e) Sequence of Treatment Units.

(1) A final clarifier must precede a filter~~, in accordance with Subchapter F of this chapter (relating to Activated Sludge Systems)~~.

(2) A filter system may be used in conjunction with a disinfection tank to provide additional detention time, provided the~~a~~ filter is backwashed to the headworks of the wastewater treatment facility ~~of the facility~~or to the influent lift station.

(f) Overload Conditions. A design must prevent effluent or partially treated effluent from overflowing from any filtration unit.

(g) Control of Slime Growth. A filtration system must provide periodic disinfectant in the influent stream ~~to a filter~~ to control slime growth in the filter and backwash storage tank.

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§217.191. Additional Requirements for Deep Bed, Intermittently Backwashed, Granular Media Filters.

(a) Application Rates. With one unit out of service, the peak application rate to any deep bed, intermittently backwashed, granular media (deep bed) filtration unit must not exceed twice the design application rate.

(1) Single Media (Sand).

(A) The design filtration rate for single media (sand) filters must not exceed three gallons per minute (gpm) per square foot (sf) of media surface.

(B) The maximum filtration run time between backwash periods is 6.0 hours.

(2) Dual Media (Stratified Anthracite and Sand). The design filtration rate for a dual media (anthracite and sand) filter must not exceed 4.0 gpm/sf of media surface.

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(3) Mixed Media (Non-stratified Anthracite, Sand, Garnet, or Other Materials). The design filtration rate for mixed media (non-stratified anthracite, sand, garnet, or other materials) must not exceed 5.0 gpm/sf of media surface.

(b) Media Design.

(1) A deep bed filter underdrain system must include a graded gravel layer with a minimum depth of 15 inches.~~,~~ Filter support media ~~or other filter media support material unless a filter media~~ other than gravel may be used if ~~is~~ justified in the report.

(2) The uniformity ~~Uniformity~~ coefficient of media used in a deep bed filter must be 1.7 or less.

(3) A dual or mixed deep bed filter must be designed to maintain stratification of media during backwash, based on the particle size distribution. ~~The particle size distribution for dual and mixed media filters must perform a hydraulic grading of material during backwash that will result in a filter bed with a pore space graded from progressively coarse to fine from the top of the media to the supporting layer.~~

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(4) Media material depths for the various deep bed filter types must conform to the values in the following table, unless other media depths are justified in the report with an analysis of the backwash rates:

Figure: 30 TAC §217.191(b)(4)

Table G.4 - Minimum Filter Depths for Deep Bed, Intermittently Backwashed Filters			
Filter Type	**Type of Media**	**Effective Particle Size (millimeters)**	**Minimum Depth (inches)**
Single Media	Sand	1.0-4.0	24
Dual Media	Anthracite & Sand *Anthracite* *Sand*	1.0-4.0 *1.0-2.0* *0.5-1.0*	16 total *10* *6*
Mixed Media	Anthracite, Sand & Other *Anthracite* *Sand* *Garnet or Similar Material*	1.0-4.0 *1.0-2.0* *0.6-0.8* *0.3-0.6*	16 total *10* *4* *2*

(c) Backwash Systems.

(1) Flow Rate ~~Flowrate~~ and Media Expansion.

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(A) A backwash system must allow a fluidized media expansion of at least 20% by volume.

(B) A single media deep bed filter must provide a minimum backwash ~~flowrate~~flow rate of 6.0 gpm/sf of media area.

(C) ~~A~~ Dual and mixed media deep bed filters must provide a minimum backwash rate of 15 gpm/sf of media area.

(D) Backwash times must be at least 10 minutes but not more than 15 minutes, unless the report justifies a different time.

(2) Surge Control.

(A) A wastewater treatment facility that does not have flow equalization or other means of surge control must have a backwash tank.

(B) A surge control device must prevent increases in flow greater than 15% of the design flow of the upstream treatment units if backwash is taken directly to the headworks or the influent lift station.

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(C) The ~~A~~ design of a surge control device must be based on calculations that demonstrate the slug effects of backwash water and that demonstrate treatment capabilities are not diminished with the return of backwash water to the ~~facility~~ headworks or the influent lift station.

(D) An enclosed backwash tank must be vented.

(3) Pumps.

(A) Pumps for backwashing deep bed filters ~~filter~~ units must deliver the required flow rate for backwash operations with the largest pump out of service.

(B) A backup pump must be available on-site.

(C) A valve arrangement for isolating a deep bed filter unit for backwashing must be accessible for maintenance.

(D) A backwash system employing automatic controls must include a manual override system.

(4) Supplemental Systems.

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(A) A single deep bed media filter system must include either an air scour system or a combination air and water scour system in addition to an up-flow backwash water system.

(B) A dual or mixed deep bed media filter system must include either a surface air or water scour system that meets one of the following requirements for air or water scouring.

(i)~~(C)~~ Air scour system ~~flowrates~~flow rates must be at least 3.0 standard cubic feet per minute per square foot of media surface area but not more than 5.0 standard cubic feet per minute per square foot (scfm/sf) of media surface area.

(ii)~~(D)~~ Water scour system ~~flowrates~~flow rates must be at least 0.5 gpm/sf of media area but not more than 2.0 gpm/sf of media area.

(d) Underdrain System. An underdrain system must provide a uniform distribution for filter backwash without plugging or exceeding the manufacturer's recommendation for maximum head loss. The manufacturer's recommendation for maximum head loss must be included in the report.

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(e) Tank Design.

(1) The bottom of a wash water collection trough must be a minimum of 6.0 inches above the maximum elevation of the expanded media during backwash.

(2) A wash water collection trough must have a minimum freeboard of 3.0 inches during the maximum backwash ~~flowrate~~flow rate.

(f) Controls.

(1) The deep bed filter operation controls may be manual or automatic.

(2) Control indicators must be visible to a ~~facility~~wastewater treatment facility operator while adjusting the controls.

(3) An automatically controlled system must include a manual override system.

(4) Each deep bed filter unit must have a head loss indicator.

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§217.192. Additional Design Requirements for Multi-Compartmented, Low Head, Automatically Backwashed Filters.

(a) Application Rates.

(1) With one unit out of service, the peak application rate to any multi-compartmented, low head, automatically backwashed (multi-compartmented) filter unit must not exceed twice the design application rate.

(2) The report must include manufacturer's recommended filtration and application rates with test data.

(3) Single Media. A single media multi-compartmented filter must have a maximum design filtration rate of 3.0 gallons per minute per square foot of media surface.

(4) Dual Media. A dual media multi-compartmented filter must have a maximum design filtration rate of 4.0 gallons per minute per square foot of media surface.

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(b) Media Design. Media sizes and depths must correspond to the values in the following figure, unless an engineer uses calculations to justify ~~the report justifies~~ different media sizes, depths, or both in the report. ~~and/or depths:~~

Figure: 30 TAC §217.192(b)

Table G.5. - Filter Depths for Multi-Compartmented, Low Head, Automatic Backwash Filters			
Filter Type	**Type of Media**	**Effective Particle Size** *(millimeters)*	**Minimum Depth** *(inches)*
Single Media	Sand	0.55-0.65	11
Dual Media	Anthracite & Sand *Anthracite* *Sand*	0.55-0.65 *1.0-2.0* *0.5-1.0*	16 *10* *6*

(c) Backwash System.

(1) A backwash system must provide a minimum backwash rate of 20 gallons per minute per square foot of media. ~~being backwashed at a given time.~~

(2) The backwash duration must last at least 20 seconds for each compartment and must allow a fluidized media expansion of at least 20% by volume,

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~~must expand the media a minimum of 20%~~ unless the report includes the manufacturer's recommended backwash rates with test data that supports a shorter backwash duration or less expansion of the fluidized media.

(3) The surge control and pumping system requirements must be the same as those detailed in §217.191(c)(2) and (3) ~~§217.191(d)(2) and (3)~~ of this chapter (relating to Additional Design Requirements for Deep Bed, Intermittently Backwashed, Granular Media Filters).

(d) Traveling Bridge. A traveling bridge mechanism must:

(1) provide support and access to the backwash pumps and equipment;

(2) be constructed of corrosion-~~-~~resistant materials;

(3) have provisions for consistent tracking of the bridge and safe support of the power cords; and

(4) initiate a backwash cycle automatically when a preset head loss through the filter media occurs.

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(e) Floating Material Control. A multi-compartmented filter system must provide for automatic ~~and regular~~ removal of any floating material from the surface of the~~a~~ multi-compartmented filter and return the floating material to the headworks ~~head~~ of the ~~facility~~wastewater treatment facility for further processing.

§217.193. Cloth or Disk Filter Systems.

(a) Cloth or disk filter systems must meet the requirements in § 217.190 in this chapter (relating to Filtration).

(b) Media Design.

(1) The average pore size of cloth or disk filter media must not exceed 30 microns.

(2) The media thickness must be based on the manufacturer's recommendations, considering frequent pressure changes. The manufacturer's recommendations must be included in the report.

(3) The media must be disinfectant-resistant.

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(3) The media must be chlorine-resistant if the filter will be exposed to chlorine.

(c) Filtration Rates and Hydraulic Requirements.

(1) The design filtration rate must be based on the submerged surface area of the media.

(2) The design filtration rate must be between 3.25 and 6.5 gallons per minute per square foot of submerged media.

(3) The filtration system must be able to treat the design flow rate with one filter unit in backwash mode.

(4) The backwash flux rate must be at least 6.0 gallons per minute per square foot of media.

(d) Disposal of Backwashed Material.

(1) Liquid filter backwash must be re-filtered or must be returned to the headworks of the wastewater treatment facility or to the influent lift station.

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(2) Solid filter backwash material must be pumped to the in fluent lift station, the headworks, the digester, or to another location approved by the executive director for processing at least once per day.

(e) Monitoring and Controls.

(1) Cloth or disk filters must use an automatic control system.

(2) An automatic control system must include manual override capability.

(3) Each filter unit must monitor head loss across the unit and must have a head loss gauge or readout.

(4) Each filter unit must monitor effluent turbidity and have a turbidity gauge or readout.

(5) Gauges and readouts must be readable from the control panel.

(f) Weather Resistance. Cloth or disk filter systems must be protected from the environment. The report must describe how the system will be protected from freezing

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conditions, ultraviolet light, and similar environmental concerns.

§217.~~193~~194. Alternative Designs for Effluent Polishing.

The executive director shall review alternative processes for tertiary suspended solids removal, other than filters, as nonconforming technologies subject to the requirements of §217.7(b)(2) of this title (relating to Type of Plans and Specifications Approvals).

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SUBCHAPTER H: NATURAL TREATMENT FACILITIES

§§217.201 - 217.213

§217.201. Applicability.

This subchapter establishes the minimum design requirements for Imhoff tanks, constructed wetlands, facultative lagoons, aerated and partially aerated lagoons, stabilization lagoons, all ~~treated effluent~~ storage lagoons, evaporative lagoon systems, and overland flow processes, except that lagoons used for reclaimed water under chapter 210 of the this title (relating to Use of Reclaimed Water) must comply with the requirements of that chapter.

§217.202. Primary and Secondary Treatment Units.

(a) A primary treatment unit may be an aerated lagoon, a partially aerated lagoon, a facultative lagoon, an evaporative lagoon, or an Imhoff tank.

(b) A secondary treatment unit may be a stabilization lagoon, a constructed wetland, an evaporative lagoon, or an overland flow process. A secondary treatment unit may be used for polishing and tertiary treatment.

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(c) A treated effluent storage lagoon downstream of the ~~permit~~ sampling location in the wastewater treatment facility permit is not considered a treatment unit for the purposes of this chapter.

(d) A secondary treatment unit must be preceded by a primary treatment unit.

§217.203. Design Criteria for Natural Treatment Facilities.

This section applies to all earthen lagoons and earthen treatment units in a wastewater treatment facility, including constructed wetlands, facultative lagoons, aerated lagoons, partially aerated lagoons, stabilization lagoons, evaporative lagoons, and storage lagoons. Storage lagoons are considered treatment units for the purposes of this chapter if they hold wastewater that is not final treated effluent, such as raw influent or wastewater that has received intermediate treatment.

(a) Flow Distribution. ~~This section applies to a constructed wetland, a facultative lagoon, an aerated lagoon, a partially aerated lagoon, a stabilization lagoon, and an overland flow process.~~

~~(1)~~ The shape and size of a treatment unit must be designed to ensure ~~even~~ uniform distribution of the wastewater flow.

~~(2) The distribution system for an overland flow process must ensure uniform sheet flow of the wastewater onto and across the overland flow terraces.~~

(b) Windbreaks and Screening.

(1) A windbreak or vegetative screening must be used if operation of the treatment system could cause spray to drift off of the property. ~~spray irrigation is used in a location where drift presents a risk of contact with the public, a windbreak or vegetative screening must be used.~~

(2) The use, ~~the~~ type, and ~~the~~ extent of windbreaks or vegetative screening must be approved by the executive director.

(c) Maximum Liner Permeability.

(1) Except as provided ~~exempted~~ in paragraph (3)(c) ~~paragraphs (4) and (5)~~ of this subsection, constructed wetlands, facultative lagoons, aerated lagoons, partially aerated lagoons, stabilization lagoons, evaporative lagoons, and storage lagoons ~~a constructed wetland, facultative lagoon, earthen aerated lagoon, partially aerated lagoon, stabilization lagoon, and treated effluent storage lagoon~~ must be

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constructed with a liner material that has ~~with~~ a ~~minimum~~ coefficient of permeability less than ~~of~~ 1×10^{-7} centimeters per second for a thickness of: ~~(cm/sec) with:~~

(i) ~~a thickness of~~ 2.0 feet for water depths less than or equal to 8.0 feet; and~~and or~~

(ii) ~~a thickness of~~ 3.0 feet ~~at~~ for water depths greater than 8.0 feet.

(2) A liner must extend from the lowest elevation in a lagoon or ~~elevation or lowest~~ constructed wetland ~~elevation~~, up to an elevation of 2.0 feet above normal water elevation in the ~~a~~ lagoon or constructed wetland.

(3)~~(3) The executive director may grant a variance to the liner requirements, in accordance with §217.4 of this title (relating to Variances).~~

~~(4)~~ If a lagoon is constructed to store treated wastewater authorized as reclaimed water under Chapter 210 of this title (relating to Reclaimed Water), the lagoon liner must comply with §210.23 of this title (relating to Storage Requirements for Reclaimed Water).

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~~(5) This subsection does not apply to an evaporative lagoon system or an overland flow system. Liner and permeability requirements for these systems are established in §217.208 of this title (relating to Evaporative Lagoons) and §217.209 of this title (related to Constructed Wetlands).~~

(d) Compliance with the Liner Permeability Requirements. ~~Paragraph (1)(A) - (D) of this subsection provides the minimum criteria for ensuring that the liner's permeability will not exceed that allowed in paragraph (3) of this subsection.~~ A lagoon must be lined and tested according to the requirements of this subsection. The report must include the results of all~~any~~ tests~~test~~ required by~~in~~ this subsection.

(1) Sampling Requirements for Soil Liners.

(A) Sample Analysis. Soil liner material must be sampled and analyzed before construction. All samples of the liner material must meet the following requirements:

(i) the coefficient of permeability must be less than 1×10^{-7} centimeters per second;

(ii) at least 30% of the liner material must pass through a 200 mesh sieve;

(iii) the liner material must have a liquid limit greater than 30%; and

(iv) the liner material must have a plasticity index of 15 or greater.

(B) Preconstruction Sampling for Unamended In-Situ Liners. Permeability testing for an unamended in-situ soil liner requires undisturbed core samples of the liner material. At least one undisturbed core sample must be analyzed for every 0.25 acre of liner surface area on the bottom and each side of each lagoon or constructed wetland. All undisturbed core samples must have a coefficient of permeability less than 1×10^{-7} centimeters per second. The report must demonstrate that the in-situ soil meets the minimum thickness requirements in subsection (c)(1) of this section.

(C) Preconstruction Sampling for Imported and Amended Soil Liners. Molded samples of the liner material are allowed for imported soil liners and

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amended in-situ soil liners. Four samples are required per 11,000 cubic feet of liner material.

(D) Post-construction Sampling. A minimum of one undisturbed core sample must be analyzed after the liner is complete for each 0.25 acre of liner surface area on the bottom and each side of each lagoon or constructed wetland. The coefficient of permeability must be less than 1×10^{-7} for each sample. An unamended in-situ liner does not require post-construction sampling if it meets the pre-construction requirements in subparagraphs (1)(A) and (1)(B) of this paragraph (relating to Sample Analysis; Preconstruction Sampling for Unamended In-Situ Liners) and the construction requirements in subparagraph (d)(2)(B) of this subsection (relating to Unamended In-situ Soil Liner Construction).

(2) Soil Liner Construction.

(A) Amended In-situ or Imported Soil Liner Construction. All amended in-situ or imported soil liners must comply with the following requirements:

(i) liner material must be placed in loose lifts that are each a minimum of 8.0 inches in depth;

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(ii) each lift must be compacted to 95% standard proctor density at optimum moisture according to American Standards for Testing and Materials (ASTM) standard D 698;

(iii) each lift must be no less than 6.0 inches thick after compaction and the completed liner must meet the minimum thickness requirements in subsection (c)(1) of this section; and

(iv) the in-situ subgrade must be scarified before placement of the lowest lift.

(B) Unamended In-situ Soil Liner Construction. All unamended in-situ soil liners must comply with the following requirements.

(i) The liner must include at least one 8.0 inch loose lift of excavated in-situ material that is compacted to no less than 6.0 inches at 95% standard proctor density at optimum moisture according to ASTM D 698.

(ii) The in-situ subgrade must be scarified before placement of the lowest lift.

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(3) Synthetic Membrane Liner Construction. All synthetic membrane liners must comply with the following requirements.

(A) A synthetic membrane liner must have a minimum thickness of 40 mils.

(B) A synthetic membrane liner must include an underdrain with a leachate detection and collection system.

(C) Synthetic membrane liner material must be able to withstand constant sunlight without degrading.

(D) Soil compaction beneath a synthetic liner must meet the liner manufacturer's requirements.

~~(1) Using Unmodified In-Situ Soils. If the soils that naturally exist at a proposed lagoon or constructed wetland site restrict the movement of wastewater to a degree equivalent to a liner placed as described in subsection (c)(1) of this section. A design must meet the requirements in subparagraphs (A) - (E) of this paragraph to~~

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~~certify the permeability of the in-situ soil layer to ensure that groundwater and surface water quality are protected.~~

~~(A) A minimum of one core sample is required for each 0.25 acres of bottom area for each lagoon or constructed wetland.~~

~~(B) Each core sample must be sampled to determine the coefficient of permeability, the percent passing a 200mesh sieve, the liquid limit value, and the plasticity index value for the soil that is to serve as a liner.~~

~~(C) Each core sample test result must show a coefficient of permeability of less than or equal to 1x10-7 cm/sec, in compliance with subparagraph (B) of this paragraph.~~

~~(D) A liner must be constructed in accordance with one of paragraphs (2), (3), or (4) of this subsection if test results indicate that in-situ soils do not exhibit a hydraulic conductivity of 1x10-7 cm/sec or less.~~

~~(E) An in-situ soil may be used as a lagoon liner or constructed wetland liner if the in-situ soil meets all the requirements in subsection (c)(1) of this section provided that one layer of excavated in-situ material, with the minimum soil~~

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~~characteristic requirements is placed on scarified subgrade in one 8 inch loose lift compacted to no less than 6 inches at 95% standard proctor density in accordance with American Society For Testing And Materials (ASTM) D 698.~~

~~(2) Placed Liners. The soil characteristics of the liner material for a placed liner must comply with subparagraphs (A) - (E) of this paragraph. The tests to determine the soil characteristics must conform to standard methods such as ASTM.~~

~~(A) At least 30% of the liner material must pass through a 200 mesh sieve;~~

~~(B) The liner material must have a liquid limit greater than 30%;~~

~~(C) The liner material must have a plastic index of 15 or greater;~~

~~(D) The liner material must be placed in four loose lifts that are each a maximum of 8.0 inches in depth and that are compacted to 95% standard proctor density in accordance with ASTM D 698. Each lift must be no less than 6.0 inches thick after compaction resulting in a total vertical thickness of at least 24 inches for a liner; and~~

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~~(E) An in-situ subgrade must be scarified prior to placement of the lowest lift.~~

~~(3) Using Amended In-Situ Soils.~~

~~(A) A liner may be constructed from amended soils or blended soils made of imported soils and soils excavated from the proposed lagoon site.~~

~~(B) Each sample of amended soil must sufficiently decrease the coefficient of permeability to 1x10-7~~ 8 cm/sec.

~~(C) The following samples are required for each liner:~~

~~(i) three representative samples from each 6,700 cubic feet of amended soil:~~

~~(ii) one field permeability test; and~~

~~(iii) one laboratory permeability test.~~

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~~(D) Each of the permeability tests must verify that the coefficient of permeability is equal to or less than 1x10-7~~ 8 cm/sec.

~~(E) When soil permeability is decreased by amending in-situ soil, the liner thickness throughout the lagoon may be decreased to 6.0 inches, if the liner is placed on scarified subgrade in one 8.0 inch loose lift compacted to no less than 6.0 inches at 95% standard proctor density in accordance with ASTM D 698.~~

~~(4) Use of a synthetic membrane liner.~~

~~(A) A synthetic membrane liner must have a minimum thickness of 40 mils.~~

~~(B) A lagoon with a membrane liner must include an underdrain with a leachate detection and collection system.~~

~~(C) A liner material must be able to withstand constant sunlight without degrading.~~

~~(D) The use of a synthetic membrane liner for a constructed wetland is prohibited.~~

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(e) Embankment Design and Construction. ~~This section applies to a constructed wetland, a facultative lagoon, an aerated lagoon, a partially aerated lagoon, a stabilization lagoon, a treated effluent storage lagoon, and an evaporative lagoon.~~

(1) The top ~~width~~ of an embankment must be at least ~~a minimum of~~ 10.0 feet wide.

(2) The report must justify all inner and outer embankment slopes ~~slope~~ steeper than 1.0 foot vertical to 4.0 feet horizontal from the top of the~~an~~ embankment.

(3) Inner and outer embankment slopes steeper than 1.0 foot vertical to 3.0 feet horizontal are prohibited.

(4) All embankments must be protected against erosion by establishing~~planting~~ grass, paving, riprapping, or any other method approved by the executive director.

(5) All vegetated embankments must have a minimum cover of 6.0 inches of topsoil. ~~if vegetated.~~

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(f) Disinfection. Unless otherwise specified in the wastewater treatment facility's wastewater permit, chemical or ultraviolet disinfection is not required if a detention time of at least 21 days is provided in the plant-free ~~entire, free~~ water surface with full sun exposure~~, natural treatment unit,~~ in accordance with §309.3(g) of this title (relating to Disinfection).

(g) Sampling Point Significance.

~~(1)~~ The ~~Sizing~~size or design of a~~any~~ treatment unit upstream of the permitted sampling point must not be based on the design of any storage lagoon or other structure ~~unit~~ downstream of the permitted sampling point.

~~(2) A wastewater lagoon downstream of the permitted sampling point is a treated effluent storage lagoon and must comply with the requirements of §210.23 of this title (relating to Storage Requirements for Reclaimed Water).~~

(h) Stormwater~~Storm Water~~ Drainage. A natural treatment system must be designed and constructed to prevent stormwater~~storm water~~ from draining into the system.

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(i) Piping. A natural system must be designed with piping that allows water in each lagoon or wetland cell to be re-routed to a different lagoon or wetland cell for maintenance.

(j) Freeboard.

(1) A lagoon must have a minimum of 2.0 feet of freeboard above the normal operating level if the lagoon's normal water surface area is less than 20 acres.

(2) A lagoon must have a minimum of 3.0 feet of freeboard above the normal operating level if the lagoon's normal water surface area is 20 acres or more.

(3) A constructed wetland cell must have at least 2.0 feet of freeboard above the normal operating level, or the freeboard required to manage the selected wetland plant population, whichever is greater.

(h) Prohibition of Synthetic Liners for Constructed Wetlands. The use of a synthetic membrane liner for a free water surface constructed wetland is prohibited

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§217.204. Imhoff Tanks.

(a) Settling Compartment.

(1) The minimum length-to-width ratio of a settling compartment is 2.0 to 1.0.

(2) A tank inlet must provide uniform flow distribution across the width of a settling compartment.

(3) The septum walls must slope to the center of a compartment at an angle of at least 50 degrees but not more than 60 degrees from horizontal. The septum walls must create an overlap with a continuous slot that is at least 8.0 inches wide ~~provided~~ between the walls to allow solids to be dispersed into the ~~a~~ digestion compartment. To prevent gases from escaping through the slot, one of the septum walls must continue past the slot to create a slot overhang of at least 8.0 inches.

(4) The ~~maximum~~ depth between the water level at design flow ~~normal water level~~ and the plane of a slot must not be more than~~is~~ 9.0 feet.

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(5) At least ~~The minimum freeboard above the normal water level is~~ 18 inches of freeboard must be provided above the normal water level.

~~(6) One of the septum walls must continue past the slot to create a minimum slot overhang of 8.0 inches.~~

(b) Surface Loading.

(1) The settling compartment ~~overflow~~ surface loading rate must not exceed 800 gallons per day per square foot of settling compartment area under design flow conditions.

(2) The longitudinal velocity of wastewater through a settling compartment must not exceed 1.0 foot per second under peak flow conditions.

(c) Scum Baffles. An inlet and an outlet of an Imhoff ~~a~~ tank must include scum baffles with a height that meets ~~meet~~ the water levels at all flows from minimum flow to peak flow.

(d) Gas Vents.

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(1) An Imhoff tank must include gas vents with a total area not less than 20% of the total Imhoff tank surface area. The total Imhoff tank surface area must be included in the report.

(2) At~~The width of at~~ least one vent opening must be large enough to allow equipment into the ~~maintenance access into a~~ digestion compartment for maintenance.

(e) Digestion Compartment Loading. The digestion compartment minimum volume must be ~~the greater of~~ 3.5 cubic feet per capita or 20.5 cubic feet per pound of influent five-day biochemical oxygen demand (BOD_5) per day, whichever is greater.

(f) Imhoff Tank Dimensions. The total depth of an Imhoff tank must not be less than 16.5 ~~15~~ feet from the water surface ~~at design flow~~ to the bottom of a digestion compartment at design flow.~~, not including the first 18 inches of tank depth below the plane of a slot for design digestion volume.~~

(g) Sludge Removal.

(1) The digestion compartment of an Imhoff tank must have a sludge withdrawal pipe. ~~in a digestion compartment.~~

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(2) A sludge withdrawal pipe must have a minimum diameter of 8.0 inches and include a provision for regular cleaning.

(3) A digestion compartment design must allow a portable pump to remove accumulated sludge.

(h) Odor Management.

(1) The design of an Imhoff tank must minimize the effect of odor from the gas vents.

(2) The executive director may require a bio-filter, a carbon filter, or other odor control device to minimize odor.

(i) Treatment Efficiency.

(1) An Imhoff tank must be followed by at least one subsequent treatment unit.

(2) A design may assume that an Imhoff tank removes 35% of the influent BOD_5 .

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~~(3) A design may assume that subsequent treatment units remove 60% of influent total suspended solids.~~

(j) Material and Construction.

(1) An Imhoff tank must be constructed of reinforced and sealed concrete.

(2) Each component of an Imhoff tank must be resistant to the corrosive effects of a wastewater environment.

§217.205. Facultative Lagoons.

(a) Configuration, Inlets, and Outlets.

(1) The length-to-width ratio of a facultative lagoon must be 3.0 to 1.0.~~, unless other dimensions more suitable to a site are justified in the report.~~

(2) The flow in a facultative lagoon must be from an inlet along one end of the lagoon to an outlet at the opposite end of the lagoon.

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(3) The length of a facultative lagoon must be oriented in the direction of the prevailing winds with the inlet side located such that debris will be blown toward the inlet.

(4) A facultative lagoon must have inlet baffles to collect floatable material when no pre-screening is provided.

(5) An outlet must be adjustable to allow the water level of a facultative lagoon to vary under normal operating conditions.

(b) Depth.

(1) The deeper portion of a facultative lagoon near the inlets must have a minimum depth of 12 feet to provide sludge storage and anaerobic treatment.

(2) The deeper portion of a facultative lagoon must cover at least 25% of the area of the~~a~~ lagoon bottom.

(3) The remainder of a facultative lagoon must have a minimum depth of 8.0~~8~~ feet.

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(c) Organic loading. The organic loading must not exceed 150 pounds of five-day biochemical oxygen demand (BOD_5) per acre per day based on the surface area of the~~a~~ facultative lagoon.

(d) Odor Control.

(1) A facultative lagoon inlet must be at least 24 inches below the water surface to minimize odor.

(2) An outlet must be at least 12 inches below the water surface, but not further below the water surface than a distance equal to one-half the depth of the lagoon at the outlet. ~~and not disturb the anaerobic zone.~~

(3) The design of a facultative lagoon must allow for recirculation ~~from~~ of at least 50%, ~~to not~~but not more than 100% of the design flow.

(4) The design of a facultative lagoon ~~design~~ must prevent siphoning of lagoon contents through a submerged inlet.

(e) Removal efficiency. The design of a facultative lagoon must not ~~may~~ be based on ~~no~~ more than 50% ~~efficient~~ removal of the influent BOD_5 .

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§217.206. Aerated Lagoons.

(a) The requirements of this section apply to both completely mixed aerated lagoons and partially mixed aerated lagoons, unless otherwise specified.

(b) ~~An aerated lagoon system must maintain~~ A minimum of 1.6 pounds of oxygen per pound of influent five-day biochemical oxygen demand (BOD_5) must be maintained in an aerated lagoon system, even with the largest single aeration unit in a lagoon system out of service.

~~(c) A lagoon system's pipes and valves must allow the flow to be proportionally rerouted.~~

(c)~~(d)~~ The aeration equipment must have an audio-visual alarm system. ~~that will provide sufficient notification to ensure timely repair to prevent a permit violation.~~ If a ~~facility~~wastewater treatment facility is not staffed 24 hours per day, the alarm system must be connected to a telemetry system with battery backup.

(d)~~(e)~~ The BOD_5 removal in each ~~lagoon~~aerated lagoon must be calculated using the following equation:

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Figure: 30 TAC §217.206(d) ~~§217.206(e)~~

Equation H.1.

$$E = \frac{1}{1 + K(\frac{V}{Q})}$$

$$E = 1 - \frac{1}{1+K\left(\frac{V}{Q}\right)}$$

Where:
E = ~~%~~ fraction of BOD_5 removal in aerated lagoon
K = first order removal rate constant, day^{-1}
V = aeration basin volume, million gallons
Q = design influent wastewater flow rate, million gallons per day.

(1) The value of K for ~~a~~ domestic wastewater in a completely mixed lagoon is 0.50 day^{-1} at 20 degrees Celsius. The value of K for domestic wastewater in a partially mixed lagoon is 0.28 day^{-1} at 20 degrees Celsius.

(2) The value of K ~~may~~ must be adjusted for the minimum monthly water temperature using the following equation:

Figure: 30 TAC §217.206(d)(2) ~~§217.206(e)(2)~~

Equation H.2.

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$$K_T = K_{20} \times 1.06^{T-20°C}$$

$$K_T = K_{20} \times 1.06^{T-20°C}$$

Where:
K_T = the lowest average water temperature during any 30-day period.
K_{20} = K value at 20°~~E~~C
T = lowest average water temperature (°~~E~~C) expected during any 30-day period

(3) The value of K must ~~may~~ be determined for high-strength or industrial wastewater by either a laboratory study or an evaluation of an existing wastewater treatment facility ~~facility~~ treating ~~similar~~ wastewater with similar organic strength and industrial contributions.

(e)~~(f)~~ Aeration Equipment.

(1) The size of the aeration equipment in an aerated lagoon must be able to supply the oxygen demand determined in subsection (b) of this section.

(2) For the purpose of sizing aeration equipment, an aerated lagoon must comply with the mechanical and diffused air requirements in §217.155(c) of this title (relating to Aeration Equipment Sizing).

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(3) If multiple partially mixed aerated lagoons are used in series, the power input may be reduced as the influent BOD5 to each lagoon decreases.

(f)~~(g)~~ Aerated Lagoon Design Requirements. An aerated lagoon system must be designed according to the ~~in accordance with~~ requirements for a wastewater treatment lagoon in §217.203(e) of this title (relating to Design Criteria for Natural Treatment Facilities) and §217.207(d) of this title (relating to Stabilization Lagoons).

(g)~~(h)~~ Scour Prevention. An earthen-lined aerated lagoon system must include a concrete scour pad in each area of the earthen liner that is subject to a velocity equal to or greater than 1.0 foot per second.

§217.207. Stabilization Lagoons.

(a) Primary treatment must remove the settleable and floatable solids in the influent prior to the wastewater entering a stabilization lagoon.

(b) Odor Management.

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(1) A stabilization lagoon must be located so that the local prevailing winds are ~~will be~~ toward a less populated area at the time of construction so that the facility will not cause a nuisance.

(2) If uncontaminated water is available, a stabilization lagoon must be pre-filled with uncontaminated water to the 2.0 foot level at start-up.

(3) A stabilization lagoon system must include a piping arrangement that allows the recirculation of effluent from a final lagoon to the influent side of an initial stabilization lagoon.

(4) A stabilization lagoon may return recirculation water by surface spray to assist in maintaining aerobic conditions at the lagoon surface and to reduce potential odor.

(c) Minimum Number of Wastewater Stabilization Lagoons. ~~A minimum of~~At least two stabilization lagoons are~~is~~ required to comply with secondary treatment limits. The stabilization lagoons must be operated in series, ~~with each other~~ following the primary treatment unit.

(d) Stabilization Lagoon Design.

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(1) The minimum length-to-width ratio of a stabilization lagoon is 3.0 to 1.0.

(2) Islands, peninsulas, and coves within a stabilization lagoon are prohibited.

(3) A stabilization lagoon must have a depth of at least 3.0 feet, but not more than 5.0 feet under design operating conditions.

(4) Inlet and outlet structures must be adjustable to assist in controlling vegetative growth. Inlet and outlet structures must ~~to~~ allow ~~for raising and lowering~~ the water level to be raised and lowered by at least ~~a minimum of~~ 6.0 inches ~~to assist in controlling vegetative growth~~.

~~(5) A stabilization lagoon must have a minimum of 2.0 feet of freeboard above the normal operating level if the lagoon's normal water surface area is less than 20 acres.~~

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~~(6) A stabilization lagoon must have a minimum of 3.0 feet of freeboard above the normal operating level if the lagoon's normal water surface area is 20 acres or more.~~

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(e) Pipe and Hydraulic Equipment.

(1) All structures and pipes in a stabilization lagoon must be sized to transport at least 250% of the ~~facility~~wastewater treatment facility's design flow.

(2) The inlet and outlet structures must be sized to ~~transport the volume of water found in~~evacuate the top 6.0 inches of a lagoon volume each day, based on the normal water level at design flow ~~during normal operating depths per day at the~~and the corresponding ~~available~~ pressure head.

(3) ~~A~~ The pipe and recirculation system must allow a stabilization lagoon system to comply with the ~~facility~~wastewater treatment facility's permitted effluent limitations,~~limitation~~ even ~~-~~with any one lagoon out of service.

(f) Maximum Surface Organic Loading Rate for Stabilization Lagoons.

(1) The maximum surface organic loading rate on a ~~the~~ stabilization lagoon series is 35 pounds (lbs) of five-day biochemical oxygen demand (BOD_5) per acre per day.

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(2) The maximum surface organic loading rate on the first lagoon in a stabilization lagoon series is 75 lbs of BOD5 per acre per day.

(3) The surface organic loading rate applied to a~~the~~ stabilization lagoon series is equal to the total influent organic loading minus any reduction in organic load provided by the primary treatment units.

(g) Inlet and Outlet Structures.

(1) A stabilization lagoon outlet must include removable baffles to prevent floating material from being discharged, and must be constructed to operate correctly as the level of the lagoon surface varies under normal operating conditions.

(2) An outlet must be at least 18 inches but not more than 24 inches below the waster surface in a stabilization lagoon ~~surface~~ to control the discharge of algae.

(3) A multipurpose control structure may be used to facilitate ~~a~~ normal operational functions~~function~~ such as drawdown, flow distribution, flow depth, measurement, sampling, pump for recirculation and chemical addition. A multipurpose control structure may also be used ~~; and~~ to minimize the number of construction sites in a stabilization lagoon.

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(4) A pipe embankment penetration must have a seep water-stop collar.

(5) A stabilization lagoon must have a drainpipe that allows the stabilization lagoon to be emptied~~to allow emptying~~ for maintenance and may use a pump as part of a drainage system. If a permanent drain pipe will not be ~~permanently~~ installed, a temporary pipe suction station must be provided.

§217.208. Evaporative Lagoons.

(a) Design.

(1) If evaporative lagoons are used, ~~a facility~~the wastewater treatment facility must have at least ~~a minimum of~~ two evaporative lagoons.

(2) The primary evaporative lagoon must provide at least 60% of the total surface area of the total ~~an~~ evaporative lagoon system.

(3) The number and size of evaporative lagoons must provide adequate evaporation for the design flow during periods of low evaporation. For the purposes of

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this chapter, the low evaporation rate used in design must be the lowest annual evaporation rate in the past 25 years.

(b) Odor Management. An evaporative lagoon must be located so that the local prevailing winds blow ~~will be~~ toward a less populated area at the time of construction so that the facility will not cause a nuisance.

~~(c) Synthetic Membrane Liners.~~

~~(1) A synthetic membrane for an evaporative lagoon must be at least 40 mils thick.~~

~~(2) A lagoon with a synthetic membrane liner must have an underdrain leak system consisting of at least a leachate collection system and a detection system.~~

~~(3) The liner manufacturer's specifications may require proper compaction of soil beneath the liner.~~

~~(4) A liner material must withstand constant sunlight without degrading.~~

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(~~d~~c) Configuration, Depth, and Loading.

(1) An evaporative lagoon may be constructed in a round, square, or rectangular shape. The corners of a square or rectangular shaped evaporative lagoon must be rounded in order to minimize accumulation of floating materials.

(2) The depth of an evaporative lagoon is dependent~~dependant~~ on its location within the lagoon system, as set forth in subparagraphs (2)(A) and (2)(B) of this paragraph.

(A) The maximum operating depth for a primary evaporative lagoon is 5.0 feet, but the area around an inlet must be designed with additional depth for solids deposition according to the criteria in §217.205 of this title (relating to Facultative Lagoons).

(B) The maximum operating depth for a secondary evaporative lagoon is 8.0 feet.

(3) Evaporation and Organic Loading.

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(A) The size of an ~~An evaporation~~ evaporative lagoon system must be ~~sized~~ based on the evaporation rate for the site and a maximum allowable organic loading rate.

(B) The evaporation loss must be calculated by using the Penman-Monteith method or a comparable, established method.

(C) An evaporative lagoon system must be sized to account for the influent flows and precipitation from a 25-year frequency, one-year rainfall event in accordance with §309.20(b)(3)(B) of this title (relating to Land Disposal of Sewage Effluent), unless the report includes an alternate method of disposing of the wastewater, along with ~~and the~~ supporting documentation.

~~(D) The maximum organic loading rate must be calculated based on an evaporative lagoon system that is sized using the evaporation rate as required by subparagraph (C) of this paragraph.~~

(D)~~(E)~~ The five-day biochemical oxygen demand (BOD_5) loading on a primary evaporative lagoon must not exceed 150 pounds of BOD_5 per acre of surface area per day.

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(~~e~~d) Embankment. The embankments for an evaporative lagoon must be constructed in accordance with §217.203(e) of this title (relating to Design Criteria for Natural Treatment Facilities).

(~~f~~e) Inlet and Outlet Structures.

(1) An influent line for an evaporative lagoon must terminate into a manhole located along the embankment edge.

(2) An inlet manhole invert must be a minimum of 6.0 inches above the maximum high water level of a primary evaporative lagoon.

(3) A submerged discharge pipe must extend from a manhole along and anchored to the bottom of an evaporative lagoon.

(4) An inlet discharge pipe must discharge on~~-~~to a concrete apron in a depression near the center of the primary evaporative lagoon to prevent scour.

~~(A)~~ A concrete apron must be at least 2.0 square feet in surface area, be at least 8.0 inches thick, and be resistant to the corrosive effects of a wastewater environment.

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~~(B) The report must justify the use of any material other than concrete for a discharge apron.~~

(5) Inlet and outlet structures for an evaporative lagoon must be designed and constructed in a manner that allows the water surface elevation to be varied during normal operating conditions.

§217.209. Constructed Wetlands.

(a) Types of Constructed Wetlands. A constructed wetland may be either a free water surface system or subsurface flow system.

(b) Natural Wetlands. The use of natural wetlands for wastewater treatment is prohibited. For the purposes of this chapter, a natural wetland is an area which was not constructed for wastewater treatment that meets the definition of wetlands in 40 Code of Federal Regulations, Part 230.

(c) Constructed Wetland Design.

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(1) A constructed wetland must be preceded by primary treatment or ~~and may be preceded by~~ secondary treatment.

(2) A primary treatment system that precedes a constructed wetland must be designed to control odor and algae.

(3) A primary treatment system must produce an effluent quality with no more than 150 milligrams per liter of five-day biochemical oxygen demand to discourage ~~minimize~~ anaerobic conditions and stress on vegetative communities in any subsequent wetland treatment unit.

(4) A ~~treatment facility~~wastewater treatment facility that uses ~~use~~ a constructed wetland as the means of complying with a permit effluent limit must be sized and designed to ensure that the permit limitations ~~may~~ will be met ~~with~~ even when any one wetland cell is out of service. The report must include water balance calculations and the potential effect of evaporation on the predicted effluent concentrations.

(d) Vegetation. A constructed wetland must have a diverse vegetative community of emergent and floating plants to minimize any adverse impact from potential disease, insect pests, or species-specific toxicity. A constructed wetland must ~~may~~ have plants

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from the following categories of emergent plants, floating plants, or both. ~~the following flora:~~

(1) Emergent plants for use in constructed wetlands include: ~~including:~~

(A) *Scirpus spp*. (bulrush);

(B) *Sagittaria spp*. (arrowhead);

(C) *Phragmites spp*. (reeds);

(D) *Juncus spp*. (rushes);

(E) *Eleocharis*~~*Elecharis*~~ *spp*. (spikerush);

(F) *Cyperus spp*. (sedges);

~~(G) Typha spp. (cattails);~~

(G)~~(H)~~ *Caladium spp*. (elephant ear); ~~or~~

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(H) ~~(I)~~ various aquatic grass species (e.g., wild rice); and

(I) other appropriate emergent plant species approved by the executive director.

(2) Floating plants for use in constructed wetlands include: ~~including:~~

(A) *Lemna spp*. (duckweed);

(B) *Hydrocotyle umbellata* ~~spp.~~ (water pennywort);

(C) *Limnobium spongia* ~~spp.~~ (frogbit);

(D) *Nymphaea spp*. (water lily);

(E) *Wolffia spp*. (water meal); or

(F) other appropriate ~~emergent~~ floating plant species approved by the executive director.

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(3) The vegetation used in a constructed wetland must be suitable for the local growing conditions. The use of indigenous plants is recommended~~,~~ if the species have been demonstrated effective in a constructed wetland wastewater environment. The report must identify the plants that will be used in each constructed wetland. ~~in the design.~~

(4) Plans for harvesting aquatic plants from water~~waters~~ in the state must be reviewed with the United States Army Corps of Engineers to determine if regulatory coordination is required.

(5) Gathering seed plants from natural wetlands must minimize any impact on the harvested plant community and the natural wetlands.

(6) The use of any harmful or potentially harmful wetland plant or organism is subject to review by the Texas Parks and Wildlife Department, as required by 31 TAC §§57.111 - 57.118 and §§57.251 - 57.258 (relating to Definitions; General Rules; Exceptions; Health Certification of Harmful or Potentially Harmful Exotic Shellfish; Transportation of Harmful or Potentially Harmful Exotic Species; Exotic Species Transport Invoice; Exotic Species Permit: Application Requirements; Exotic Species Permit Issuance; Definitions; General Provisions; Permit Application; Denial;

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Renewal; Amendment; Reporting and Recordkeeping; and Prohibited Acts, respectively).

(e) Maintenance of a constructed wetland ~~activity~~ must not result in a deterioration of ~~water~~ effluent quality.

(1) ~~All~~ The use of herbicides, insecticides, and fertilizers ~~are~~ ~~prohibited~~ in a constructed wetland is prohibited.

(2) Floating Material Removal.

(A) A constructed wetland must be designed to allow the removal of an algal mat or other floating material prior to the effluent entering ~~the~~ each cell of the constructed wetland. ~~wetlands.~~

(B) A removal mechanism must ~~may~~ be a screen, a submerged adjustable inlet, a baffle, or another ~~suitable~~ method approved by the executive director. The removal mechanism must be justified in the report.

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(C) The removed floating material must be stored and disposed of in a manner that minimizes odor and complies with the requirements of Chapter 330 of this title (relating to Municipal Solid Waste).

(3) ~~A facility~~The operation and maintenance manual for a ~~facility~~wastewater treatment facility that has a constructed wetland must include a detailed description and schedule for maintaining the constructed wetlands. The maintenance plan must include a schedule and procedure for harvesting plants and removing dead plant material.

(f) A constructed wetland ~~wetlands~~ system must have an established plant community and must be ~~matured and~~ functioning properly before wastewater effluent is processed. The report must include a management and oversight program that specifies construction scheduling, plant species selection, planting practices, and start-up procedures.

(g) Liners.

(1) The liner for a constructed wetland system must comply with the requirements of §217.203(c) and (d) of this title (relating to Maximum Liner

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Permeability; Compliance with the Liner Permeability Requirements). ~~(relating to Design Criteria for Natural Treatment Facilities).~~

(2) A ~~minimum 6.0 inch~~ layer of productive topsoil at least 6.0 inches thick must be placed above a liner to encourage root propagation. ~~penetration.~~

(h) Berms.

(1) A berm of a constructed wetland must comply with the requirements of §217.203(e) of this title (relating to Embankment Design and Construction).~~have side slopes no steeper than 3:1.~~

~~(2) The interior side slopes must be lined up to 2.0 feet above the normal water level.~~

~~(3) The interior side slopes above the normal operational water level and the exterior side slopes must be finished with:~~

~~(A) a minimum 6.0 inch productive topsoil layer and vegetated with grass;~~

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~~(B) a comparable natural erosion control system; or~~

~~(C) a synthetic protection system such as paving.~~

(i) Flood Hazard Analysis. A constructed wetland must be protected from flooding according to~~in accordance with~~ the requirements of §217.35 of this title (relating to One Hundred-Year Flood Plain Requirements).

(j) Nitrification. A constructed wetland that provides nitrification is an innovative and nonconforming technology and is subject to the requirements of §217.7(b)(2) of this title (relating to Types of Plans and Specification Approvals).

(k) Allowed Uses. A constructed wetland may be used as a secondary treatment unit, as an advanced secondary treatment unit, or for polishing wastewater effluent. A constructed wetland may not be used~~, but not~~ for primary treatment.

§217.210. Constructed Wetlands--Free Water Surface~~System~~ (FWS) Design.

(a) Areas of emergent vegetation in a free water surface~~system~~ (FWS) wetland must be designed with ~~based on~~ a maximum water depth less than or equal to ~~of not greater than~~ 24 inches ~~in emergent vegetation areas~~ at design flow.

(b) Plants.

(1) Emergent plant spacing must be no more than 66 inches on center.

(2) Floating plants are prohibited in an FWS wetland.

(c) Multiple Cells. An FWS wetland must include multiple cells that can ~~may~~ be operated independently, allowing an individual cell to be removed from service while maintaining system operations.

(d) System Size. An FWS wetland system must be sized to meet permit effluent limits, even when ~~with~~ any single cell is removed from service.

(e) Bottom slope.

(1) An~~A~~ FWS wetland cell must have adequate bottom slope, or other means such as strategically placed deep-water zones, to facilitate drainage for maintenance.

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(2) The ~~A~~ design of an FWS wetland cell must include r~~equire that a bottom slope maintain~~ an appropriate range of wetland water depths to support growth of the selected wetland plant species ~~along the entire cell length~~ under all anticipated operational flow conditions.

(f) Parallel trains. An FWS wetland must have parallel treatment trains to increase operational flexibility.

(g) Wind protection. An FWS wetland cell must either be oriented to avoid prevailing winds perpendicular to the process flow direction, ~~-~~or must use elevated berms or vegetative windbreaks.

(h) Inlets and Outlets.

(1) The inlets and outlets of an FWS wetland cell must ensure ~~assure~~ uniform distribution of influent flow and uniform collection of effluent flow across the entire cell cross section.

(2) An FWS wetland must have multiple inlet and outlet devices designed to ~~must~~ minimize scouring ~~erosion~~ of wetland substrate caused by ~~from~~ locally high velocity effluent flow.

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(3) Each inlet and outlet device in an FWS wetland must be adjustable to allow variations in the operational water level.

(4) Submergence. An FWS wetland inlet must be submerged under normal operational conditions.

(5) Inspection and Cleaning. An FWS wetland must be designed to allow for the ~~A design must allow~~ inspection and cleaning of inlet and outlet devices.

(i) Organic Loading and Treatment Efficiency.

(1) The design of an FWS ~~constructed~~ wetland must ~~process design may~~ be based on the design organic loading ~~design for typical municipal wastewater primary or secondary effluent, whichever is~~of the influent ~~for~~ to the FWS ~~constructed~~ wetland.

(2) ~~A design must be based on the o~~Organic removal ~~treatment~~ efficiency for FWS wetlands must be calculated from ~~on~~ the ~~areal~~ area-based loading rate equation found in the following figure, unless the report justifies an alternate method to determine the organic removal ~~treatment~~ efficiency by identifying a method, the sources of the method, and all supporting calculations.

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Figure: 30 TAC §217.210(i)(2)

Equation H.3.

$$C_0 = C^* + (C_i - C^*) \exp^{-\frac{Ka}{0.0365Q}}$$

Where:
C_i = influent five-day biochemical oxygen demand (BOD_5) concentration, mg/l
C_o = target effluent BOD_5 concentration, mg/l
C* = wetland background limit, mg/l
(for TSS, C* = 5.1 = 0.16C_i)
(for BOD_5, C* = 3.5+ 0.053 C_i)
K = first-order areal rate constant:
(34 meters/year (m/yr)) @ 20°~~B~~ C for BOD_5)
a = is required wetland area, ~~hectacre~~hectare (ha) (1,000 m/yr @ 20^B C for total suspended solids (TSS)) (active treatment area, not including dike, buffers, etc.)
Q = design flow in cubic meters per day (m^3/d)

(j) Vector Control.

(1) The design of an FWS wetland must include mosquito control by:

(A) using mosquito fish (*Gambusia spp.*) or~~and~~ other natural predators,

(B) maintaining aerobic conditions, or

(C) using other biological controls.

(2) A design must minimize the potential for damage to wetlands caused by mammals such as nutria and muskrats.

§217.211. Constructed Wetlands--Subsurface Flow System (SFS) General Design.

(a) A wetted subsurface media must allow adequate root penetration. The type of subsurface media must ~~and~~ be identified in the report.

(b) The operational water depth of a subsurface flow system (SFS) wetland must not exceed the lesser of:

(1) 18 inches at design flow; or

(2) the maximum normal root depth of the emergent plant species used in the~~an~~ SFS wetland.

(c) Seasonal draw down of the water level must be performed to encourage deeper root penetration into the wetted media.

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(d) Plant spacing must be sufficient to allow maturity of a wetlands flora ecosystem, but must not exceed 36 inches on center.

(e) Configuration. An SFS wetland must include the following minimum configuration standards:

(1) Multiple cells. An SFS wetland must include multiple cells that can be operated independently, allowing individual cells to be removed from service while maintaining system operations.

(2) Cell Size. ~~The size of a~~SFS wetland ~~-~~cells~~cell~~ must be designed to meet permit effluent limitations, ~~with~~ even when any single cell is removed from service.

(3) Hydraulic profile.

(A) An SFS wetland must maintain between ~~minimum~~ 6.0 inches and 9.0 inches of dry media cover at design flow. ~~,~~ The wetland must have at least 2.0 inches of upstream media cover during peak flow conditions, and not more than 12.0 inches of upstream media cover during diurnal low flow conditions.

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(B) An SFS wetland hydraulic profile must be based on the following figure, unless ~~the report justifies~~ an alternate design method~~,~~ is justified in the report. The report must include ~~includes~~ the method, the source of the method~~,~~ and all supporting calculations and documentation.

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Figure 1: 30 TAC §217.211(e)(3)(B)

Equation H.4. Darcy's Law.

$$Q = K_s \times A \times S$$

$$RAF = \frac{(PPD\ BOD_5) \times (O_2/lb\ BOD_5)}{WOTE \times 0.23 \times 0.075 \times 1440}$$

Where:
Q = Design flow (gallons/day)
Ks = Media hydraulic conductivity (gallons/square foot/day)
(see Figure 2: 30 TAC §217.211(e)(3)(B), Table H.1)
S = Hydraulic gradient (foot/foot)
A = Cross sectional area perpendicular to the flow (square feet)

Figure 2: 30 TAC §217.211(e)(3)(B)

Table H.1 - Typical Media Characteristics

~~Table H.1 - Typical Media Characteristics~~			
Media	**Effective Size** *(inches)*	**Porosity** *(%)*	**Hydraulic Conductivity** *(gallons/square foot/day)*
Fine Gravel	5/8	38	185,000
Medium Gravel	1.25	40	250,000
Coarse Rock	5.0	45	2,500,000

(4) Maximum depth.

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(A) The maximum wetted media depth of an SFS wetland is the lesser of:

(i) 24 inches at design flow; or

(ii) the maximum normal root depth for a planned primary population of emergent plant species.

~~(B) An SFS wetland must have a dry media cover depth of at least 6.0 inches and not more than 9.0 inches above the design flow hydraulic gradient.~~

(5) Minimum slope. An SFS wetland cell must have an adequate bottom slope to facilitate drainage for maintenance and to maintain media water depth over the entire cell length under all ~~anticipated~~ operational flow conditions.

(6) Parallel trains. An SFS wetland must have parallel treatment trains to increase operational flexibility.

(f) Flow Distribution. An ~~A constructed~~ SFS wetland must be designed with ~~have~~ effective flow distribution and collection ~~to efficiently treat wastewater~~by meeting the following standards for inlets and outlets, submergence, maintenance, and staged

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influent feed. ~~An SFS wetland must include the following minimum flow distribution standards:~~

(1) ~~Flow distribution~~Inlets and Outlets.

(A) The inlet and outlet system of an SFS wetland cell must be designed to ensure ~~assure~~ uniform distribution of influent flow and uniform collection of effluent flow across an entire cell.

(B) The inlet and outlet devices of an SFS wetland cell must not cause locally high velocities ~~to avoid the~~that could result in movement of wetland media.

(C) Each inlet and outlet system must be adjustable to allow variation in operational water level and flooding of a cell for weed control.

(2) Submergence. Each inlet and outlet of a~~n~~ SFS wetland must be below the media surface.

(3) Maintenance. The design of ~~an~~ inlet and outlet devices~~device~~ must allow inspection, ~~and~~ cleaning, and maintenance.

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(4) Staged influent feed. If an average ~~a high~~ influent BOD_5 concentration greater than 200 milligrams per liter ~~load~~ is anticipated, an SFS wetland must be designed to ~~the design must~~ allow for staged influent ~~fee to~~feed to improve process control.

(g) ~~SFS~~ Organic Loading and Treatment Efficiency.

(1) A constructed wetland process must at least ~~may~~ be based on the design organic loading of the influent to the constructed wetland. ~~organic loading design for typical municipal wastewater primary or secondary effluent.~~

(2) The ~~A~~ design of an SFS wetland must be based on the organic removal treatment efficiency for an SFS wetland on the ~~areal loading~~ equation found in the following figure, unless ~~the report justifies~~ an alternate method to determine the organic removal treatment efficiency is justified in the report. The report must include the method, the source of the method, and all supporting calculations.

Figure: 30 TAC §217.211(g)(2)

Equation H.5.

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$$C_0 = C^* + (C_i - C^*)\exp^{-\frac{Ka}{0.0365Q}}$$

Where:
C_i = influent five-day biochemical oxygen demand (BOD_5) concentration, mg/l
C_o = target effluent BOD_5 concentration, mg/l
C^* = wetland background limit, mg/l
(for TSS, $C^* = 5.1 = 0.16C_i$)
(for BOD_5, $C^* = 3.5 + 0.053C_i$)
K = first-order areal rate constant: (180 m/yr @ 20^B C for BOD_5)
a = is required wetland area, ha (3,000 m/yr @ 20^B C for TSS)
(active treatment area, not including dike, buffers, etc.)
Q = design flow in m^3/d

(h) Temperature. An SFS wetland must be designed to treat the wastewater treatment facility's wastewater at all water temperatures. ~~A design must be adequate to treat wastewater in the range of temperatures of the wastewater in the facility.~~

(i) Vector Control. Vegetation maintenance, including removal of excessive plant litter and detritus, is required to ~~prevent~~ limit mosquito ~~breeding opportunities~~production.

(j) Media Design. SFS wetland media must meet the following minimum requirements.~~:~~

(1) The media must be hard rock, slag, or other clean, comparable media material.

(2) The media must contain less than 0.1% by weight of clay, sand, and other fine materials.

(3) The media materials must have a Mohs hardness of at least 5.0.

(4) The media must be resistant to acidic conditions.

(5) Synthetic media is a nonconforming or innovative technology and is subject to the requirements of §217.7(b)(2) of this title (relating to Type of Plans and Specifications Approvals).

(6) Media gradation and uniformity must be used to determine the SFS wetland's hydraulic conductivity.

(7) The media must be placed in an SFS wetland by light-weight equipment to avoid introduction of clay or other undesirable materials, to avoid compaction, clogging of the media, and damage to the liner.~~to avoid creating ruts in the subgrade.~~

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(8) If an SFS wetland has gravel media larger than 1.5 inches~~inch~~ in diameter, the design must specify a top layer of smaller~~small~~ gravel to encourage healthy plant rooting. The layer of smaller gravel ~~gravel layer~~ must be above the normally saturated media zone. The design must specify a transitional (medium grade) layer between small gravel and coarse gravel to minimize small gravel migration into lower void spaces.

§217.212. Overland Flow Process.

(a) An overland flow process is a nonconforming technology and is subject to the requirements of §217.7(b)(2) of this title (relating to Types of Plans and Specifications Approvals).

(b) The distribution system for an overland flow process must ensure uniform sheet flow of the wastewater onto and across the overland flow terraces.

§217.213. Integrated Facultative Lagoons.

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(a) Nonconforming technology. An integrated facultative lagoon is a nonconforming technology and is subject to ~~review in accordance with~~the requirements of §217.7(b)(2) of this title (relating to Types of Plans and Specifications Approvals).

(b) Integrated Facultative Lagoon Design.

(1) The length-to-width ratio of an integrated facultative lagoon must be 3.0 to 1.0. ~~, unless the report justifies other dimensions more suitable to the site.~~

(2) A pit must not be less than 0.25 ~~0.40~~ acre in total surface area.

(3) The outer lagoon area must not be less than 10 times the surface area of the pit.

(4) A pit must have adequate volume to contain:

(A) 0.1 cubic foot per capita per year of sludge storage for a minimum of 20 ~~-~~years~~-~~; and

(B) two days of design flow above the sludge storage area. ~~a two-day hydraulic retention time above the sludge storage area.~~

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(5) The ~~maximum~~ up-flow velocity in the pit ~~is~~ must be less than 2.0 feet per day at design flow.

(6) If an integrated facultative lagoon has more than one pit, ~~each pit must receive an amount of wastewater~~ influent flow must be split proportional to the ~~equivalent to the size of a~~ pit volumes.

(7) An inlet must be located in the pit portion of a lagoon.

(8) An outlet must be at a depth of ~~able to maintain the water level within~~ 1.0 foot from the lagoon surface. ~~of a constant level.~~

(9) ~~A design must locate an integrated facultative lagoon in a central location with regard to the surrounding secondary lagoons~~An integrated facultative lagoon must ~~and~~ meet the buffer zone requirements specified in §309.13 of this title (relating to Unsuitable Site Characteristics).

(10) Depth.

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(A) A~~The depth of an inlet~~ pit must ~~not~~ be ~~less than~~at least 15 feet deep ~~from~~during normal operating conditions, measured from ~~-~~the water surface ~~elevation during normal operating conditions~~ to the ~~influent~~influent inlet point. ~~within the pit.~~

(B) An integrated facultative lagoon must have berms ~~or other deflection devices~~ around the pit.

(C) The berm height must be at least ~~the lesser of~~ 5.0 feet or one-half the depth of the outer lagoon, whichever is greater.

(D) The ~~minimum~~ distance from the water surface elevation during normal operating conditions to the top of the berm around a pit ~~is~~ must be at least 5.0 feet.

(11) Organic Loading. The ~~maximum~~ organic loading into a pit ~~is~~ must not exceed 300 pounds of ~~ultimate~~ five-day biochemical oxygen demand (BOD_5~~-~~) per acre of total lagoon area per day.

(12) Odor Control.

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(A) An inlet to a pit must be 3.0 feet above the bottom of the ~~a~~ lagoon and the influent flow must be directed downward.

(B) An integrated facultative lagoon must be capable of recirculating at least 50% of the design flow from an outlet of the downstream lagoon.

(C)~~(B) A design must allow~~ Oxygenated water from a downstream stabilization lagoon must be recirculated ~~from a downstream lagoon~~ to the surface of the integrated facultative lagoon. ~~Water from a lagoon following an integrated facultative lagoon must be recirculated to the surface of the integrated facultative lagoon.~~

~~(C) An integrated facultative lagoon must be capable of recirculating at least 50% of the design flow from an outlet of the downstream lagoon.~~

(D) An integrated facultative lagoon must be designed to prevent siphoning of ~~not siphon~~ lagoon contents through a submerged inlet.

(13) Removal Efficiency.

(A) The design of an integrated facultative lagoon must not be based on ~~A design may be based on the~~ more than 60% organic removal efficiency in the

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pit. ~~of the pit of an integrated facultative lagoon no more than 60% of the influent BOD5~~

~~.~~

(B) The design of an integrated facultative lagoon must not ~~A design may~~ be based on a subsequent organic removal efficiency of more than ~~BOD5~~ 50% in the outer portion of the integrated facultative lagoon. ~~no more than 50% of the remaining BOD5 , which is 20% of the original BOD5 .~~

(C) The design of an integrated facultative lagoon must not be based on more than 80% organic removal efficiency over the entire integrated facultative lagoon.

(14) Detention Time. An integrated facultative lagoon must provide a minimum of 21 days hydraulic retention time at design flow.

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SUBCHAPTER J: SLUDGE PROCESSING~~TREATMENT UNITS~~

§§217.241 - 217.252

§217.241. General Requirements.

(a) For purposes of this section, ~~the~~ sludge processing ~~process~~ includes thickening, stabilization, and dewatering.

(b) A design must base the selection and operation of the sludge processing units on the desired final sludge product.

(c) A ~~facility~~wastewater treatment facility that disposes of sludge under Chapter 312 of this title (relating to Sludge Use, Disposal, and Transportation) must stabilize the sludge according to the requirements of that chapter.

(d) A ~~facility~~wastewater treatment facility that disposes of sludge under Chapter 330 of this title (relating to Municipal Solid Waste) must comply with the requirements of that chapter.

§217.242. Control of Sludge and Supernatant Volumes.

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(a) Supernatant, filtrate, or centrate resulting from sludge processing must be returned to the headworks, the influent lift station, -or ~~at~~to a point preceding an aeration system or secondary treatment unit.

(b) A sludge processing unit must limit digester supernatant liquor volume to the greatest extent practicable.~~practical.~~

(c) The design of a sludge processing unit must prevent the returned supernatant from causing interference with wastewater treatment processes in all other ~~minimize the impact of the returned supernatant on the~~ treatment units.

§217.243. Sludge Pipes.

(a) Each pipe associated with a sludge processing unit must be designed with a slope that ensures ~~have sufficient gradient to ensure~~ the flow of sludge.

(b) A pipe under a stationary structure must allow a blockage to be easily eliminated by rodding or a sewer-cleaning device.

(c) A gravity pipe must have uniform grade and alignment.

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(d) The slope of a gravity discharge pipe must not be less than 3.0%.

(e) The minimum diameter for a pipe associated with sludge processing is shown in the following figure:

Figure: 30 TAC §217.243(e)

Table J.1. Sludge Processing Minimum Pipe Diameter

~~Table J.1. Sludge Processing Minimum Pipe Diameter~~	
Pipe	**Diameter**
Sludge drainpipe	4.0 inches
Pipe in a sludge digester	4.0 inches
Suction pump pipe	4.0 inches
Discharge pipe	4.0 inches
Gravity withdrawal pipes associated with ~~an anaerobic~~an anaerobic digester or gravity thickener	6.0 inches

(f) The available head on a discharge using a gravity withdrawal pipe must be at least 4.0 feet.

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(g) A gravity withdrawal pipe ~~used for withdrawal~~ from a ~~the primary sludge~~ clarifier ~~pump~~ must allow for the removal of ~~digested~~ sludge.

(h) Each sludge pipe must include a means to observe the quality of the supernatant from each of the withdrawal outlets.

(i) Each individual sludge processing ~~and treatment~~ unit must have a dedicated means of dewatering.

(j) Pipes ~~Pipe~~ located inside a digestion tank must be designed for use in corrosive environments and must be sufficiently supported to prevent damage to the pipe or adjacent equipment.

(k) A sludge pipe must not contain any bends that form an acute angle with the pipe.

§217.244. Sludge Pumps.

(a) A sludge transfer pump size must be based on the quantity and character of the ~~anticipated~~ solids load.

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(b) A mechanical pumping system must provide the ~~minimum~~ required firm pumping capacity with the largest sludge pumping unit out of service.

~~(c) An air lift pump is acceptable for use as a sludge pump. Airlift pumps are not subject to redundancy requirement outlined in subsection (b) of this section.~~

(c)~~(d)~~ A centrifugal sludge pump must have a positive suction head, unless the pump includes a priming device.

(d)~~(e)~~ A positive displacement pump or other type of pump must have ~~with~~ demonstrated solids handling capability ~~must be used~~ for handling ~~raw~~ sludge.

~~(f) centrifugal pumps must be designed with sufficient net positive suction head to operate at the minimum anticipated water level occurring on the suction side~~.

(e)~~(g)~~ A positive suction head of 24 inches or more is required for all sludge pumps.

(f) An air lift pump may be used as a sludge pump. Airlift pumps are not subject to the redundancy requirements for mechanical pumps.

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§217.245. Exclusion of Grit, ~~and~~ Grease, and Debris from Sludge Processing ~~Treatment~~ Units.

(a) A ~~facility~~wastewater treatment facility must be designed to~~design must~~ minimize the amount of grit, debris, oil, and grease entering a sludge processing ~~treatment~~ unit.

(b) A sludge processing~~treatment~~ unit must be designed for the final use or final disposal of the various solids generated during the treatment of domestic sewage.

(c) If sludge is to be land applied, a sludge processing~~treatment~~ unit must remove debris~~screeni~~,~~ngs,~~ grit, and grease, which must be disposed of separately from the sludge.

§217.246. Ventilation and Odor Control.

(a) A design must include sufficient ventilation to eliminate an accumulation of fumes or gases at a level that could adversely impact human health, safety, welfare, or the environment.~~might be a health hazard or a threaten air quality~~.

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(b) An enclosed area that is accessible to individuals ~~may be accessed by staff~~ must have automatic mechanical ventilation. Automatic mechanical ventilation consists of:

(1) a continuous ventilation system that provides ~~must provide~~ at least one ~~six~~ complete air exchange every 10 minutes; or~~exchanges per hour.~~

(2) an intermittent ventilation system that provides ~~must provide~~ at least one~~30~~ complete air exchange every two minutes. ~~exchanges per hour.~~

(c) A sludge processing unit must be designed to prevent nuisance odors.

§217.247. Chemical Pretreatment of Sludge.

(a) All chemicals~~A chemical~~ used to treat sludge must be compatible with the operation of the sludge processing ~~treatment~~ unit and must not adversely affect any other treatment unit or the ~~have no detrimental effect upon~~ receiving waters.

(b) The report must justify appropriate chemicals and feed ranges. ~~by including~~ A pilot plant study or data from a treatment unit must be used. The ~~with characteristics such as~~ organic, ~~levels,~~ metal, ~~concentrations,~~ and hydraulic loadings at the pilot plant

must be ~~hydraulics that are~~ within 25% of the ~~proposed~~ design organic, metal, and hydraulic loadings.

(c) Each chemical must be handled, stored, and disposed of according to its material safety data sheet. ~~safely.~~

(d) A liquid chemical storage tank must include:

(1) a liquid level indicator; and

(2) an emergency overflow receiving basin or drain capable of retaining any spill.

(e) Powdered activated carbon must be stored in an isolated fireproof area.

(f) A storage or handling area where potentially volatile chemicals are present ~~or conditions may occur~~ must have electrical outlets, lights, and motors that meet the National Electric Code~~,~~ in effect at the time the storage or handling area was constructed, including explosion prevention requirements.

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(g) The design of systems for transport, transfer, storage, and use of any volatile chemical must prevent volatile chemicals from discharging ~~discharge~~ to the atmosphere.

(h) A ~~facility~~wastewater treatment facility must have at least a 30-day supply of each chemical in dry storage conditions, unless the report justifies a reduced amount.

(i) A solution storage tank or direct-feed day tank must have sufficient capacity for operation at the design flow of the ~~facility~~wastewater treatment facility.

(j) The procedures for measuring the quantity of each chemical used to prepare each feed solution must be included in the ~~facility~~wastewater treatment facility's operation and maintenance manual.

(k) The design of a chemical storage tank, pipe, or other equipment must be compatible with the chemical it is designed to handle.

(l) Chemicals must only be combined in a feed solution. Intermixing of chemicals prior to preparing a feed solution is prohibited.

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(m) Concentrated liquid acid must not be stored in an open vessel, and ~~, but~~ must be pumped in undiluted form from the original container to a point of treatment, an enclosed acid-resistant~~a covered~~ day tank, or an enclosed acid resistant ~~a~~ storage tank.

(n) Concentrated liquid acid must be kept in a closed, acid-resistant shipping container or storage unit.

(o) The transfer of a toxic material must be controlled by an ~~a positive~~ actuating device.

(p) A ~~facility~~wastewater treatment facility must be designed with one or more of the following control methods to ensure that dust will be minimized during the ~~a~~ transfer of a dry chemical: ~~will minimize dust:~~

(1) a~~Vacuum pneumatic equipment of a~~ closed conveyor system with vacuum pneumatic equipment;

(2) a facility for emptying shipping containers in a special enclosure; or

(3) an exhaust fan and dust filter that uses~~put~~ a hopper or bin under negative pressure ~~sufficient~~ to eliminate chemical particles in the air.

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(q) Disposing of a chemical or an empty chemical container must be done in a manner that minimizes the potential for harmful exposure and in compliance with Chapter 335 of this title (relating to Industrial Solid Waste and Municipal Hazardous Waste).

(r) A chemical delivery system ~~Chemical feed equipment~~ must meet the following requirements:

(1) Structures housing equipment.

(A) A floor surface must be smooth, slip resistant, impervious, and must have a minimum slope of 1/8 inch per foot.

(B) An open basin, tank, or conduit must be protected from a chemical spill or accidental drainage.

(C) An area that houses a chemical delivery system ~~chemical feed equipment~~ must provide access for servicing, repair, and observation of operations.

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(2) Redundancy. A chemical delivery ~~feed~~ system must have at least two feeders and must be able to supply the amount of chemicals needed for process reliability throughout the feed range. ~~range of feed.~~ Chemical delivery ~~Feed~~ equipment must be able to maintain operation at design flow with the largest operational unit out of service.

(3) Design and Capacity.

(A) A chemical delivery ~~feed~~ system must be able to deliver a proportional amount of chemical feed based on the rate of flow.

(B) A chemical delivery ~~feed~~ system must not use positive displacement type solution feed pumps to feed chemical slurries, unless the report justifies such use.

(C) If using potable water, the potable water supply must be protected by at least the equivalent of two backflow preventers, including at least one air gap between a supply pipe and a solution tank.

(D) A chemical delivery ~~feed~~ system component must be resistant to the chemical it is designed to apply.

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(E) A dry chemical delivery ~~feed~~ system must:

(i) measure the chemical volumetrically or gravimetrically;

(ii) provide effective mixing and solution of the chemical in a solution pot;

(iii) provide gravity feed from a solution pot;

(iv) completely enclose chemicals; and

(v) prevent emission of dust to the operation room.

(4) Spill Containment. The chemical delivery ~~feed~~ equipment must have protective curbing to contain a chemical spill.

(5) Control Systems.

(A) All chemical delivery ~~feed~~ systems must have an automatic control system that is capable of manual control.

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(B) A chemical delivery ~~feed~~ system must have manual starting equipment.

(C) A chemical delivery ~~feed~~ system may be designed with an automatic chemical dose or residual analyzer.

(D) If an automatic chemical dosing or residual analyzer is used, the design must require both recording charts and an alarm for any critical value.

(6) Weighing Scales. A volumetric dry chemical feeder or a non-volumetrically calibrated carboy must have weighing scales that measure in increments of no greater than 0.5% of the load.

(7) Chemical Delivery ~~Feed~~ System Protection. A chemical delivery ~~feed~~ system must have freeze protection and must be accessible for cleaning.

(8) Water Supply.

(A) A water supply for chemical mixing may be potable water or reclaimed water.

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(B) A chemical delivery ~~feed~~ system must protect its water supply from contamination. If using potable water, the potable water supply must be protected by at least the equivalent of two backflow preventers, including at least one air gap between a supply pipe and a solution tank.

(C) A water supply must have sufficient pressure to ensure dependable operations.

(D) A water supply must include a means for measuring solution concentrations.

(E) A water supply design must include sufficient duplicate equipment to ensure process reliability.

(F) A water supply design may include a booster pump to maintain water pressure.

(9) Solution Tanks.

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(A) A solution tank must be able to maintain uniform strength of solution consistent with the nature of the chemical solution and must provide continuous agitation.

(B) A chemical delivery ~~feed~~ system must have at least two solution tanks.

(C) The solution tank(s) must provide storage for at least one full day of operation at design flow.

(D) A solution tank must have a drain and a solution level indicator.

(E) An intake point for potable water must have an air gap.

(F) A chemical solution tank must be covered and have an access opening that is curbed and fitted with a tight cover.

(G) Each subsurface solution tank must:

(i) be impermeable;

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(ii) be protected against buoyancy;

(iii) include a means to drain groundwater or other accumulated water away from the tank;

(iv) include leak detection; and

(v) allow for containment and remediation of any chemical spill.

(H) An emergency overflow pipe must:

(i) be turned downward;

(ii) have an unobstructed discharge;

(iii) be clearly visible;

(iv) drain to a containment area; and

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(v) must not contaminate the wastewater or receiving stream.

(10) Chemical Application.

(A) A chemical application system must be efficient and operate safely.

(B) The chemicals application system must prevent backflow or back-siphoning between multiple points of feed through common manifolds.

(C) The application of a pH-affecting chemical to the wastewater must be done before the addition of a coagulant.

§217.248. Sludge Thickening.

(a) If a sludge thickening system ~~thickener(s)~~ is used, the following criteria are required:

(1) Capacity. The maximum monthly sludge production rate must be used as the basis for sludge thickening system sizing and design.

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(2) Flexibility.

(A) A sludge thickening system must have a bypass to the digester.

(B) A ~~facility~~wastewater treatment facility with a design flow greater than 1.0 million gallons per day ~~(mgd)~~ must have:

(i) at least two ~~dual~~ sludge thickening units;

(ii) an alternate means of sludge thickening; or

(iii) an alternate sludge disposal method.

(b) Specific Requirements for a Mechanical Gravity Thickener.

(1) Equipment Features.

(A) A mechanical gravity thickener must have:

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(i) a low-speed stirring mechanism for continuous mixing and flocculation; ~~within the zone of sludge concentration;~~

(ii) sufficient sludge storage, ~~if sufficient storage is unavailable~~or sufficient additional storage in other external ~~tankage~~tanks; and

(iii) a means of controlling the rate of sludge withdrawal.

(B) A mechanical gravity thickener may use a chemical addition or dilution water feed system.

(C) A scraper mechanical train must be capable of withstanding any expected torque load. The ~~normal~~ working torque load must not exceed 10% of the manufacturer's recommended torque load.

(2) Design Basis.

(A) The design of a mechanical thickener ~~design~~ must be justified in the report.

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(B) The executive director may require data from a pilot study or similar mechanical gravity thickener ~~sludge thickening unit~~ operating under similar conditions.

(C) The mechanical gravity thickener ~~overflow~~ surface loading rate must be at least 400 gallons per day per square foot, ~~(gpd/sf)~~ but not~~no~~ more than 800 gallons per day per square foot.~~gpd/sf.~~

(D) The minimum side water depth for a mechanical gravity thickener is 10 feet.

(E) A circular mechanical gravity thickener must have a minimum bottom slope of 1.5 inches per foot.

(F) The peripheral velocity of a scraper must be at least 15 feet per minute but no more than 20 feet per minute.

(G) A mechanical gravity thickener ~~design~~ must be designed to prevent ~~minimize the potential for~~ short-circuiting.

(c) Specific Requirements for a Dissolved Air Flotation (DAF) Basin. ~~Thickener.~~

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(1) Equipment Features.

(A) A DAF basin must have a bottom scraper that functions~~function~~ independently of the surface skimmer.

(B) A recycle pressurization system for a DAF basin must use effluent ~~or secondary effluent~~ instead of potable water.

(C) A DAF basin must have a polymer feed system that meets ~~. A feed system must meet~~ the requirements of §217.247(r) of this title (relating to Chemical Pretreatment of Sludge).

(D) A DAF basin must be located in a covered building with positive air ventilation.

(2) Design Basis.

(A) The design of a DAF basin ~~design~~ must be justified in the report.

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(B) The executive director may require data from a pilot study or similar DAF basin operating under similar conditions.

(C) The hydraulic loading rate must not exceed 2.0 gallons per ~~minute (gpm) per~~minute per square foot ~~(sf)~~.

(D) The solids loading rate must be at least 1.0 pound per hour per square foot, but not more than 4.0 pounds per hour per square foot. ~~sf.~~

(E) The air to solids weight ratio must be at least 0.02, but not more than 0.04.

(F) A retention tank system must have a minimum pressure of 40 pounds per square inch, gauge.

(G) A skimmer must have multiple or variable speeds that allow an operational range of at least 1.0 foot per minute ~~(fpm)~~, but not more than 25.0 ~~fpm~~feet per minute.

(d) Specific Requirements for a Centrifugal Thickener.

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(1) The design of a ~~A~~ centrifugal thickener ~~design~~ must be justified in the report.

(2) The executive director may require data from a pilot study or data from a similar centrifugal thickener operating under similar conditions.

(3) A centrifugal thickener must be preceded by pretreatment to prevent plugging of a nozzle or excessive wear in the bowl.

(4) The centrate is subject to the requirements of §217.242 of this title (relating to Control of Sludge and Supernatant Volumes).

(e) Specific Requirements for a Gravity Belt Thickener.~~Thickeners.~~

(1) Equipment Features.

(A) A gravity belt thickener ~~thickeners~~ must include a wash water system ~~(60 pounds per square inch minimum)~~ capable of providing 60 gallons per minute of flow ~~gpm~~ per meter of belt width ~~belt~~ at a pressure of at least 60 pounds per square inch. Booster pumps may be used. ~~employed to achieve design conditions.~~

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(B) A gravity belt thickener ~~thickeners~~ must include a polymer feed system that meets the requirements of §217.247(r) of this title (relating to Chemical Pretreatment of Sludge).

(C) A filtrate drainage system must be sized to remove the full hydraulic capacity of a gravity belt thickener without accumulation or ponding of filtrate.

(2) Design Basis. Unless otherwise justified in the report, gravity belt thickener sizing must be based upon: ~~the following criteria, unless otherwise justified in the report~~:

(A) a maximum solids loading of 1,250 pounds per meter of belt width; or

(B) a maximum hydraulic loading of 250 gallons per minute ~~gpm~~ per meter of belt width.

(3) Gravity belt thickener filtrate is subject to the requirements of ~~requirement in~~ §217.242 of this title (relating to Control of Sludge and Supernatant Volumes).

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§217.249. Sludge Stabilization.

(a) Design Requirements. The design requirements for the stabilization processes in this section are based on only one ~~the assumption that the process is the sole~~ stabilization process being used ~~employed~~ at the ~~facility~~wastewater treatment facility.

(b) Variance. An owner must request a variance in accordance with §217.4 of this title (relating to Variances), if a design includes ~~employs~~ a series of two or more stabilization processes. ~~or methods.~~ Any deviations from the requirements of this section must be documented in the variance request.

(c) Anaerobic Digestion.

(1) A ~~facility~~wastewater treatment facility with a design flow exceeding 0.4 million gallons per day must have at least two anaerobic digesters.

(2) Anaerobic digesters may be operated in series or in parallel. Each anaerobic digester may be used ~~as a first stage or primary reactor~~ for treating sludge from both primary and secondary ~~sludge flows~~clarifiers.

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(3) Each anaerobic digester must have a means for transferring a portion of its contents to another anaerobic digester.

(4) A ~~facility~~wastewater treatment facility that has been granted a variance to operate without multiple anaerobic digesters must have an emergency storage basin for storing sludge during times when ~~so~~ the anaerobic digester needs to ~~may~~ be taken out of service.

(d) Depth. An anaerobic digester must provide a minimum of 6.0 feet of storage depth for supernatant liquor.

(e) Maintenance Provisions. A digester design must allow access to each unit for maintenance.

(f) Digester Configuration.

(1) The bottom of a digester must slope towards a drainpipe.

(2) A flat-bottomed digestion chamber is prohibited.

(g) Access Manholes.

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(1) The top of a digester must have at least two access manholes and a gas dome.

(2) One manhole must have a sufficient diameter to permit the use of mechanical equipment to remove grit and sand.

(3) A digester system must have a separate sidewall manhole at ground level.

(h) Safety.

(1) The ~~facility~~wastewater treatment facility operation and maintenance manual must require the use of non-sparking tools, rubber soled shoes, a safety harness, and gas detectors for flammable and toxic gases when working in a digester.

(2) At least one self-contained breathing apparatus must be maintained in operational condition and kept on site.

(i) Sludge Inlets and Outlets. To facilitate effective mixing of the digester contents a digester must have:

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(1) multiple sludge inlets located to minimize short-circuiting and at least one inlet located in the center of ~~a~~ the digester above the liquid level at design flow;

(2) at least three recirculation sections; and

(3) at least three outlets.

(j) Digester Capacity.

(1) The digester capacity must be calculated using the expected volume and character of the sludge. The report must include the calculations used to justify the design.

(2) The total digester volume must be based upon:

(A) the volume of sludge added;

(B) the percent solids and character of the sludge;

(C) the temperature to be maintained in the digester;

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(D) the degree or extent of mixing to be obtained; and

(E) the size of the installation with appropriate allowance for sludge and supernatant storage.

(3) A digester must be able to maintain a minimum ~~daily average~~ sludge digestion temperature of 35 degrees Celsius, plus or minus 4 degrees. ~~(95 degrees Fahrenheit) and maintain the temperature within a 4 degrees Celsius (+/-) range.~~

(4) Sludge that will be disposed of in a landfill must undergo at least 15 days of ~~The minimum detention time for sludge undergoing~~ digestion for stabilization ~~is 15 days~~ in the primary digester. Sludge that will be land-applied must undergo at least 60 days of digestion for stabilization, or ~~for sludge to be landfilled, or~~ the period required to achieve the necessary level of pathogen control and vector attraction reduction as required by Chapter 312, Subchapter D of this title (relating to Pathogen and Vector Attraction Reduction), whichever is less. ~~, if sludge is to be land applied.~~

~~(5) An unheated digester must provide a minimum detention time of 60 days and maintain a temperature of at least 20 degrees Celsius (68 degrees Fahrenheit),~~

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~~or the period required to achieve the necessary level of pathogen control and vector attraction reduction as required by Chapter 312, Subchapter D of this title.~~

(6) A Completely Mixed System.

(A) A digester must have an average feed loading rate of less than 200 pounds ~~(lbs)~~ of volatile solids per 1,000 cubic feet ~~(cf)~~ of volume per day in the active digestion volume.

(B) Complete mixing in 30 minutes or less is required for:

(i) a confined mixing system, if gas or sludge flow is directed through a vertical channel;

(ii) a mechanical stirring or pumping system; and

(iii) an unconfined continuously discharging gas mixing system.

(C) A digester tank over 60 feet in diameter must have multiple mixing devices.

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(D) The minimum gas flow supplied for complete mixing must be 15 cubic feet per minute ~~(cfm)~~ per 1,000 ~~cf~~ cubic feet of digestion volume.

(E) A complete mixing system must have a flow-measuring device and a throttling valve.

(F) The minimum power supply for a ~~mechanical stirring or pumping complete~~ mixing system is 0.5 horsepower per 1,000 ~~cf~~ cubic feet of digestion volume.

(7) Moderately Mixed Systems.

(A) A digestion system where mixing is accomplished only by circulating sludge through an external heat exchanger must be loaded at less than 40 ~~lbs~~ pounds of volatile solids per 1,000 ~~cf~~ cubic feet of volume per day in the active digestion volume. A design must be based on the volatile solids loading in accordance with the degree of mixing.

(B) The report must include a justification for the loading rates, if mixing is accomplished by another method.

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(k) Gas Collection, Pipes, Storage, and Appurtenances.

(1) General Requirements. Each portion of a gas system must maintain positive gas pressure under all normal operating conditions, including sludge withdrawal.

(2) Safety Equipment.

(A) A gas system must include a pressure valve, vacuum relief valve, a flame trap, and an automatic safety shut-off valve.

(B) ~~An i~~Installation of water seal equipment on a gas pipe is prohibited.

(3) Gas Pipes and Condensate.

(A) The gas pipe system must be designed for the volume of gas expected.

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(B) A gas pipe must be pressure tested for leakage at 1.5 times the design pressure before a digester is placed into service.

(C) A gas pipe must slope at least 1/8 inch per foot to drain condensate.

(D) The main gas pipe from a digester must have a sediment trap and a drip trap.

(E) ~~A f~~Float controlled condensate traps ~~is~~ are prohibited.

(F) A condensation trap must be accessible for daily servicing and draining.

(G) A drip trap must be located at each low point in the pipes.

(H) A gas pipe to each gas outlet must have a flame check or a flame trap.

(I) A burner pilot must use natural or bottled gas.

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(J) Each main gas pipe must have a flame trap with a fusible shut-off.

(K) A gas pipe to a waste gas burner must have a pressure valve and a vacuum relief valve.

(4) Electrical Fixtures and Equipment. The electrical equipment near sludge digester pipes containing gas must be designed to prevent potentially explosive conditions.

(l) Waste gas.

(1) A waste gas burner must be accessible and must be located at least 50 feet away from any structure, if placed at ground level.

(2) A waste gas burner may be located on the roof of the control building.

(3) A waste gas burner must not be located on top of a digester.

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(4) A discharge of less than 100 cubic feet per hour of digester gas through a return bend screened vent with a flame trap terminating at least 10 feet above a walking surface is allowed.

(m) Ventilation.

(1) An underground enclosure connected to an anaerobic digester~~s~~ tank, gas pipe, or sludge equipment must have forced ventilation in accordance §217.246 of this title (relating to Ventilation and Odor Control).

(2) An underground enclosure must have a tight-fitting, self-closing door to minimize the spread of gas.

(n) Gas Meter.

(1) An anaerobic digester ~~A~~ system must have a gas meter to measure total gas production.

(2) A meter must have a bypass.

(o) Manometer.

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(1) A gas manometer must have a tight shut-off vent and vent cock.

(2) A vent pipe must be extended from a manometer to the outside of the building.

(3) A vent pipe opening must have a screen and be designed to prevent the entrance of rainwater.

(4) A manometer design must specify all safety devices that are needed for a manometer pipe system and must list the safety items in the report.

(p) Gas Piping. The gas piping for an anaerobic digester must be equipped with gauges that measure the following in inches:

(1) the pressure of the main pipe;

(2) the pressure to gas-utilization equipment; and

(3) the pressure to waste burners.

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(q) Digestion Temperature Control.

(1) Passive Temperature Control.

(A) A digester must be constructed above the shallowest groundwater table, including any perched water tables.

(B) A digester must be insulated to minimize heat loss.

(2) Heating Facilities.

(A) The sludge must be heated by circulating the sludge through an external heater.

(B) A piping system must allow for the preheating of feed sludge before introduction to the digesters, unless effective mixing is provided within a digester.

(C) A pipe and valve layout must facilitate cleaning.

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D) The size of a heat exchanger sludge pipe must be based on the heat transfer requirements.

(3) Heating Capacity.

(A) A digester system must have the heating capacity to maintain the temperature required for sludge stabilization established in paragraph (j)(3) of this section.

(B) A digester system must be designed to use an alternate source of fuel and must have an alternate source of fuel available for emergency use.

(4) Mixing. A digester system must have equipment to mix the sludge.

(5) Location of a Sludge Heating Device. A sludge heating device with an open flame must be located above grade and in an area separate from gas production and any storage area.

(r) Supernatant Withdrawal.

(1) Pipe Size. The minimum diameter for a supernatant pipe is 6.0 inches.

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(2) Withdrawal Arrangements.

(A) The supernatant pipes must be arranged to allow withdrawal from three or more levels in a tank.

(B) A supernatant selector must have at least two draw-off levels located in the digester's supernatant zone, in addition to an unvalved emergency supernatant draw-off pipe.

(C) A supernatant withdrawal system must have a positive, unvalved, vented emergency -overflow. The engineer must specify where overflow is routed in the report.

(D) A supernatant withdrawal level design must be based on a fixed cover digester design.

(E) Supernatant withdrawal must be by means of interchangeable extensions at the discharge end of a withdrawal pipe.

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(F) A supernatant piping system must have high-pressure backwash equipment.

(3) Sampling.

(A) A supernatant pipe must have sampling points at each supernatant draw-off level.

(B) The minimum diameter for a sampling pipe is 1.5 inches.

(4) Supernatant Handling.

(A) The report must include how the treatment units are designed to handle shock organic loads associated with digester supernatant.

(B) Supernatant liquor from an anaerobic digester may be returned directly to the headworks ~~facility~~ for treatment, ~~-~~or may be chemically treated before being returned to the headworks ~~facility~~ for treatment. Any other method of treating supernatant liquor must be approved by the executive director.

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(C) If treating the supernatant liquor with lime, each of the following requirements must be met:

(i) Lime must be applied to obtain a pH of at least 11.5 standard units ~~(su)~~.

(ii) A lime feeder must be capable of feeding 2,000 milligrams per liter ~~(mg/l)~~ of hydrated lime or its equivalent.

(iii) Lime must be mixed with the supernatant liquor by a rapid mixer or by agitation with air in a mixing chamber.

(iv) After adequate mixing, the solids must be allowed to settle.

(D) A supernatant liquor treatment system may be either a batch or a continuous process.

(i) A batch process may have both the mixing and the settling processes in the same tank.

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(ii) A sedimentation tank for a batch process must have the capacity to hold at least 36 hours of supernatant liquor at design flow, but not less than 1.5 gallons per capita.

(iii) A sedimentation tank for a continuous process must have a detention time of not less than 8.0 hours.

(E) The solids from the supernatant liquor treatment must be returned to a digester or conveyed to a sludge handling unit.

(F) The clarified supernatant liquor must be returned to the headworks ~~head of the treatment works~~ in accordance with §217.242 of this title (relating to Control of Sludge and Supernatant Volumes).

(s) Anaerobic Digester Covers.

(1) An uncovered anaerobic digester is prohibited.

(2) The sludge and supernatant withdrawal pipes for a single-stage or a first-stage digester with a fixed cover must be arranged to minimize the possibility of air being drawn into a gas chamber above the liquid in a digester.

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(3) A digester cover must include a gas chamber.

(4) A digester cover must be gas tight. The specifications must include a test of each digester cover for gas leakage.

(5) A digester cover must be equipped with an air vent with a flame trap, a vacuum breaker, and a pressure relief valve.

(t) Aerobic Sludge Digestion. This subsection applies to the stabilization by aerobic digestion of waste sludge to Class B biosolids, as defined in Chapter 312 of this title (relating to Sludge Use, Disposal, and Transportation).

(1) Solids Management. The report must include a solids management plan.

(2) Detention Time. The design temperature of an aerobic digester system must be based on the average of the lowest consecutive seven-day ~~low~~ temperature at a similar wastewater treatment facility located within 50 miles of ~~a~~ the proposed site ~~must be used~~.

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(3) Mass Balance Requirements. Mass balance calculations must be included in the report. The mass balance calculations must take into account design sludge age, ~~wastestream~~waste stream concentration, operational hours, operational volume in the tanks, decant or dewatering volumes and characteristics, time needed for decanting or dewatering, and the volume needed for storage and sampling.

(4) Single Stage. Single stage aerobic digestion consists of utilizing one tank operating in continuous-mode-no-supernatant removal, continuous-mode-feeding-batch removal, or other mode detailed in a solids management plan.

(A) The ~~design of the~~ size of an aerobic digester must be based on the minimum total detention time for the water temperature in the table located in subparagraph (B) of this paragraph based on Chapter 312 of this title (relating to Sludge Use, Disposal, and Transportation) and 40 Code of Federal Regulations Part 503 (relating to Standards for the Use or Disposal of Sewage Sludge).

(B) The digester size must be sufficient to provide both the detention time in the following table and to provide for the mass load received by the unit:

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Figure: 30 TAC §217.249(t)(4)(B)

Table J.2. - Minimum Detention Times for Aerobic Digesters

~~Table J.2. - Minimum Detention Times for Aerobic Digesters~~	
Temperature (Degrees Celsius)	**Total Detention Time**
15°	60 days
20°	40 days

(5) Multiple Stage. Multiple stage aerobic digestion consists of two or more completely mixed digesters ~~reactors~~ operating in series.

(6) Field Data.

(A) Any increase in flow or organic loading, ~~-~~or any change in process requires new testing and verification of time and temperature operating parameters.

(B) An expansion of an existing ~~facility~~wastewater treatment facility may be designed and operated according to previously established time and temperature operating parameters.

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(C) The executive director may re-rate a ~~facility~~wastewater treatment facility under Subchapter B of this chapter (relating to Wastewater Treatment Facility Design Requirements), if an owner requests a re-rating and submits sufficient supporting data.

(7) Design Requirements.

(A) The maximum solids concentration used to calculate the total detention time for an aerobic digester that concentrates the waste sludge only in a digester tank must be~~:~~

~~(i)~~ 2.0% solids concentration,~~;~~ unless~~-~~:

(~~ii~~i) supporting data is submitted in the report to increase the solids concentration to 3.0%; or

(~~iii~~ii) a higher concentration is justified by the use of a sludge thickening unit upstream of a digester.

(B) A diffuser must be designed to minimize clogging.

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(C) A diffuser must be designed to permit its removal without dewatering a tank for inspection, maintenance, and replacement. Removable diffusers are not required if the wastewater treatment facility is designed with a redundant basin.

(D) The volatile solids loading rate must be designed to be at least 100 ~~lb~~ pounds but not more than 200 ~~lb~~ pounds of volatile solids per 1,000 ~~cf~~ cubic feet per day, unless otherwise justified in the report.

(E) The dissolved oxygen concentration maintained in the liquid in an aerobic digester must be at least 0.5 ~~mg/l~~milligrams per liter.

(F) If mechanical aerators are used, the energy input for mixing must be at least 0.5 horsepower per 1,000 ~~cf~~ cubic feet. ~~for mechanical aerators.~~

(G) If diffused air mixing is used, the energy input for mixing must be at least 20 standard ~~cf~~ cubic feet per minute per 1,000 ~~cf~~ cubic feet per 1,000 ~~cf~~ cubic feet of aeration tank. ~~if diffused air mixing is used.~~

(H) An aerobic digester ~~A unit~~ must be designed for effective solids separation and withdrawal, or decanting of the supernatant.

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(u) Heat Stabilization.

(1) The design of a heat treatment system must be based on the anticipated sludge flow, sludge characteristics, and sludge concentration.

(2) A heat treatment system must operate continuously to minimize the additional heat input necessary to start up the system, unless justified in the report.

(3) A heat treatment system must have multiple units, unless storage or an alternate stabilization method is available.

(4) A single unit heat treatment system must have a standby grinder, a fuel pump, an air compressor, and ~~if applicable, and~~ dual sludge pumps.

(5) The report must identify the expected downtime for maintenance and repair, based on data from a comparable ~~facility~~wastewater treatment facility.

(6) The report must include a design for adequate storage for process feed and downtime.

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(7) A heat treatment system must provide heat stabilization in a reaction vessel:

(A) at a minimum of 175 degrees Celsius (350 degrees Fahrenheit) for 40 minutes, but not more than 205 degrees Celsius (400 degrees Fahrenheit) for 20 minutes and at a pressure of not less than 250 lbs per square inch, gauge pressure, ~~(psig)~~ but not more than 400 ~~lbs/psig~~pounds per square inch, gauge pressure; or

(B) provide for pasteurization at temperatures of 30 degrees Celsius (85 degrees Fahrenheit) or more and gauge pressure of more than 1.0 standard atmosphere (14.7 pounds per square inch) for a period of at least 25 days.

(8) A heat treatment system must have a sludge grinder to protect a heat exchanger from rag fouling.

(9) A heat treatment system must include an acid wash or high-pressure water wash system to remove scale from heat exchangers and reactors.

(10) A decant tank must have a sludge scraper mechanism and must be covered.

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(11) A heat exchanger must be constructed of corrosion--resistant material.

(12) A heat treatment system must have a continuous temperature recorder.

(v) Recycle Loads.

(1) The report must identify a method of treatment for the recycle stream from the heat treatment system.

(2) A recycle stream must not impact effluent quality or the ~~facility~~wastewater treatment facility's treatment processes.

(w) Alkaline Stabilization.

(1) Design Basis.

(A) Alkaline Dosage. The report must include the calculation of the alkaline dosage required to stabilize sludge based on the type of sludge, chemical composition of sludge, and the solids concentration. Performance data taken from a

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pilot test program or from a comparable ~~facility~~wastewater treatment facility must be used to determine the proper dosage.

(B) Temperature, pH, and Contact Time. An alkaline stabilization system must uniformly mix an alkaline additive-sludge mixture to maintain the pH, temperature, and contact time, as specified in §312.82 of this title (relating to Pathogen Reduction) and §312.83 of this title (relating to Vector Attraction Reduction).

(2) Reliability.

(A) An alkaline stabilization system must have multiple units, unless storage or an alternate stabilization method is available to continue operations when a unit is not in service.

(B) A single unit that has adequate storage or an alternate stabilization method must have a standby conveyance and mixer, a backup heat source, and dual blowers.

(C) A design must include:

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(i) the expected downtime for maintenance and repair based on data from a comparable ~~facility~~wastewater treatment facility; and

(ii) adequate storage for process, feed, and downtime.

(3) Alkaline Stabilization Housing Unit.

(A) A housing unit must meet the requirements in §217.247(r)(1) ~~§217.247(u)(1)~~ of this title (relating to ~~Chemical Pretreatment of Sludge~~Structures Housing Equipment).

(B) A housing unit must have mechanical or air agitation to ensure uniform discharge from the storage bins.

(4) Feeding Equipment.

(A) The alkaline additive feeding equipment must meet the requirements of §217.247(r)(1) ~~§217.247(u)(1)~~ of this title (relating to Structures Housing Equipment).

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(B) Hydrated lime must be fed as a slurry consisting of at least 6% calcium hydroxide $Ca(OH)_2$ ~~slurry~~ by weight but not more than 18% $Ca(OH)_2$ ~~slurry~~ by weight, unless otherwise justified in the report.

(C) The report must identify a means for controlling the feed rate of any other dry additive.

(5) Mixing Equipment.

(A) An additive and sludge blending or mixing vessel must be large enough to hold the mixture for a minimum of 30 minutes at the maximum feed rate.

(B) A batch process must maintain a pH greater than 12 ~~su~~ standard units in a mixing tank during the blending period.

(C) A continuous flow process must maintain a pH greater than 12 ~~su~~ standard units in an exit pipe.

(D) A continuous flow process must be designed for a detention time that is the tank volume divided by the volumetric input flow rate.

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(E) A slurry mixture may be mixed with either a diffused air mixer or a mechanical mixer.

(F) The mixing equipment must maintain an alkaline slurry mixture in complete suspension.

(G) If using a diffused air mixer, the following requirements apply: ~~.~~

(i) a coarse bubble diffuser must have a minimum air supply of 20 standard cubic feet per minute per 1,000 ~~cf~~ cubic feet (cf) of tank volume; ~~.~~ and

(ii) a mixing tank must be ventilated and include odor control equipment.

(H) If using a mechanical mixer, the following requirements apply: ~~.~~

(i) a mechanical mixer must provide at least 5.0 horse power per 1,000 cf of tank volume but not more than 10 horse power per 1,000 cf of tank volume; and ~~.~~

(ii) the impellers must minimize debris fouling in the sludge.

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(6) Detention Time. A pasteurization vessel must provide a minimum detention period of 30 minutes.

(7) External Heat. The report must include any supplemental external heat necessary.

§217.250. Sludge Dewatering.

(a) The report must include a justification for the proposed sludge dewatering units, including design calculations, results from any pilot studies, all assumptions, and appropriate references.

(b) The design of a dewatering unit must be based on mass balance principles.

(c) General Requirements.

(1) Centrate or Filtrate Recycle.

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(A) The drainage from beds and centrate or filtrate from dewatering units must be returned to the headworks~~head~~ of the wastewater treatment facility ~~facility~~ for treatment.

(B) The design of a treatment unit downstream from a dewatering unit must be based on the organic load from the centrate or filtrate recycle.

(2) Sludge with Industrial Waste Contributions. A dewatering system must be designed to prevent the release of any constituent (such as a free metal, an organic toxin, or a strong reducing or oxidizing compound) that adversely impacts ~~threatens~~ water quality or compliance with the associated wastewater permit.

(3) Redundancy.

(A) A mechanical dewatering system must have at least two dewatering units, unless the report justifies adequate storage or an alternative means of sludge handling.

(B) ~~When performance reliability and sludge management are dependent on production of dewatered sludge, the~~ Mechanical dewatering units must be

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able to dewater the average daily sludge flow with the largest dewatering unit out of service.

(4) Storage Requirements.

(A) A mechanical dewatering system must have separate storage if the equipment will not operate on a continuous basis and the wastewater treatment facility ~~treatment system~~ has no digesters with built-in short-term storage.

(B) In-line storage of stabilized or unstabilized sludge must not interfere with any treatment unit.

(C) The separate sludge storage from a primary digester must be aerated and mixed to prevent a nuisance odor condition.

(5) Sampling Points. A dewatering system must have sampling stations before and after each dewatering unit and must allow periodic evaluation of the dewatering process.

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(6) Maintenance. Each dewatering system unit must have a bypass to allow for maintenance, repair, and replacement. The engineer must specify where the bypass flow will be routed in the report.

(d) Sludge Conditioning.

(1) The design and location of a chemical addition point must consider interactions of the chemical with other chemicals and processes used in the wastewater treatment facility.~~An additive addition point must be located in relation to downstream equipment and in relation to the combined effect of other additives.~~

(2) A dewatering system must provide adequate mixing time for the reaction between an additive and the sludge. Any subsequent handling must eliminate floc shearing.

(3) The report must include a pilot plant or full-size performance data used to determine the characteristics and design dosage of any sludge additive.

(4) The report must justify the in-stream flocculation and coagulation system design by including comparable performance data or pilot plant data.

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(5) The report must include whether the mixers require conditioning tanks.

(6) The report must include calculations for a range of detention times.

(7) Solution storage capacity, at maximum chemical demand, must be based on:

~~may be smaller than the design volume required for daily dosage if the equipment is not in continuous operation.~~

(a) the amount of chemical needed per shift for continuous processes; or

(b) the amount of chemical needed for a full batch for intermittent and batch processes.

(8) Solution storage capacity may be reduced if ~~A minimum of eight hours storage must be provided, unless~~ the specific chemical or additive selected is adversely affected by storage.

~~(9) The storage for a batch operation must be adequate for one batch at maximum chemical demand.~~

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(9)~~(10)~~ The report must justify any storage volume reduction and any other method used to ensure a continuous supply of chemicals by accounting for chemical use through a full operating day or a full batch.~~an operating day or batch.~~

(e) Sludge Drying Beds.

(1) The size of sludge drying beds ~~size~~ must be based on data from a similar wastewater treatment facility ~~facility~~ in the same geographical area with the same influent sludge characteristics.

(2) If the data required by paragraph (1) of this subsection is not available,~~such data is unavailable,~~ or if the executive director determines that the data is not appropriate for a proposed wastewater treatment facility, ~~facility,~~ the design of sludge drying beds must be based on the following:

(A) Open Beds.

(i) A sludge drying bed system must have at least two sludge drying beds.

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(ii) The report must include the calculation of the minimum surface area for a sludge drying bed using the values in the following figure for an area of the state with less than 45 inches annual average rainfall or less than 50% annual average relative humidity, ~~of less than 50%,~~ as determined by data from the nearest National Oceanic and Atmospheric Administration's weather station that has at least ten years of data.~~National Weather Service data.~~ The entire period of record for the weather station must be used.

Figure: 30 TAC §217.250(e)(2)(A)(ii)

Table J.3. - Surface Area Requirements for Sludge Drying Beds

~~Table J.3. - Surface Area Requirements for Sludge Drying Beds~~	
Stabilization Process	**Pounds of Digested Dry Solids** ***per square foot per year***
Anaerobic Digestion	20.0
Aerobic Digestion	15.0

(iii) Another method of sludge dewatering is required in lieu of a sludge drying bed in an area of the state that experiences either 45 or more ~~greater than 45~~ inches of average annual rainfall or 50% or greater annual average relative humidity, ~~of 50% or greater,~~ as determined by data from the nearest National Oceanic and Atmospheric Administration's weather station that has at least ten years of data.

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The entire period of record for the weather station must be used. ~~National Weather Service data.~~

(iv) A sludge drying bed system must be designed to: ~~design must:~~

(I) ~~provide a method of effectively dewatering~~dewater sludge during normal operations;

(II) provide ~~a means for~~ accelerated sludge dewatering during abnormally wet conditions;

(III) ~~size the sludge drying beds to~~ store accumulated sludge during periods of extended high humidity and rainfall; ~~and~~

(IV) use ~~provide~~ an alternative dewatering method to ~~effectively~~ dewater the sludge during periods of extended high humidity and rainfall; and ~~.~~

(V) prevent the unauthorized discharge of solids from the sludge drying beds.

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(v) The report must provide justification for the use of innovative or non-conforming sludge drying beds in high rainfall, high relative humidity areas of the state, as described in subparagraph (A)(iii) of this paragraph.

(B) Gravel Media Beds. A gravel media bed must be laid in two or more layers. The gravel around the underdrains must be properly sized to allow drainage. ~~graded~~ The gravel around the underdrains ~~and~~ must be at least 12 inches deep, extending at least 6.0 inches above the top of the underdrains. The top layer of a gravel media bed must be at least 3.0 ~~three~~ inches thick and must consist of gravel 1/8 inch to 1/4 inch in size.

(C) Sand Media Beds. A sand media bed must consist of at least 12 inches of sand with a uniformity coefficient of less than 4.0 and an effective grain size of at least 0.3 millimeters ~~(mm)~~ but not more than 75 millimeters ~~mm~~ above the top of the ~~an~~ underdrain.

(D) Underdrains.

(i) The underdrains must be at least 4.0 inches in diameter and a slope of at least ~~sloped not less than~~ 1.0% to the drain.

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(ii) The underdrains must not be spaced ~~not~~ more than 20 feet apart.

(iii) The engineer must specify where the flow from the underdrains will be routed in the report.

(E) Decanting. A sludge drying bed may have a method of decanting supernatant installed on the perimeter of the bed. The wastewater treatment facility must be designed to return the decanted liquid from a sludge drying bed to the headworks or to the beginning of the secondary treatment process.

(F) Walls.

(i) The interior walls of a sludge drying bed must be watertight and extend 12 inches to 24 inches above and at least 6 inches below the bed surface.

(ii) The exterior walls of a sludge drying bed must be watertight and extend 12 inches to 24 inches above the bed surface or ground elevation, whichever is higher.

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(G) Sludge Removal.

(i) A sludge drying bed system must be arranged to facilitate sludge removal.

(ii) The sludge drying beds must have concrete pads for vehicle support tracks on 20 foot centers for all percolation type sludge beds.

(H) Sludge Influent.

(i) A sludge pipe to the sludge drying beds must terminate at least 12 inches above the surface of the media and be arranged so that the pipe drains to a sump that pumps ~~to be pumped~~ to the headworks or the influent lift station.

(ii) A sludge discharge point must have a concrete splash plate.

(I) Drying Bed Bottom.

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(i) The bottom of a sludge drying bed must consist of a layer ~~minimum of one foot layer~~ of clayey subsoil having a thickness of a least 1.0 foot and a permeability of less than 1 x 10^{-7} centimeters per second. ~~(cm/sec).~~

(ii) An impermeable concrete pad must be installed over a liner in locations where the groundwater table is within 4.0 feet of the bottom of the liner.

(3) Innovative or Non-Conforming Sludge Drying Beds. The executive director will review any vacuum assisted sludge drying beds or other variations to the gravity drying bed concept as innovative ~~and/~~or nonconforming technologies subject to §217.7(b)(2) of this title (relating to Types of Plans and Specifications Approvals).

(4) Rotary Vacuum Filtration.

(A) Filtration Rate. The report must justify the ~~actual~~ value calculated for the rates of filtering for various types of sludge with proper conditioning, using the following table:

Figure: 30 TAC §217.250(e)(4)(A)

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Table J.4. - Filtration Rates

~~Table J.4. - Filtration Rates~~	
Type of Treatment	**Pounds of Dry Solids** ***per square foot per hour (minimum-maximum)***
Primary	4-6
Primary and Trickling Filter	3-5
Primary and Activated Sludge	3-4

(B) Duplicate Equipment. Unless two treatment ~~dual~~ trains are provided, a feed pump, a vacuum pump, and a filtrate pump ~~the following equipment~~ must be provided in duplicate to allow equipment alternation~~: feed pump, vacuum pump and filtrate pump~~. Spare filter fabric must be kept at the wastewater treatment facility,~~provided~~ except when metal coil filters ~~coils~~ are used.

(C) Filter Equipment. Parts that will get wet ~~Wetted parts~~ must be constructed of corrosion-resistant material. Drum and agitator assemblies must be equipped with variable-speed drives, and provisions must be made for adjusting the liquid level in the filtration system.

(D) Pumps.

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(i) A vacuum pump with a capacity of at least 1.5 cubic feet per minute per square foot ~~(cfm/sf)~~ must be provided for metal-covered drums.

(ii) A dry-type vacuum pump must have a vacuum receiver.

(iii) A filtrate pump must have adequate capacity to pump the maximum amount of liquid to be removed from the sludge.

(iv) Each filter must be fed by a separate feed pump to ensure a proper feed rate.

(5) Centrifugal Dewatering.

(A) The report must justify the sizing and design of a centrifugation system. A centrifuge design must be based on performance data from a similar centrifuge ~~centrifugation system~~ when available. If no performance data is available, the results of a pilot or full-scale test must be used.

(B) Selection of a material for a scroll must ~~be~~ include consideration of the amount of grit expected in the sludge.

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(C) A centrifuge design must include adequate sludge storage, based on the disposal process.

(D) Unless two treatment ~~dual~~ trains are provided, a centrifugation system must have the following spare equipment, including necessary connecting pipes and electrical controls:

(i) drive motor;

(ii) gear assembly; and

(iii) feed pump.

(E) A ~~Each~~ feed pump must have a variable speed drive.

(F) Each centrifuge must have a separate feed system.

(G) A ~~Each~~ centrifuge must be equipped for variable scroll speed and pool depth.

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(H) A centrifuge ~~Each centrifugation~~ system must have a crane or monorail for equipment removal and ~~or~~ maintenance.

(I) A ~~Each~~ centrifuge system must provide ~~have~~ access for ~~adequate and efficient~~ wash down of the interior of the each centrifuge.~~machine.~~

(6) Plate and Frame Presses.

(A) Sizing.

(i) The design of a plate and frame press ~~A design~~ must be based on performance data developed from a plate and frame press of similar size with similar operational characteristics. ~~concerning the size of a plate and frame press when available.~~ If no performance data is available, the results of ~~a~~ pilot scale tests or full-scale tests must be used.

(ii) The design of a plate and frame press ~~A design~~ may be based on appropriate scale-up factors for full size designs if pilot scale testing is done in lieu of full-scale testing.

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(iii) The report must justify the size of a plate and frame press.

(B) Duplicate Equipment and Spare Parts. Unless multiple units are provided, a plate and frame press system must include the following spare equipment:

(i) one~~a~~ duplicate feed pump;

(ii) two extra plates, or at least one extra plate for every ten required for startup, whichever is greater~~but not less than two~~;

(iii) one complete filter fabric set;

(iv) one closure drive system;

(v) one air compressor; and

(vi) one washwater booster pump.

(C) Operational Requirements.

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(i) The filter feed pumps must be capable of handling ~~a combination of~~ initial high volume flow, low pressure filling, ~~followed by~~and sustained periods of operating at 100 pounds per square inch ~~(psi)~~ to 225 pounds per square inch.~~psi.~~

(ii) The design of a plate and frame press ~~A design~~ may specify an integral pressure vessel to produce ~~this~~ initial high volume flow.

(iii) A plate and frame press system may use operating pressures less than 225 pounds per square inch ~~psi~~ if the report ~~includes~~ justifies the design operating pressure using actual performance data from a plate and frame press that processes similar sludge. ~~using similar sludge justifying such a use.~~

(iv) The design of a plate and frame press ~~A design~~ may include provisions for sludge-cake breaking to protect or enhance down line processes when necessary.

(D) Maintenance.

(i) A plate and frame press system must have a crane or monorail capable of removing the plates.

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(ii) A plate and frame press system must have a high-pressure water or acid wash system to clean the filter.

(7) Belt Presses.

(A) Sizing.

(i) Actual performance data developed from a ~~facility~~wastewater treatment facility with similar operational characteristics must be used to size a belt press system. If pilot plant testing is performed in lieu of full-scale testing, appropriate scale-up factors must be used to develop a full-scale design.

(ii) A belt press system must have a duplicate belt press, or another method of sludge processing or disposal that has been approved by the executive director, if the design flow exceeds 4.0 million gallons per day. ~~(mgd).~~

(iii) The report must include all data used to size a belt press system.

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(B) Duplicate Equipment and Spare Parts. Unless multiple belt press units are provided, a belt press system must have the following spare equipment:

(i) one~~a~~ duplicate feed pump;

(ii) one washwater booster pump; ~~pumps;~~

(iii) one complete set of belts;

(iv) one set of bearings for each type of press bearing;

(v) one set of ~~duplicate~~ tensioning equipment;

(vi) one set of tracking sensors;

(vii) one set of wash nozzles;

(viii) one doctor blade; and

(ix) ~~duplicate~~ conditioning or flocculation drive equipment.

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(C) Conditioning. The report must include the polymer selection methodology, account for sludge variability, and document the anticipated sludge loading to the belt press.

(D) Sludge Feed.

(i) The sludge feed must be relatively constant to eliminate difficulties in polymer addition and belt press operation.

(ii) The report must include the range in feed variability.

(iii) A belt press system may include grinders ahead of a flocculation system.

(iv) The sludge feed must provide a method for uniform sludge dispersion on a belt.

(v) A belt press system must use thickening of the feed sludge, unless the report justifies separate thickening or dual purpose thickening.

(E) Filter Press Belts.

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(i) A belt must have a variable speed drive.

(ii) A belt press system must have belt tracking and tensioning equipment.

(iii) The report must justify the weave, material, width, and thickness of the belts.

(F) Filter Press Rollers.

(i) The rollers must have a protective finish.

(ii) The maximum roller deflection and operating tension of the~~a~~ belt must be included in the report to justify equipment selection.

(iii) The roller bearings must be watertight and rated for a life of 100,000 hours.

(G) Spray Wash System.

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(i) A belt press system must use high-pressure wash water for each belt.

(ii) The design of a spray wash system ~~A design~~ must specify the operating pressure at the point of washwater discharge.

(iii) A spray wash system must allow cleaning without interfering with the~~-~~ spray wash system operation.

(iv) The report must justify the nozzle and nozzle cleaning system selection.

(v) A belt press system must have replaceable spray nozzles and spray curtains.

(H) Maintenance Requirements.

(i) A belt press system must have drip trays under the belt press and under the thickener when gravity belt thickening is employed.

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(ii) The side and floor of a belt press must have adequate clearance for maintenance and removal of the dewatered sludge.

(iii) An electrical panel or other component ~~material~~ subject to corrosion must be weatherproof or located outside of the belt press area.

(iv) A doctor blade clearance must be adjustable.

§217.251. Sludge Storage.

(a) This section applies to the storage of sludge ~~residuals~~ after processing but before final disposal or removal from the wastewater treatment facility ~~facility~~ site.

(b) Sludge ~~A site may store Residuals~~ in liquid, dewatered, or dry form may be stored at the wastewater treatment facility if the solids have been stabilized in a treatment process.

(c) General Storage Requirements.

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(1) ~~The design of~~ A sludge storage facility must be designed to prevent ~~minimize~~ odor from becoming a nuisance and to minimize ~~conditions and~~ vector attraction.

(2) A sludge storage facility must provide storage of waste sludge separate from a biological treatment process.

(3) The design of a sludge storage facility must be based on process design, sludge age, waste stream concentration, operational hours, operational volume in tanks, decant or dewatering volumes and characteristics, time frames needed for decanting or dewatering, and volume needed for storage and sampling.

(4) The report must include a solids management plan that describes ~~demonstrates~~ a method for ~~of~~ managing the waste solids that will maintain the design sludge age for a biological process.

(d) Storage of Solids - Not Dewatered.

(1) Aerobically Digested Solids.

(A) A storage facility may store aerobically digested solids.

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(B) A sludge storage basin must have diffused air or mechanical mixing.

(C) A diffused air-mixing unit must provide a minimum air capacity of 30 standard cubic feet per minute per 1,000 cubic feet ~~(cf)~~ of volume.

(D) A mechanical surface aerator must have a minimum of 1.0 horsepower per 1,000 cubic feet~~cf~~ of volume.

(E) An earthen sludge storage basin must be lined in accordance with §217.203(c) and (d) of this title (relating to Design Criteria for Natural Treatment Facilities).

(2) Anaerobically Digested Solids. Anaerobically digested solids must ~~may~~ be stored in a covered basin with gas release valves and gas control measures.

(e) Storage of Dewatered Solids.

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(1) ~~A storage facility must store the~~ Dewatered solids in a must be stored in a steel or concrete container, or in an open ~~a~~ stockpile. ~~that prevents re-wetting by precipitation.~~

(2) ~~A storage container may store~~ Dewatered solids with a solids content of less than 35% must not be stored for ~~no~~ more than seven days. Dewatered solids with a solids content of at least 35% but not more than 50% must not be stored for more than 90 days.

~~(3) A storage facility must store dewatered solids in a steel or concrete container that prevents re-wetting by precipitation.~~

~~(4) A storage facility may store Dewatered solids with a solids content of at least 35% but not more than 50% for no more than 90 days.~~

(f) Open Stockpiles.

(1) An open stockpile must have an impervious pad underneath the solids to prevent groundwater contamination.

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(2) An open stockpile must have a system for collecting stormwater ~~storm water~~ runoff and returning it to the headworks~~head~~ of the wastewater treatment facility. ~~treatment facility.~~

(g) Dried Solids Storage.

(1) A storage facility may store dewatered solids with a solids content of greater than or equal to 50% in a covered bin or covered facility for 90 days or more, but not longer than two years.

(2) An~~A~~ enclosed storage structure must be mechanically ventilated with at least 20 ~~air exchanges per~~complete air exchanges per hour and must have an odor control system for the exhaust.

§217.252. Final Use or Disposal of Sludge.

(a) The report must identify the final use or final disposal of the sludge. The use, disposal, and transportation of sludge must be conducted in accordance with the requirements contained in Chapter 312 of this title (relating to Sludge Use, Disposal, and Transportation) or in Chapter 330 of this title (relating to Municipal Solid Waste).

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(b) Quantities of Sludge.

~~(1) An estimate of~~ The quantity of solids generated by the treatment process must be estimated using a mass-balance approach or actual data from a similar full-scale ~~facility~~wastewater treatment facility or pilot study. The methods, calculations, and analyses used to estimate quantities of solids must be included in the report.

~~(2) A mass balance approach must be used to determine the quantity of sludge produced at a facility.~~

(c) Final Disposition. The sludge use or disposal option must be based on the pathogen and vector attraction characteristics of the sludge.

(d) Sludge Constituents.

(1) The concentrations of metals ~~and their concentration~~ in sludge must be determined using methods approved in 40 Code of Federal Regulations §136.3 (relating to Guidelines Establishing Test Procedures for the Analysis of Pollutants) ~~Standard Method's laboratory test procedures~~ and must be less than the levels specified in §312.63 of this title (relating to Metal Limits (Other Than Domestic Septage)~~)~~.

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(2) A sludge processing system must be designed to reduce pathogens in sludge to levels that comply with §312.82 of this title (relating to Pathogen Reduction). ~~compliant with Chapter 312 of this title concerning the ultimate use or disposal method.~~

(3) A sludge processing system must be designed to produce digested sludge that complies with §312.83 of this title (relating to Vector Attraction Reduction).~~Chapter 312 of this title with regards vector attraction.~~

(e) Emergency Provisions for Sludge Disposal. The~~A~~ design of a sludge processing system must include a secondary method of sludge disposal in the event of conditions that prevent the use of a ~~facility~~wastewater treatment facility's primary use or primary disposal method. The~~A~~ secondary sludge disposal method must be included in the report.

(f) Weather Factors. Weather factors such as rainfall, wind conditions, and humidity must be considered as process selection and storage constraints ~~included~~ in the determination of the use or disposal of sludge.

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SUBCHAPTER K: CHEMICAL DISINFECTION

§§217.271 - 217.283

§217.271. Gaseous Chlorine (Cl_2) Disinfection and Sulfur Dioxide (SO_2) Dechlorination System Redundancy Requirements.

(a) Each gaseous chlorine ~~Cl_2~~ disinfection and sulfur dioxide ~~SO_2 and~~ dechlorination system must include the number of cylinders required for normal operation at peak flow, plus at least one additional cylinder.~~at least two banks of chemical storage cylinders.~~

(b) Gaseous chlorine disinfection systems and sulfur dioxide dechlorination systems ~~A bank of cylinders~~ must include a device that automatically switches between ~~from an empty bank of cylinders to a full bank of~~ cylinders in a manner that ensures continuous disinfection and dechlorination.

(c) A wastewater treatment facility must have sufficient space to store at least as many ~~a bank of~~ empty cylinders as the number of cylinders required for normal operation at peak flow.

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(d) A gaseous chemical delivery system must be designed to meet ~~so that~~ the pounds~~pound~~ per day requirements in §217.272 of this title (relating to Capacity and Sizing of Gaseous Chlorine ~~(Cl_2)~~ Disinfection and Sulfur Dioxide ~~(SO_2)~~ Dechlorination) ~~are met~~ when ~~with~~ the largest chlorinator, sulfonator, or evaporator is out of service.

(e) If an injector water supply requires a booster pump, a duplicate backup pump is required. ~~A chemical delivery system must include a backup pump for any injector water supply system requiring a booster pump.~~

(f) A gaseous chemical delivery system must include an emergency power source capable of operating ~~maintaining operation of~~ the chlorination and dechlorination systems ~~of the minimum flow necessary to keep the facility from being inundated by influent~~ during an extended power outage, in accordance with §217.36 of this title (relating to Emergency Power Requirements).

§217.272. Capacity and Sizing of Gaseous Chlorine (Cl_2) Disinfection and Sulfur Dioxide (SO_2) Dechlorination Systems.

(a) The capacity of a chlorine ~~(Cl_2)~~ or a sulfur dioxide ~~(SO_2)~~ gas withdrawal system must be based on the peak flow, in compliance with §217.32(a)(1) of this title (relating to Organic Loadings and Flows) and the equation in the following figure:

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Figure: 30 TAC §217.272(a)

Equation K.1.

$$PPD = Q \times D \times 8.34$$

Where:
PPD = Pounds (lbs) per day of Cl_2 or SO_2 required for treatment
Q = Peak 2 hour flow (millions of gallons per day)
D = Cl_2 concentration from Table K.1 in Figure: 30 TAC §217.272(b), or SO_2 dosage needed to dechlorinate the expected Cl_2 residual
8.34 = conversion factor

(b) The following table ~~figure~~ establishes the minimum acceptable design chlorine ~~Cl_2~~ dosage for disinfection:

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Figure: 30 TAC §217.272(b)

Table K.1. - Minimum Design Cl_2 Concentration Needed for Disinfection

Type of Effluent	**Cl_2 Concentration** *milligrams per liter (mg/l)*
Primary	15
Fixed Film	10
Activated Sludge	8
Tertiary Filtration Effluent	6
Nitrified Effluent	6

(c) A dechlorination system design must provide ~~include~~ at least one unit of sulfur dioxide ~~SO_2~~ gas for each ~~to dechlorinate at least one~~ unit of chlorine ~~Cl_2~~ gas.

§217.273. Cylinder Requirements for Gaseous Chlorine ~~(Cl_2)~~ Disinfection and Sulfur Dioxide ~~(SO_2)~~ Dechlorination Systems.

(a) Cylinder Withdrawal Rates for Chlorine and Sulfur Dioxide Gases.

(1) Gas Withdrawal. The gas withdrawal rate per cylinder for chlorine and sulfur dioxide cylinders must be based on ~~the~~ Equation K.2. ~~located in the following~~

~~figure~~ and the variables from Table K.2. located in the following equation and table:

~~figure:~~

Figure: 30 TAC §217.273(a)(1)

Equation K.2.

$$W_g = (T_A - T_{th}) \times F$$

Where:
T_A = Low ambient temperature, °~~E~~F
T_{th} = Threshold temperature, °~~E~~F
F = Withdrawal factor, lb/°~~E~~F/day
W_g = Maximum gas withdrawal rate per cylinder, lb/day

Table K.2 - Threshold Temperatures and Withdrawal Rates for Chlorine and Sulfur Dioxide

~~Table K.2 - Threshold Temperatures and Withdrawal Rates for Cl_2 And SO_2 – *~~			
Gas and Cylinder Size	**Withdrawal Factor, (F) lb/°~~E~~F/day**	**Threshold Temperature, (T_{th}) for Cylinder Mounted Vacuum Regulator, °~~E~~F**	**Threshold Temperature, (T_{th}) for Manifold Systems at 10-15 psig pressure, °~~E~~F**
150-lb Cl_2 Cylinder	1.0	0	10
1-ton Cl_2 Cylinder	8.0	0	10
150-lb SO_2 Cylinder	0.75	30	40
1-ton SO_2 Cylinder	6.0	30	40
~~* - Values from the *Handbook of Chlorination*, Second Edition, White, Reinhold~~			

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Values from the *Handbook of Chlorination*, Second Edition, White, Reinhold

(A) If the chlorine or sulfur dioxide cylinders are not stored in a temperature-controlled enclosure, the report must include the ambient temperature based on the lowest consecutive seven-day average of the average daily local temperatures over the last ten years, as measured at the nearest National Oceanic and Atmospheric Administration's National Weather Service weather station with at least ten years of records.

(B) Heating blankets on chlorine ~~(Cl_2)~~ gas cylinders are prohibited.

(2) Liquid Withdrawal. If liquid withdrawal from one-ton cylinders is proposed, ~~the following are~~ the maximum withdrawal rates are:

(A) 9,600 ~~pounds (~~lbs~~)~~/day of chlorine ~~Cl_2~~; and

(B) 7,200 lbs/day of sulfur dioxide ~~(SO_2)~~.

(b) Number of Cylinders Required. ~~per Bank.~~ The number of cylinders required for normal operation at peak flow ~~per cylinder bank~~ must be based on the equation in the following figure:

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Figure: 30 TAC §217.273(b)

Equation K.3.

$$Cyl = \frac{PPD}{W_{gi}}$$

Where:
Cyl = minimum number of cylinders required per bank (round up to the nearest whole number)
PPD =lb/day of chemical required as determined in Figure: 30 TAC §217.272(a), Equation K.1
$W_{g\text{-}l}$ = lb/day of chemical that may be withdrawn per cylinder as determined in Figure: 30 TAC §217.272(a), Equation K.1 or Figure: 30 TAC §217.273(a)(1), Equation K.2.

§217.274. Dosage Control for Gaseous Chlorine ~~(Cl_2)~~ Disinfection and Sulfur Dioxide ~~(SO_2)~~ Dechlorination Systems.

Gaseous ~~A new, expanded or materially altered~~ chlorine ~~(Cl_2)~~ and sulfur dioxide ~~(SO_2)~~ systems ~~system~~ must include automatic dosage control that adjusts the dosage ~~of Cl_2 or SO_2~~ relative to the flow of the ~~an~~ effluent stream.

§217.275. Requirements for 150 Pound Cylinders used in Gaseous Chlorine ~~(Cl_2)~~ Disinfection and Sulfur Dioxide ~~(SO_2)~~ Dechlorination Systems. ~~Using 150 Pound (lb) Cylinders.~~

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(a) Heated Rooms.

(1) A chlorine ~~(Cl_2)~~ and sulfur dioxide ~~(SO_2)~~ system that uses 150 ~~-~~pound ~~(lb)~~ cylinders must be located indoors at a minimum temperature of 65 degrees Fahrenheit. This provision applies to all chemical feed equipment, including all connected ~~the~~ cylinders, the chlorinators, and~~/or~~ the sulfonators.

(2) An unconnected chlorine or sulfur dioxide cylinder may be stored outdoors, but the cylinder must reach at least 65 degrees Fahrenheit before it is ~~being~~ connected to a system.

(b) Heating Blankets.

(1) Heating blankets on chlorine ~~Cl_2~~ gas cylinders are prohibited.

(2) A heating blanket may only be placed on a sulfur dioxide ~~An so_2~~ cylinder ~~may have a heating blanket only~~ in a temperature-controlled room to increase the temperature inside the ~~a~~ cylinder to above the ambient room temperature.

(A) A heating blanket on a sulfur dioxide cylinder must include a mechanism that ensures that a blanket does not heat a cylinder above 100 degrees

Fahrenheit. The report must include a calculation that documents ~~determining~~ the setting for a heating blanket to maintain a sulfur dioxide cylinder temperature of less than 100 degrees Fahrenheit.

~~(B) A heating blanket must include a mechanism that ensures that a blanket does not heat a cylinder above 100 degrees Fahrenheit.~~

(B)~~(C)~~ A cylinder with a heating blanket that is connected to a dechlorination ~~disinfection~~ system must have a downstream pressure-reducing valve.

(C)~~(D)~~ A sulfur dioxide ~~An~~ ~~SO_2~~ system must be capable of automatically deactivating a heating blanket if high pressure is detected downstream.

(b) Outdoor Storage. If a 150 pound cylinder is stored outdoors, it must be kept in a storage structure that:

(1) protects the cylinder from direct sunlight; and

(2) allows safe removal and replacement of the cylinder.

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~~(c) Separation. The design of a disinfection system using 150-lb cylinders must ensure that Cl_2 and SO_2 are not in the same room and will never come into contact with each other.~~

§217.276. Requirements for One-Ton and Larger Cylinders used in Gas Withdrawal Chlorine ~~(Cl_2)~~ Disinfection and Sulfur Dioxide ~~(SO_2)~~ Dechlorination Systems. ~~Using Gas Withdrawal From One-Ton Cylinders.~~

(a) Heated Rooms. The chlorinators and sulfonators for a system using one-ton cylinders must be located indoors and maintained at a minimum temperature of 65 degrees Fahrenheit.

(b) Outdoor Storage.

(1) If one-ton cylinders are stored outdoors, the system sizing must be done in accordance with §217.273(a) of this title (relating to Cylinder Requirements for Chlorine ~~(Cl_2)~~ Disinfection and Sulfur Dioxide ~~(SO_2)~~ Dechlorination Systems). Calculations supporting system sizing must be included in the report.

(2) If a one-ton cylinder is stored outdoors, it must be kept in a storage structure that: ~~must:~~

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(A) protects the ~~protect a~~ cylinder from direct sunlight; and

(B) allows ~~allow~~ safe removal and replacement of a cylinder.

(3) A one-ton cylinder stored outdoors may be connected to ~~have~~ heated pipes to prevent gas from liquefying in the transfer pipes. ~~when a chemical enters a heated building or when gas cools in a pressure pipe.~~

(c) Heating Blankets.

(1) A heating blanket on a one-ton chlorine ~~Cl_2~~ gas cylinder is prohibited.

(2)) A heating blanket may only be placed on a sulfur dioxide ~~A one-ton SO_2~~ cylinder ~~may have a heating blanket~~ to increase the operating temperature of the sulfur dioxide ~~an SO_2~~ system. The ~~A~~ design must specify the temperature a heating blanket may be set to maintain an adequate temperature inside a cylinder, based on the lowest consecutive seven-day average of the local daily low temperatures over the last ten years, as measured at the nearest National Oceanic and Atmospheric Administration's National Weather Service weather station with at least ten years of records.

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(3) The ambient temperature must be used to calculate a cylinder withdrawal rate in §217.273(a) of this title (relating to Cylinder Requirements for Gaseous Chlorine Disinfection and Sulfur Dioxide Chlorination Systems).

(4) A heating blanket on a sulfur dioxide cylinder must include a mechanism that ensures that a blanket does not heat the cylinder above 100 degrees Fahrenheit.~~to prevent heating a cylinder to more than 100 degrees F.~~ The report must include a calculation that documents the setting for a heating blanket to maintain a sulfur dioxide cylinder temperature of less than 100 degrees Fahrenheit

(5) A cylinder with a heating blanket that is connected to a dechlorination system must have a downstream pressure-reducing valve.

(6) A sulfur dioxide system must be capable of automatically deactivating a heating blanket if high pressure is detected downstream.

~~(5) A dechlorination system must have a pressure-reducing valve downstream from the cylinders connected to the system and a high-pressure interlock to deactivate any heating blanket.~~

~~(d) Separation.~~

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~~(1) The housing of the SO_2 feed equipment for one-ton cylinders must be in a separate room from the chlorination feed equipment and cylinders.~~

~~(2) A system with Cl_2 and so_2 one-ton cylinders must separate the feed equipment from the cylinders with a gas tight wall, except for the following exceptions:~~

~~(A) One-ton SO_2 cylinders and Cl_2 cylinders may be stored in the same area if:~~

~~(i) the cylinders are stored outdoors;~~

~~(ii) an SO_2 outlet valve and a Cl_2 outlet valve are separated by at least 10 feet; and~~

~~(iii) the Cl_2 equipment and storage containers are marked differently than SO_2 equipment and storage containers.~~

~~(B) SO_2 and Cl_2 chemical feed equipment may be stored in the same room if:~~

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~~(i) both systems are remote vacuum type;~~

~~(ii) no pressure gas pipes are in the room;~~

~~(iii) no cylinders are stored in the room; and~~

~~(iv) the design ensures that Cl_2 and SO_2 cannot be mixed.~~

§217.277. Requirements for One-Ton and Larger Cylinders used in Liquid Withdrawal Chlorine Disinfection and Sulfur Dioxide Dechlorination Systems.~~Requirements for Chlorine (Cl_2) Disinfection and Sulfur Dioxide (SO_2) Dechlorination Systems Using Liquid Withdrawal From One-Ton Cylinders.~~

(a) Heated Rooms. The chlorinators and sulfonators must be located indoors at a minimum temperature of 65 degrees Fahrenheit.

(b) Outdoor Storage. The chlorine ~~(Cl_2)~~ and sulfur dioxide ~~(SO_2)~~ cylinders for systems using liquid withdrawal may be stored outdoors without reducing the withdrawal rates calculated from ~~assumed in~~ §217.273(a)(2) of this title (relating to

Cylinder Requirements for Gaseous Chlorine ~~(Cl_2)~~ Disinfection and Sulfur Dioxide ~~(SO_2)~~ Dechlorination Systems).

(c) Separation. The separation requirements for a one-ton cylinder liquid withdrawal systems are the same as those for a one-ton cylinder gas withdrawal system under §217.278(e) ~~§217.276(d)~~ of this title (relating to Safety Requirements for Gaseous Chlorine Disinfection and Sulfur Dioxide Dechlorination Systems). ~~Requirements for Chlorine (Cl_2) Disinfection and Sulfur Dioxide (SO_2) Dechlorination Systems Using Gas Withdrawal from One-Ton Cylinders).~~

§217.278. Safety ~~Housing~~ Requirements for Chlorine ~~(Cl_2)~~ Disinfection and Sulfur Dioxide ~~(SO_2)~~ Dechlorination Systems.

(a) Floor Drains. A floor drain from a chlorine ~~Cl_2~~ or sulfur dioxide ~~SO_2~~ feed or storage room must not drain to a ~~any~~ pipe system connected to any other room of the wastewater treatment facility. Drainage must be routed for safe disposal or for further processing at a rate that does not cause interference.

(b) Doors and Windows.

(1) Each door in a chlorine or sulfur dioxide room must:

(A) open to the outside of the building; and

(B) include panic hardware.

(2) Each chlorine or sulfur dioxide room must have at least one clear, gas-tight window in a gas-tight ~~an~~ exterior door.

(3) A chlorine or sulfur dioxide room may have additional clear, gas-tight windows to ensure the disinfection and dechlorination systems may be viewed without entering an enclosed room.

(c) Ventilation.

(1) An enclosed storage and feed room must have continuous forced mechanical ventilation with at least one complete ~~1.0~~ air exchange every 3.0 minutes.

(2) Exhaust equipment must have:

(A) external controls; and

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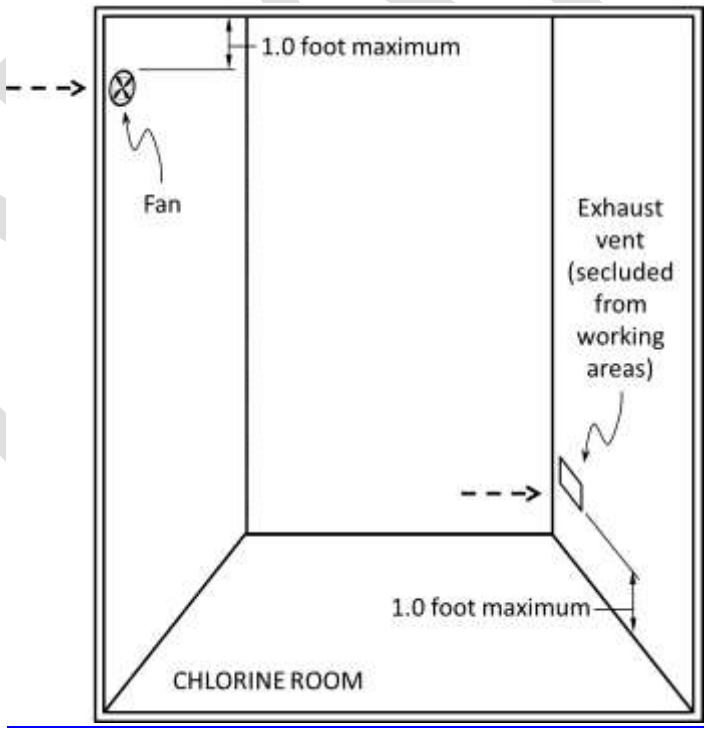
(B) leak detection equipment.

(3) A fan must be located at the top of the room to push air across the room and through an exhaust vent located at the bottom of the room on the opposite side (see figure 30 TAC §217.278(c)(3)). The top of the fan must be no more than one foot below the ceiling. The bottom of the exhaust vent must be no more than one foot above floor level.

Figure: 30 TAC §217.278(c)(3)



(4) An exhaust system may use vacuum ~~negative~~ pressure ventilation instead of forced mechanical ventilation if the facility has gas containment and treatment as prescribed by the National Fire Protection Association's Uniform Fire Code.

(5) A vent from the sulfur dioxide ~~SO_2~~ or chlorine ~~Cl_2~~ gas feed systems must: ~~exhaust to a point that is:~~

(A) exhaust to a point that is not frequented by facility staff, such as stairs, walkways, and common areas;

(B) exhaust to a point that is not near a fresh air intake; and

(C) be clearly marked with four inch font that reads "Danger: Hazardous Exhaust."

(d) Gas Detectors and Protection.

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(1) An area containing chlorine ~~Cl_2~~ or sulfur dioxide ~~SO_2~~ under pressure must have a gas detector and alarm system.

(2) An area used for handling pressurized chlorine or sulfur dioxide gases must have respiratory and protective equipment. The respiratory and protective equipment must meet ~~that meets~~ the requirements of the National Institute for Occupational Safety and Health.

(A) The respiratory and protective equipment must be immediately accessible at the wastewater treatment facility. The location and use of the respiratory and protective equipment must be described ~~and included~~ in the wastewater treatment facility's ~~facility's~~ operation and maintenance manual.

(B) The storage of respiratory equipment in any room where gas under pressure is stored or used is prohibited.

(C) Instructions for using the respiratory and protective equipment must be kept with or posted next to the equipment.

(D) The respiratory equipment must use compressed air and must have at least a 30-minute capacity.

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(e) Separation.

(1) Chlorine cylinders must not be stored in the same room as sulfur dioxide cylinders.

(2) Chlorine feed equipment must not be housed in the same room as sulfur dioxide feed equipment.

(3) Cylinders and feed equipment that supply chlorine must be separated by at least one gas-tight wall from cylinders and feed equipment that supply sulfur dioxide.

§217.279. Equipment and Material Requirements for Gaseous Chlorine ~~(Cl_2)~~ Disinfection and Sulfur Dioxide ~~(SO_2)~~ Dechlorination Systems.

(a) All equipment and material used in a disinfection and dechlorination system must meet the manufacturer's recommendations.

(b) ~~Storage Orientation.~~

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~~(1)~~ A 150-pound cylinder must be stored vertically and secured by a clamp or chain to prevent it from falling over. A one-ton cylinder ~~cylinders~~ must be stored horizontally on trunnions.

~~(2) A 150-pound cylinder must be stored vertically and secured by a clamp or chain.~~

(c) Measurements. A gaseous chlorine ~~(Cl_2)~~ and sulfur dioxide ~~(SO_2)~~ system must have a scale designed for determining the amount of chemical ~~used daily and the amount of chemical~~ remaining in ~~a container~~the connected cylinders.

(d) Pressure Pipe Systems for Gas Transport.

(1) Gas transport pressure pipes ~~pipe~~ and fittings must be at least equivalent to Schedule 80 black seamless steel pipe. Gas transport fittings must be at least equivalent to ~~and~~ 2,000 pound forged steel fittings.

(2) The use of polyvinyl chloride (PVC) in a pressure pipe system is prohibited.

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(3) A one-ton cylinder system must use a gas filter upstream of a pressure-reducing valve.

(4) A pressure pipe system must have a pressure-reducing valve if:

(A) the system has more than 20 linear feet ~~a length~~ of supply pipes; ~~greater than 20 feet;~~

(B) a gaseous sulfur dioxide ~~an SO_2~~ system has a heating blanket; or~~,~~

(C) there are pressure pipes on the discharge side of an evaporator.

(5) A pressure pipe on ~~at~~ the gas discharge side of an evaporator must have a rupture disk and a high-pressure alarm to warn wastewater treatment facility ~~that warns facility~~ staff of disk rupture.

(6) A gas pipe entering a chlorinator or sulfonator must have a heated leg drop sediment trap.

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(7) A gaseous sulfur dioxide ~~An SO_2~~ system must have a seat and stem constructed of material with corrosion resistance and brittle strength at least ~~the~~ equivalent to ~~of~~ 316 stainless steel ~~seat and stem~~.

(8) A gaseous chlorine ~~Cl_2~~ system must have at least the equivalent of a Monel® seat and stem.

(e) Pressure Pipe Systems - Liquid Transport.

(1) The use of PVC in a pressure pipe system is prohibited.

(2) The manifolding of one-ton containers for simultaneous liquid chemical withdrawal is prohibited.

(3) A liquid pipe system must include a rupture disk, a pressure switch to warn ~~facility~~wastewater treatment facility staff of disk rupture, and an expansion chamber.

(f) Vacuum Pipes.

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(1) Vacuum pipes and fittings downstream from ~~of~~ a vacuum regulator must have corrosion resistance ~~be the~~ equivalent to ~~of~~ PVC or 316 stainless steel.

(2) A vacuum pipe must have socket joints.

(g) Diffusers. The ~~report must include calculations that verify a~~ minimum velocity through any chlorine or sulfur dioxide system diffuser must be at least ~~of~~ 10 feet per second ~~through any Cl_2 or SO_2 system diffuser,~~. The report must include calculations that verify this requirement is met, unless a diffuser has a mechanical mixer.

§217.280. Design of Sodium Hypochlorite (NaClO) Disinfection and Sodium Bisulfite ($NaHSO_3$) Dechlorination Systems.

(a) Redundancy. ~~A~~ Sodium hypochlorite ~~(NaClO)~~ and sodium bisulfite systems ~~Bisulfate ($NaHSO_3$) system~~ must include at least two chemical solution pumps and must ensure that the capacity requirements in subsection (b) of this section ~~of §217.272(b) of this title (relating to Capacity and Sizing of Chlorine (Cl_2) Disinfection and Sulfur Dioxide (SO_2) Dechlorination Systems)~~ are met with the largest pump out of service.

(b) Capacity and Sizing. The size of a chemical liquid solution pump and pipe system must be determined as follows:

(1) Sodium Hypochlorite. ~~NaClO.~~

(A) ~~Determine~~ Pounds Per Day of Chlorine ~~(Cl_2)~~ Required. Figure: 30 TAC §217.272(b), Table K.1. and Figure: 30 TAC §217.272(a), Equation K.1. of this title must be used to determine the pounds per day of chlorine ~~Cl_2~~ required.

(B) Chlorine ~~Cl_2~~ Determination. The pounds of available chlorine ~~Cl_2~~ per gallon of sodium hypochlorite ~~NaClO~~ solution must be determined using values and appropriate references supplied by the chemical manufacturer.

(C) Gallons per Hour Determination. In order to size the chemical metering equipment, the gallons per hour must be calculated using ~~the values found in~~ the following equation:

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Figure: 30 TAC §217.280(b)(1)(C)

Equation K.4.

$$R = \frac{PPD}{24C}$$

Where:
R = minimum size of chemical metering equipment, (gal/hr)
PPD = pounds per day of Cl_2 that must be delivered to the wastewater, (lb/day)
C = pounds of available Cl_2 in one gallon of NaClO, (lb Cl_2/gal)

(2) Sodium Bisulfite. ~~$NaHSO_3$.~~

(A) Figure: 30 TAC §217.280(b)(1)(C), Equation K.4. of this subsection must be used ~~the basis~~ to determine the pounds per day of sodium bisulfite ~~chemical~~ required.

(B) The minimum amount of sodium bisulfite ~~$NaHSO_3$~~ needed to dechlorinate one pound of chlorine ~~Cl_2~~ is 1.465 pounds. The pounds per day of chlorine ~~Cl_2~~ that must be dechlorinated, as determined in subparagraph (A) of this paragraph, multiplied by 1.465 pounds of sodium bisulfite ~~$NaHSO_3$~~ per pound of chlorine, ~~Cl_2,~~ determines the pounds of sodium bisulfite ~~$NaHSO_3$~~ needed.

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(C) The gallons per hour ~~(R)~~ of sodium bisulfite ~~$NaHSO_3$~~ solution needed from the chemical metering equipment must be calculated using the following equation:

Figure: 30 TAC §217.280(b)(2)(C)

Equation K.5.

$$R = \frac{\text{lbs } NaHSO_3}{10.9 \text{ lbs } NaHSO_3/\text{gallon } NaHSO_3}\left(\frac{1}{S}\right) \times 24$$

Where:
S = solution strength in percent
R = gallons per hour of $NaHSO_3$ solution

(c) Dosage Control. A dosage control system may be positive pressure or vacuum and must automatically adjust the sodium hypochlorite ~~NaClO~~ or sodium bisulfite ~~$NaHSO_3$~~ feed rate to correspond to the flow of the effluent stream.

(d) Chemical Handling.

(1) Storage Tank Sizing.

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(A) A ~~bulk~~ storage facility for sodium hypochlorite ~~NaClO~~ with a solution strength greater than or equal to 10% must not be sized to store more than a 15-day supply, based on the design average daily consumption, unless a residual analyzer or oxidation-reduction potential (ORP) monitor provides automatic feed control to compensate for solution degradation. Where a residual analyzer or ORP monitor is included in the design, a storage facility must not be sized to store more than a 30-day supply, based on the daily average consumption.

(B) A storage facility for sodium hypochlorite ~~NaClO~~ with a solution strength less than 10% ~~, and where a residual analyzer or ORP monitor is provided, a bulk storage facility~~ must not be sized to store more than a 30-day supply, based on the daily average consumption.

(C) A ~~facility~~wastewater treatment facility with a design flow greater than or equal to ~~or greater than~~ 1.0 million gallons per day must have at least two chemical storage tanks for each chemical.

(2) Temperature considerations.

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(A) A sodium hypochlorite tank that is stored outdoors ~~If a NaClO tank is not stored indoors, the tank~~ must be opaque or otherwise block sunlight from penetrating the tank. ~~penetration.~~

(B) An outdoor ~~$NaHSO_3$~~ sodium bisulfite storage facility and associated pipes must be insulated and heat traced if located in an area ~~in a location~~ where the ambient temperatures fall ~~temperature is~~ below 40 degrees Fahrenheit, ~~F,~~ based on the lowest 7-day average of the average daily local temperatures over the last 10-years, as measured at the nearest National Oceanic and Atmospheric Administration's National Weather Service weather station with at least ten years of data.

(e) Equipment and Materials.

(1) Equipment and materials used for storage, pumping, and transport of sodium hypochlorite ~~NaClO~~ must be used according to the manufacturer's recommendations and designed for use ~~suitable for use~~ in a corrosive chemical environment.

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(2) Equipment and materials used for storage, pumping, and transport of sodium bisulfite ~~$NaHSO_3$~~ must be used according to the manufacturer's recommendations and designed ~~suitable~~ for use in an acidic chemical environment.

(f) Safety.

(1) Ventilation. A chemical storage area must be ~~sufficiently~~ ventilated to exhaust fumes.~~to prevent buildup of fumes.~~

(2) Liquid-depth indicators. A chemical storage tank must have an external liquid-depth indicator.

(3) Spill Containment.

(A) A chemical storage area for sodium hypochlorite and sodium bisulfite must have secondary containment equal to 125% of the volume of the largest storage tank.

(B) A manifolded tank must have secondary containment equal to 125% of the cumulative manifolded tank volume.~~,~~ If ~~unless~~ the pipe system is designed

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to prevent ~~prevents~~ a combined release, then the secondary containment must equal 125% of the largest tank volume.

(C) A tank must ~~be placed on an equipment pad that is~~either:

(i) be placed on an equipment pad that is elevated above the secondary containment maximum liquid level; or

(ii) be placed in a secondary containment structure that is able to be drained to prevent the tank from floating.~~provided with positive drainage from below the tank.~~

(D) A containment structure ~~system~~ for sodium hypochlorite ~~NaClO~~ must be separate from a containment structure ~~system~~ for sodium bisulfite. ~~$NaSO_3$.~~

(4) Emergency and Protective Equipment. A chemical storage area must have at least one emergency eyewash station and ~~adequate~~ personal protective equipment for all wastewater treatment facility ~~facility~~ staff working in the area.

§217.281. Application of Chlorination and Dechlorination Chemicals.

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(a) Mixing Requirements.

~~(1) Chlorination Unit. A chlorination unit must be constructed so that the applied chlorine (Cl_2) is thoroughly mixed with the wastewater prior to entry into a Cl_2contact chamber.~~

(1) ~~(2)~~ Mixing Zones. A mixing zone within a chlorine ~~Cl_2~~ contact basin ~~of an existing facility~~ must not be considered as part of the volume needed for disinfection. A mixing zone must be designed to ensure that the chlorine is thoroughly mixed with the wastewater before entering a chlorine contact chamber, as described in paragraph (2) of this subsection.

(2) ~~(3) Cl_2 and~~Chlorine and Sodium Hypochlorite Application. ~~(NaClO)~~. A disinfection system must apply the chlorine ~~Cl_2~~ gas or solution in a highly turbulent flow regime created by in-line diffusers, mechanical mixers, or jet mixers. Effective initial mixing for the mean velocity gradient (G value) in the area of turbulent flow must exceed 500 per second. ~~[1].~~ A serpentine disinfection channel may be used in place of turbulent initial mixing if the length-to-width ratio is at least 40-to-1 and complete mixing is demonstrated by a dye test.

(3) ~~(4)~~ Sulfur Dioxide ~~(SO_2)~~ and Sodium Bisulfite Application. ~~($NaHSO_3$):~~

(A) The mixing for a sulfur dioxide or sodium bisulfite ~~an SO_2 and $NaHSO_3$~~ system must ensure compliance with permitted effluent limits. ~~all relevant permit requirements.~~

(B) A disinfection system must provide a mean velocity gradient (G value) of at least 250 per second^{-1}~~-~~.

(b) Chlorine ~~Disinfection~~ Contact Basins.

(1) A chlorine ~~Cl_2~~ contact basin must provide a minimum chlorine ~~Cl_2~~ contact time of 20 minutes at the peak flow.

(2) The design of a chlorine ~~Cl_2~~ contact basin~~chamber~~ must prevent short-circuiting to ensure ~~and~~ that the wastewater is retained in a chlorine contact basin for at least 20 minutes at peak flow.

(3) A rectangular chlorine contact basin must have rounded corners.

(4) If a facility is designed with more than one chlorine contact basin, an accessible sampling point, primary measuring device, and a staff gauge must be

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provided at each chlorine contact chamber to verify the chlorine residual and measure the flow passing through each chlorine contact chamber. A primary measuring device may be a weir, flume, or other similar measuring device approved by the executive director.

(5) The design of an aerated chlorine contact basin must include an analysis of the chlorine feed rate required to offset chlorine volatilization.

(6)~~(3)~~ The report must include supporting data from a chlorine contact basin design model, performance data of a similar design, or a field tracer study.

(c) Dechlorination Contact Time.

(1) A Dechlorination ~~disinfection~~ system must have sufficient mixing and contact time between the disinfected wastewater and a dechlorinating agent to ensure continuous compliance with the permitted chlorine ~~Cl_2~~ limits.

(2) The ~~A~~ design of a dechlorination system must prevent short-circuiting and provide a minimum contact time of 20 seconds at the peak flow.

§217.282. Other Chemical Disinfection and Dechlorination Processes.

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(a) Any chemical disinfection or dechlorination process not discussed in this subchapter, such as chlorine dioxide, ozone, tablet or powder disinfection and dechlorination processes, and liquid solution disinfection and dechlorination processes are subject to the requirements of §217.7(b)(2) of this title (relating to Types of Plans and Specifications Approvals).

(b) Chemical disinfection processes not discussed in this chapter, must be flow-paced and must use chemicals approved by the manufacturer for the purpose of wastewater disinfection.

§217.283. Post-Disinfection Requirements.

(a) Sampling points must be identified in the report. A design must include a sufficient number of sampling points to:

(1) allow an operator to monitor the disinfection system for process control; and

(2) allow monitoring of permitted effluent limits.

~~. Sampling points must be identified in the report.~~

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(b) Dissolved Oxygen ~~(DO)~~ Requirements. A treatment facility must be designed with the ability to add post-aeration if needed to meet effluent limits for dissolved oxygen in the wastewater permit. If the wastewater permit requires a minimum dissolved oxygen of 5.0 milligrams per liter or greater, the report must include calculations that demonstrate how the post-aeration system will maintain the minimum dissolved oxygen level.

~~(1) A disinfection system must include post-aeration to ensure compliance with DO requirements in the facility's wastewater permit.~~

~~(2) If the wastewater permit requires a minimum DO of 5.0 milligrams per liter or greater, the report must include the calculations that demonstrate how a post-aeration system will maintain the minimum DO level.~~

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SUBCHAPTER L: ULTRAVIOLET LIGHT DISINFECTION

§§217.291 - 217.300

§217.291. Ultraviolet Light Disinfection System Definitions.

(a) Module--A grouping of ultraviolet (UV) lamps electrically and physically connected to each other.

(b) Bank--A grouping of modules that:

(1) can be automatically turned on and off in relation to effluent flow variations;

(2) is electrically or physically connected together or physically adjacent to each other; and

(3) forms a complete unit capable of treating the full ~~channel~~ design width and depth of the disinfection channel.

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§217.292. Ultraviolet Light Disinfection Systems Effluent Limitations.

Ultraviolet light disinfection systems must be designed, at a minimum, to disinfect the effluent to the bacteria limits ~~comply with at least the effluent limits relating to the bacterial limit~~ in the wastewater treatment facility's wastewater permit.

§217.293. Ultraviolet Light Disinfection Systems Redundancy Requirements.

(a) An ultraviolet (UV) disinfection system must include at~~a~~ least two banks positioned in series in a disinfection channel.

(b) A UV light disinfection system must be designed so that the dosage requirements determined in §217.295 of this title (relating to Ultraviolet Light Disinfection Dosage and System Sizing) are met under all conditions.

(c) An owner must maintain an inventory of replacement ~~spare~~ equipment, including ~~but not limited to,~~ lamps, ballasts, quartz sleeves, banks, and modules, to replace equipment during emergency repairs and scheduled maintenance. The minimum inventory of replacement lamps, ballasts, and quartz sleeves is described in

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§217.298(b) of this title (relating to Ultraviolet Light Disinfection System Cleaning and Maintenance).

§217.294. Ultraviolet Light Disinfection Systems Monitoring and Alarms.

(a) An ultraviolet (UV) system shall continuously monitor and display the following information on ~~locally~~ at the system control panel: ~~the following:~~

(1) the flow rate in each disinfection channel;

(2) the relative intensity of the lamps ~~a lamp~~ in one bank of a disinfection channel;

(3) the operational status and condition of each bank;

(4) the on or ~~/~~off status of each lamp in the system;

(5) the number of operating hours of the lamps in each bank in the system; ~~and~~

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(6) the total number of hours of operation for each bank in the system; and.

(7) the transmissivity of UV light in the disinfection channel.

(b) Flow pacing is required and shall be accomplished by automatically turning the appropriate number of banks on or off in proportion to effluent flow. Set points used to energize the banks must be adjustable. shall be operator adjustable.

(c) A UV system must include an alarm system.

(1) A wastewater treatment facility facility that is not supervised 24-hours per day must have a telemetry system with battery backup as part of the alarm system. A telemetry system must notify a wastewater treatment facility facility operator in the event of a UV alarm and must distinguish between major and minor alarms.

(2) A UV system must include the following minimum alarm conditions:

(A) A minor minor alarm must activate if:

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(i) the ~~relative~~ UV intensity of the system is less than 45%, relative to the peak intensity after 100 hour burn in; or

(ii) there is a lamp outage.

(B) A major alarm must activate if ~~major alarm must activate if~~:

(i) the ~~relative~~ UV intensity of the system is less than 25%, relative to the peak intensity ~~(~~after 100 hour burn in~~)~~;

(ii) more than 10% of the lamps fail;

(iii) there is a loss of flow signal upon failure of a bank to energize; ~~or~~

(iv) there is an outage of any module or bank; or~~.~~

(v) the transmissivity is low, based on the manufacturer's recommendations.

§217.295. Ultraviolet Light Disinfection Dosage and System ~~Systems~~ Sizing.

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(a) An ultraviolet light (UV) ~~A~~ system must be sized based upon the results of an independent bioassay that meets the ~~. The~~ following ~~are the~~ minimum criteria.

(1) The lamp and ballast in a bioassay test system must have the same spectral characteristics and 254 nanometers (nm) wavelength output as the full-scale system.

(2) Spacing of the lamps in a bioassay test unit must be the same as in the full-scale system.

(3) The arrangement of the lamps must mirror the full-scale system.

(4) The maximum scale-up factor is 10.

(5) Scale down is prohibited.

(6) The minimum number of lamps in a bioassay is four ~~4~~ lamps per reactor.

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(b) If a variable output lamp is used, detailed documentation from the lamp manufacturer must be provided to document 254 nm ultraviolet output, operational wattage versus lamp input power (voltage and current), along with data demonstrating power requirements to the lamp and ballast to achieve the stated output.

§217.296. Ultraviolet Light Disinfection Bioassay Test Procedure.

(a) A bioassay procedure must conform to one of the ~~three~~ following protocols:

~~(1) *USEPA(1986) Design Manual: Municipal Wastewater Disinfection,* EPA/625/1-86/021;~~

(1)~~(2)~~ National Water Research Institute's *Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse* (3rd ed., 2012~~May 2003~~); or

(2)~~(3)~~ NSF International, The Public Health and Safety Company, 40 CFR §35.6450 *Environmental Technology Verification Protocol* (October 2002).

(b) The following minimum standards are required for ~~proper~~ validation of a bioassay.~~:~~

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(1) The source of water for the test organism solution must be identified and its UV transmittance must be recorded. If potable water is used, the bioassay must also address how disinfectant residues were removed.

(2) The depth of the suspension must be 1.0 centimeter ~~(cm)~~.

(3) The organism density must be 105 to 107 plaque forming units or colony forming units per milliliter.

(4) The dose response relationship must be based on a range of five to seven exposure times.

(5) The bioassay procedure must be conducted ~~Runs must be in~~ at least three times ~~triplicate~~, each from a separate dilution of the same ~~-~~stock suspension. All results must be reported for a bioassay to be valid.

(6) A minimum of two controls (unexposed) must be sampled and analyzed with each dose run. All results must be reported for a bioassay to be valid.

(7) The diameter of the collimating tube must be at least equal to the diameter of the Petri dishes. ~~dish.~~ Any difference between the diameter of the

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collimating tube and the diameter of the Petri dishes ~~in diameters~~ must be accounted for in the supporting calculations.

(8) The narrow band detector used for intensity determination must be calibrated for accuracy.

(9) 254 nanometer ultraviolet must be measured and reported as the dose response.

(10) The speed of the mixing bar must not cause spatter or cavitation.

(11) Any difference between the velocity profile in the bioassay and the velocity profile in the full-scale unit must be justified.

(12) Any difference between the gallons per minute per inch of UV lamp in the bioassay and the gallons per minute per inch of UV lamp the in full-scale unit must be justified.

(13) The lamp intensity data obtained in the bioassay must be used to set the operating parameters of the lamps.

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(14) Lamp intensity used in the flow through test reactor shall be set after a 100-hour burn in and stabilization period.

(15) Electrical input for 100% lamp output must be recorded and verified.

(16) Lamp intensity in the bioassay must be measured at the exact height of the surface of the suspension.

(17) No operating condition may be used that has not been proven effective by the bioassay.

(18) Any variation from the criteria in this subsection must:

(A) be justified by using industry best practices such as *Standardization of Method for Fluence (UV Dose) Determination in Bench-Scale UV Experiments,* Bolton and Linden (2003); and

(B) approved through the variance procedures in §217.4 of this title (relating to Variances). ~~in this chapter.~~

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(19) Bioassay procedures and results must be signed and sealed by a licensed professional engineer.

(c) Effluent percent transmission during the full scale testing shall be established in accordance with the terms and conditions of the ~~facility~~wastewater treatment facility's wastewater permit.

§217.297. Ultraviolet Light Disinfection Reactor Design.

(a) An approach channel must be unobstructed and have a minimum length of 4.0 feet before the first ultraviolet (UV) bank.

(b) The downstream channel length must be unobstructed for a minimum length of 4.0 feet following the last bank of UV lamps and before a fluid-level control device.

(c) Inlet channels must be designed to provide equal flow distribution across all UV channels.

(d) A downstream discharge point of a UV system ~~reactor~~ must include a level control that ensures that the UV lamps remain submerged, according to the manufacturer's recommendations, ~~at a near-constant depth,~~ regardless of flow.

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(e) The UV system must be designed to prevent an individual's exposure to UV light from the UV system, including upstream and downstream portions of a UV channel. ~~upstream and downstream portions of a UV reactor channel between UV banks must be covered to shut out all natural light.~~

(f) An enclosed UV system must have a dehumidifier or must be designed to prevent corrosion of electrical components.

§217.298. Ultraviolet Light Disinfection System Cleaning and Maintenance.

(a) The ~~A~~ design of an ultraviolet (UV) disinfection system must include provisions for draining each UV ~~ultraviolet (UV)~~ disinfection channel to another treatment unit within the wastewater treatment facility and for routine cleaning of the UV lamps and modules.

(b) A UV system must include the following replacement ~~spare~~ parts, as a percentage of the total system, equal to ~~equaling~~ at least:

(1) 5% of the lamps;

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(2) 2% of the ballasts; and

(3) 5% of the quartz sleeves.

(c) The UV system must be designed to ensure continuous disinfection during maintenance. ~~owner must provide the minimum number of spare banks or modules necessary to ensure continuous disinfection during maintenance and repair.~~

§217.299. Ultraviolet Light Disinfection System Safety.

Signs must be posted in an ultraviolet (UV) reactor area with "WEAR UV-RATED EYE PROTECTION" and "DO NOT LOOK AT UV LAMPS" in English and Spanish. Anyone in a reactor area must wear appropriate personal protection, including a ~~at least an ultraviolet (UV)~~ UV-rated face shield and safety glasses or goggles.

§217.300. Post-Disinfection Requirements.

(a) Sampling points must be identified in the report. A design must include a sufficient number of sampling points to:

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(1) allow an operator to monitor the disinfection system for process control; and

(2) allow monitoring of permitted effluent limits.

~~Sampling Points. A design must include a sufficient number of sampling points, including at least one point immediately downstream of an ultraviolet (UV) system, to allow an operator to monitor the system. Sampling points must be identified in the report.~~

(b) Dissolved Oxygen ~~(DO)~~ Requirements. ~~Requirement.~~ A wastewater treatment facility must be designed with the ability to add post-aeration if needed to meet effluent limits for dissolved oxygen in the wastewater permit. If the wastewater permit requires a minimum dissolved oxygen of 5.0 milligrams per liter or greater, the report must include calculations that demonstrate how the post-aeration system will maintain the minimum dissolved oxygen level.

~~(1) A UV disinfection system must include post-aeration to ensure compliance with DO requirements in the facility's wastewater permit.~~

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~~(2) If the wastewater permit requires a minimum DO of 5.0 milligrams per liter or greater, the report must include the calculations that demonstrate how a post-aeration system will meet the minimum DO level.~~

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SUBCHAPTER M: SAFETY

§§217.321 - 217.333

§217.321. Safety Design of a Wastewater Treatment Facility.

(a) The safety aspects of a wastewater treatment facility ~~treatment facility~~ design must be based on *Design of Municipal Treatment Plants*, WEF Manual of Practice No. 8, published by the Water Environment Federation. ~~, or~~ Other safety design guidelines may be used only if submitted in the design submittal and approved by the executive director.

(b) Occupational safety and health hazards, and risks to workers and the public, must be addressed in the design of collection system and wastewater treatment facility ~~treatment facility~~ equipment and processes.

(c) The design of a wastewater treatment facility ~~design~~ must incorporate processes that use the least hazardous and least toxic chemicals and the smallest least amounts of those chemicals that will effectively treat and disinfect the influent so that the effluent and ~~the~~ sludge meet the requirements in the associated wastewater permit, and do not degrade the water quality in a receiving stream or cause accumulation of hazardous or toxic chemicals in a land application area.

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(d) Where applicable, a design must follow the guidelines established under 29 Code of Federal Regulations, Part 1910.

~~(e) A design must demonstrate compliance with this section by implementing §217.322 of this title (relating to Safety and Security Audits) and §217.323 of this title (relating to Hazardous Operation and Maintenance).~~

§217.322. Safety and Security Audits.

(a) Safety Audit.

(1) The owner of an existing wastewater treatment facility ~~facility being materially altered or expanded~~ must conduct an annual ~~a~~ safety audit of the wastewater treatment facility and collection system that evaluates injuries and incidents ~~at the facility~~ during the prior ~~three~~ year ~~period~~ in order to determine the locations, causes, types of injuries, and jobs being performed when the injuries or incidents occurred.

(i) For the purposes of this chapter, an injury is harm or damage to an individual that results in any of the following: death, days away from work, restricted

work or transfer to another job, medical treatment beyond first aid, or loss of consciousness.

(ii) For the purposes of this chapter, an incident is harm or damage to an individual that results in first aid.

(2) A safety audit must identify the locations and jobs associated with injuries or incidents and the owner must develop a ~~any subsequent~~ corrective action plan with a reasonable risk-based schedule for implementing corrective actions to address the causes of the injuries and incidents. ~~taken or planned.~~

(3) The owner must complete corrective actions according to the schedule in the owner's risk-based corrective action plan. ~~A design must include measures that address the needed corrective actions identified in the safety audit as part of a material alteration or expansion project.~~

(b) Security Audit.

(1) The owner of an existing wastewater treatment facility must ~~may~~ conduct an annual ~~a~~ security audit of the wastewater treatment facility and collection system.

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(2) The security audit must ~~may~~ be based on the *Asset Based Vulnerability Checklist for Wastewater Utilities* (2002) by the Association of Metropolitan Sewerage Agencies. ~~or an equivalent security audit protocol.~~ An equivalent security audit protocol may be used, but only if approved by the executive director.

§217.323. Hazardous Operation and Maintenance.

(a) An owner shall perform an analysis of operational and maintenance tasks to identify potentially hazardous situations for a new or altered wastewater treatment unit or collection system unit. ~~, expanded, or materially altered facility.~~

(b) For those identified potentially hazardous tasks, a list must be prepared for each task that identifies the necessary:

(1) tools, equipment, and supplies;

(2) fixed and portable lifting equipment;

(3) fixed and portable monitoring equipment;

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(4) personal protective equipment and clothing;

(5) warning signs and guards; and

(6) first-aid supplies.

(c) The tools at a wastewater treatment facility must be sufficient to:

(1) allow workers to safely and properly operate equipment;

(2) perform required preventive maintenance, in compliance with the manufacturers' minimum requirements;

(3) make repairs; and

(4) maintain processes, pumps, motors, blowers, compressors, laboratory~~,~~ instrumentation, and other equipment.

§217.324. Chemical Handling.

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(a) An owner must make available personal ~~appropriate~~ protective equipment for breathing, eyes, face, head, and extremities, as well as all other equipment recommended by the Material Safety Data Sheet, for all individuals ~~operating staff~~ that ~~who~~ will handle any chemical known to pose a potential health risk. The owner ~~and~~ must train the wastewater treatment facility staff in the use of the equipment.

(b) A wastewater treatment facility that uses any chemical must be designed to provide eye washing and showering systems within the chemical work area for immediate emergency use.~~in all appropriate locations.~~

(c) All personal protective equipment and chemical neutralizers must be immediately accessible ~~stored near but~~ outside a chemical storage area.

§217.325. Railings, Ladders, Walkways, and Stairways.

(a) A guard rail with an opening that is designed to provide access ~~in a railing~~ must have a removable chain across the opening.

(b) An ~~A~~ open valve box, pit, tank, or basin that extends less than 4.0 feet above ground must have a railing capable of preventing an individual ~~a person~~ from falling into it.

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(c) A ~~steep or vertical~~ ladder may not be used to ~~is acceptable only for infrequent~~ access ~~to~~ equipment or work areas that are more than 4.0 feet above or below ground level. Equipment and work areas that are more than 4.0 feet above or below ground level must be designed with a stairway for access.

(d) A ladder must have flat safety tread rungs and must extend ~~extensions~~ at least 1.0 foot out of a vault.

(e) A walkway above an open tank must have a raised edge at least four inches tall that is designed to prevent a person from slipping off the walkway.

(f) Walkways, steps, landings, and ladder rungs must have a non-slip finish. The vertical rise between adjacent steps on a stairway must not exceed 9.5 inches. Stairways must be designed with no horizontal gap between the tread run of adjacent steps.

(g) An overhead pipe or other overhead obstruction must have at least a 7.0-foot clearance, unless the pipe or obstruction is padded to prevent head injury and has a warning sign.

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(h) Basins with vertical walls terminating more than 4.0 feet above or below ground level must be designed with a stairway ~~to the walkway~~for access.

(i) Guard rails on walkways shall have adequate clearance space for maintenance operations.

(j) Clarifiers must have grating across the discharge pipe in the launder or stop bars across the launder before the discharge pipe to prevent an individual from entering the discharge pipe from the clarifier.

(k) All guard rails, railings, ladders, walkways, and associated appurtences must be designed and constructed to ensure the safety of individuals at the wastewater treatment facility.

§217.326. Electrical and Fire Code Compliance.

(a) The electrical elements of a wastewater treatment facility and collection ~~facility or~~ system design must conform to local electrical codes. ~~or to~~ If the wastewater treatment facility or collection system is located in an area that does not have a local electrical code, the electrical elements must comply with the most recent edition of the

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National Fire Protection Association ~~(NFPA) 70~~ - National Electrical Code® (NFPA 70) at the time of installation.~~if the facility is located in an area that does not have a local electrical code.~~

(b) The wastewater treatment facility ~~facility or~~ and collection system design must conform to local fire codes. If ~~or to the National Fire Protection Association (NFPA) 70 if~~ the wastewater treatment facility ~~facility~~ is located in an area that does not have a local fire code, the wastewater treatment facility and system design must comply with the most recent edition of National Fire Protection Association Fire Codes (NFPA 1) at the time of installation.

(c) Electrical elements must be protected from environmental hazards with a housing. Environmental hazards include moisture, extreme temperatures, and pests.

§217.327. Non-Potable Water.

Each hydrant and outlet for non-potable water must have signs in both English and Spanish reading "NON-POTABLE WATER, DO NOT DRINK" and “NO BEBA EL AGUA.” ~~must be clearly marked as "NON-POTABLE WATER" or "UNSAFE WATER."~~

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§217.328. Wastewater Treatment Facility Access Control.

(a) A wastewater treatment facility ~~facility~~ must be completely enclosed by an intruder-resistant fence. ~~fenced and have a lockable gate at each access point.~~

(1) The intruder resistant fence must have a locked gate at each access point.

(2) The intruder-resistant fence must be at least 8.0 feet tall, and the bottom of the fence must be close enough to surface grade to prevent human access.

(3) The intruder-resistant fence must be constructed of wood, concrete, masonry, or metal. Other materials may be used, but only if approved by the executive director.

(4) The top of the intruder-resistant fence must have at least three strands of barbed wire. The top of an intruder-resistant fence may have outwardly-directed iron bars spaced on four-inch centers instead of barbed wire, but only if approved by the executive director.

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(5) A five-strand barbed wire fence may be used in a rural area for fencing lagoons or overland-flow plots, but only if approved by the executive director.

(b) A wastewater treatment facility ~~facility containing an open tank~~ must have hazard signs on the outward facing side of the fence, stating "DANGER - ~~OPEN TANKS -~~ NO TRESPASSING" in English and Spanish. ~~within visible sighting of each other and on each gate.~~ The signs must be within 50 feet of each other, with no less than one sign on each side of the fence and one sign on each gate.

~~(c) A facility containing an open tank must be surrounded by an intruder resistant fence that is :~~

~~(1) at least an 8.0 foot solid material or chain-link fence topped with at least one strand of barbed-wire;~~

~~(2) at least a 6.0 foot high solid material or chain-link fence topped with three strands of barbed-wire ; or~~

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~~(3) a five-strand barbed-wire fence may be used in a rural area for fencing lagoons or overland-flow plots, in lieu of chain-link or board fencing required by paragraphs (1) and (2) of this subsection.~~

(c)~~(d)~~ A wastewater treatment facility ~~facility~~ must be accessible by truck during all weather conditions, including a 25-year, 24 hour rainfall event, and must have at least one all-weather access road with the driving surface situated above the 100-year flood plain.

§217.329. Color Coding of Pipes.

(a) A new wastewater treatment facility ~~facility~~ must have color-coded pipes in accordance with subsection (e) of this section.

(b) A new wastewater treatment facility ~~facility~~ must have detectable underground warning ~~tracer~~ tape for each non-metallic underground pipe.

(c) An existing wastewater treatment facility ~~facility~~ must color-code and install detectable underground warning~~tracer~~ tape for each pipe associated with an alteration ~~a material alteration~~ or expansion.

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(d) A non-potable water pipe must be painted purple and be stenciled "NON-POTABLE WATER, DO NOT DRINK" and "NO BEBA EL AGUA."~~"NON-POTABLE WATER" or "UNSAFE WATER."~~

(e) A wastewater treatment facility ~~facility~~ design must use the following color-coding for new pipes:

(1) sludge - brown;

(2) natural gas - red;

(3) potable water - light blue;

(4) chlorine - yellow;

(5) sulfur dioxide - lime green with yellow bands;

(6) sewage - grey;

(7) compressed air - light green;

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(8) heated water - blue with 6 inch red bands spaced 30 inches apart;

(9) power conduit - in compliance with the National Electric Code;

(10) reclaimed water - purple;

(11) instrument air - light green with dark green bands;

(12) liquid alum - yellow with orange bands;

(13) alum (solution) - yellow with green bands;

(14) ferric chloride - brown with red bands;

(15) ferric sulfate - brown with yellow bands;

(16) polymers - white with green bands;

(17) ozone - stainless steel with white bands;

(18) raw water - tan; and

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(19) effluent after clarification - dark green.

§217.330. Public Drinking Water Supply Connections.

(a) A connection between a ~~public~~ drinking water supply system and any part of a wastewater treatment facility or collection system must be made through an air gap or a reduced-pressure ~~principle~~ backflow ~~prevention~~ assembly (RPBA) in accordance with American Water Works Association (AWWA) Standard C511-97 or AWWA Manual M14.

(b) Each RPBA must be tested and passed annually by a Texas licensed backflow prevention assembly tester. If an RPBA fails an annual test, it must be repaired or replaced, and then retested by a Texas licensed backflow prevention assembly tester.

(c) RPBA test results and maintenance records must be retained at the wastewater treatment facility ~~onsite~~ for at least three years.

(d) Vacuum breakers are required on all washdown hoses.

§217.331. Freeze Protection.

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A horizontal surface subject to freezing temperatures and water accumulation must be sloped to prevent ice formation.

§217.332. Noise Levels.

(a) An area accessed by individuals ~~staff~~ must be designed to comply with 29 Code of Federal Regulations §1910.95 (relating to Occupational Safety and Health Standards).

(b) Removable noise attenuation equipment is prohibited.

§217.333. Confined Spaces.

(a) A design must, to the extent practicable, avoid confined spaces as defined in 29 Federal Code of Regulations §1910.146 (relating to Occupational Safety and Health Standards).

(b) A ventilating manhole must be equipped with a connection for a portable ventilator.

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(c) A confined space entry must be conducted according to the requirements of 29 Code of Federal Regulations §1910.146 (relating to Occupational Safety and Health Standards).

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