The Texas Commission on Environmental Quality (commission) adopts new §§217.1 - 217.17; 217.31 - 217.39; 217.51 - 217.70; 217.91 - 217.100; 217.121 - 217.129; 217.151 - 217.164; 217.181 - 217.193; 217.201 - 217.213; 217.241 - 217.252; 217.271 - 217.283; 217.291 - 217.300; and 217.321 - 217.333.

Sections 217.14; 217.15; 217.17; 217.33; 217.36; 217.37; 217.51; 217.52; 217.54; 217.55; 217.61; 217.62; 217.64 - 217.68; 217.70; 217.91 - 217.94; 217.96 - 217.100; 217.123 - 217.127; 217.129; 217.151; 217.153; 217.154; 217.156 - 217.164; 217.181; 217.184 - 217.193; 217.201; 217.202; 217.204 - 217.213; 217.241 - 217.246; 217.251; 217.252; 217.272; 217.273; 217.275 - 217.283; 217.291; 217.294; 217.297; 217.299; 217.300; 217.324; 217.325; 217.327; 217.330-217.333 are adopted *without changes* to the proposed text as published in the March 14, 2008 issue of the *Texas Register* (33 TexReg 2126) and will not be republished.

Sections 217.1- 217.13; 217.16; 217.31; 217.32; 217.34; 217.35; 217.38; 217.39; 217.53; 217.56 - 217.60; 217.63; 217.69; 217.95; 217.121; 217.122; 217.128; 217.152; 217.155; 217.182; 217.183; 217.203; 217.247 - 217.249; 217.250; 217.271; 217.274; 217.292; 217.293; 217.295; 217.296; 217.298; 217.321 - 217.323; 217.326; 217.328; and 217.329 are adopted *with changes* to the proposed text and will be republished.

BACKGROUND AND SUMMARY OF THE FACTUAL BASIS FOR THE ADOPTED RULES

Adopted new Chapter 217, *Design Criteria for Domestic Wastewater Systems*, has three major goals: implementing the commission's goal of having all water related rules in the 200 series by repealing 30 TAC Chapter 317 and adopting a new chapter; bringing the standards and criteria for wastewater

collection systems and treatment facilities up-to-date with current engineering practices and technology; and updating the rules to reflect the current permitting practices of the commission.

The commission last comprehensively revised Chapter 317 in 1986. Since then, minor revisions in 1988, 1990, and 1994, have addressed specific concerns, but did not seek to bring the whole chapter in line with advances in wastewater technologies. These rules incorporate those advances. Additionally, revisions are needed to address requirements in current wastewater treatment facility discharge permits that are not addressed by Chapter 317 requirements.

These new rules will ease the administrative burden on the commission by providing additional specific criteria for building, expanding, or materially altering wastewater collection systems and treatment facilities. The adopted rules provide minimum design standards for wastewater collection and treatment. The criteria require a licensed professional engineer to design the systems and facilities.

The adopted rules also allow the executive director to approve variances for innovative technology on a case-by-case basis. Approval may include requirements for pilot studies, demonstration projects, and/or performance bonds. If the executive director grants conditional approval and recognizes after a reasonable time that the technology meets the design standards, a performance bond would no longer be required. The objectives of these rules are to ensure that wastewater collection systems and treatment facilities designed using innovative technology will be protective of human health and environment, as well as cost effective.

The adopted rules also provide flexibility for the approval of nonconforming technology, which is defined in this rulemaking as technology that is not addressed in or does not conform to the design criteria in this chapter, but produces effluent that protects human health and environment. The rule also establishes criteria for a treatment facility's use of reclaimed water and establishes design criteria for reclaimed water use, as authorized by 30 TAC Chapter 210, Use of Reclaimed Water.

Adopted new Chapter 217 eliminates the use of appendices. The information that was in Chapter 317 appendices has been incorporated into the body of the rule. This format groups all like requirements together and improves readability.

Until March 1, 2009, the executive director will grant variance requests that meet the design criteria of Chapter 317 for any project that was in its design phase when these rules were adopted. Projects that were in the design phase will not have to be re-engineered. To be granted, variances must be protective of human health and the environment.

A corresponding rulemaking is published in this issue of the *Texas Register* and includes the repeal of Chapter 317, Design Criteria for Sewage Systems.

SECTION BY SECTION DISCUSSION

The adopted rulemaking would repeal Chapter 317. However, the commission will retain some of the existing Chapter 317 requirements and move these requirements to adopted new Chapter 217. For clarity and readability, the adopted rulemaking would reorganize, reformat, and revise Chapter 317 provisions to bring them up-to-date with current agency rule standards regarding style, formatting, and structure. The

adopted rulemaking would amend some of the Chapter 317 requirements and add new requirements that would bring the design criteria up-to-date with current technology and engineering practice.

Many of the modifications to the provisions being moved to Chapter 217 allow increased flexibility in designing wastewater collection systems and treatment facilities. By providing more flexibility in design, a system or facility will be better able to meet the current and future needs of the community for which the system or facility is designed. Owners need more flexibility to meet changing and more site-specific effluent limitations. Increased flexibility will also allow designs to incorporate evolving technology.

The commission adopts the change of the following terms throughout the rule: "pond" to "lagoon;" "plant" to "facility;" "lines" to "pipe;" "sewage system" or "sewerage system" to "collection system;" and "permittee" to "owner." The commission also changed the terms "modify," "modification," "substantially modify," and "substantial modification" to "materially alter" or "material alteration" to use the terminology and definition found in Texas Water Code (TWC), §26.034(b). The commission adopts these changes for consistency with other rules and readability.

Additionally, the commission changed the word "commission" to "executive director" where appropriate in the rule to conform to current agency rule standards. The term "executive director," as defined in 30 TAC Chapter 3, means the executive director of the commission or any authorized individual designated to act for the executive director. The agency uses the term "executive director" in rules to denote any actions carried out by the executive director's staff.

SUBCHAPTER A: ADMINISTRATIVE REQUIREMENTS

Subchapter A consolidates and streamlines the administrative requirements relating to collection systems and treatment facilities.

Adopted new §217.1, Applicability, establishes that Chapter 217 applies to any person who proposes to construct facilities that will collect, transport, treat, or dispose of domestic wastewater. This section contains the specific requirements for the administrative processes that govern the implementation of this chapter. Until March 1, 2009, the executive director will grant variance requests that meet the design criteria of Chapter 317 for any project that is in its design phase when this rule is adopted. This section also states that Chapter 217 does not apply to facilities constructed to comply with non-domestic wastewater permits or constructed under 30 TAC Chapter 285, On-Site Sewage Facilities.

Adopted new §217.2, Definitions, defines terms as used in this chapter. The definitions for these words are consistent with wastewater industry standards.

Adopted new §217.3, Purpose, explains that these design criteria are minimum requirements necessary for domestic wastewater collection, treatment, and disposal systems to meet state water quality standards. In order for the executive director to evaluate a project, the plans, specifications, and reports for a proposed project must meet the requirements of this chapter. The executive director may require more stringent criteria than those in this chapter, if necessary to meet public health and water quality goals.

Adopted new §217.4, Variances, states the requirements for applying for and reviewing variances. The rule clarifies and expands the former Chapter 317 variance requirements.

Adopted new §217.4(a) requires that the report include all requested variances from the requirements of this chapter.

Adopted new §217.4(b) requires that a technical justification be included for any request for a variance.

Adopted new §217.4(c) authorizes the executive director to deny a variance or require additional protective measures if the executive director determines that the variance would result in a potential compromise of public health or environment.

Adopted new §217.4(d) states that the executive director may not grant or approve a variance from any expressed prohibition within this chapter. The executive director determined that the prohibitions in Chapter 217 are necessary to protect public health and environment. The commission adopts this provision to provide notice to the regulated community.

Adopted new §217.4(e) provides that a variance is conditionally approved if the executive director does not notify the owner in writing within 30 days that further information is requested or that the variance is denied. The commission adopts 30 days instead of the 10 days allowed in Chapter 317 to allow sufficient time for the executive director to complete a thorough review of a variance request.

Adopted new §217.4(f) provides that any plans and specifications that do not meet the conditions in subsections (c) and (d) are not eligible for the automatic approval process in subsection (e).

Adopted new §217.4(g) provides that any plans and specifications that include design elements that require an affirmative approval are not eligible for the automatic approval process in subsection (e).

Adopted new §217.5, Plans and Specifications General Requirements, explains how plans and specifications approval relates to wastewater permits.

Adopted new §217.5(a) requires that the effluent limits used as the basis of the plans and specifications for a facility be at least as stringent as the effluent limits in the associated wastewater permit. This requirement ensures that a treatment facility will meet the effluent limits in the current wastewater permit, but allows the owner the flexibility to design to a higher standard to meet future needs, such as population growth, industrial development, more stringent effluent limits, or other contingencies.

Adopted new §217.5(b) expressly states that an owner is not required to submit plans and specifications for a proposed facility prior to the commission issuing a wastewater permit. Under the Chapter 317 rules, the question regarding when plans and specifications must be submitted arose in contested case hearings. This requirement specifically states that an owner has no obligation to submit plans and specifications prior to receiving an issued permit. Because the preparation of plans and specification is costly, the commission will not require an owner to submit them prior to knowing that the facility is authorized and what effluent limits and other conditions the issued permit will ultimately require.

Adopted new §217.5(c) explains that approval of plans and specifications under this chapter does not relieve the owner of the responsibility to obtain a wastewater permit or any other authorization required

by TWC, Chapter 26. The commission has made this provision more specific than the requirement in Chapter 317 so that an owner knows additional authorizations may be needed.

Adopted new §217.5(d) specifies that the executive director's approval of a wastewater permit does not relieve an owner of the responsibility to obtain plans and specifications approval of a facility before commencing construction.

Adopted new §217.5(e) requires that a facility's design meet all the design requirements in the associated wastewater permit. Design requirements are sometimes added to wastewater permits to ensure compliance with specific effluent limitations.

Adopted new §217.6, Submittal Requirements and Review Process, outlines the procedure an owner must follow to submit a project for the executive director's review and the process that the review will take.

Adopted new §217.6(a) enumerates the elements required in the transmittal letter and names the recipients as the executive director and the appropriate regional office. This list is similar to the requirements of Chapter 317 with the exception of an additional requirement to add all requested variances to the transmittal letter.

Adopted new §217.6(b) states that the executive director may review any facility's plans and specifications. This requirement states that although the executive director may not review all plans and specifications, all are subject to review. The commission removed the list of factors that were listed in Chapter 317, because it is not an exhaustive list.

Adopted new §217.6(c) states that an owner is not required to submit plans and specifications unless the owner receives a written request from the executive director within 30 days after submitting a transmittal letter. The commission changed the 10-day approval to 30 days to allow staff adequate time to review a transmittal letter and determine if a full plans and specifications review is warranted.

Adopted new §217.6(d) is a requirement that an owner must respond to a request for additional information or plans and specifications within 30 days after receiving the executive director's request. The 30-day deadline for submittal of plans and specifications or additional information is intended to make the review process more efficient.

Adopted new §217.7, Types of Plans and Specifications Approvals, lists the ways the executive director may approve plans and specifications.

Adopted new §217.7(a) states that a plans and specifications approval does not relieve an owner of the responsibility for designing, constructing, and operating a facility in accordance with commission rules and the associated wastewater permit.

Adopted new §217.7(b) explains that there are three types of plans and specifications approvals that may be granted by the executive director: standard approval for plans and specifications with no requested variances; approval of innovative or nonconforming technologies; and conditional approval based on specific parameters.

Adopted new §217.7(b)(1) requires the executive director grant a standard approval for plans and specifications that comply with all applicable parts of the design criteria listed in these rules.

Adopted new §217.7(b)(2) authorizes the executive director to grant approval for innovative or nonconforming technology after the executive director evaluates the supporting documentation and determines that the innovative or nonconforming technology will be as protective of public health and environment as the design criteria in this chapter.

Adopted new §217.7(b)(2)(A)(iv) authorizes the executive director to require evidence of an acceptable two-year performance bond that insures the performance of the innovative or nonconforming technology. This provision ensures that a wastewater facility will have funds available to replace a failed unit or facility if an innovative or nonconforming technology fails. The provision allows owners the flexibility to use innovative and nonconforming technology without threatening public health or environment.

Adopted new §217.7(b)(3) contains the provisions regarding conditional approvals. A conditional approval grants approval for a set of plans and specifications that the executive director determined may work only in certain circumstances. A conditional approval will contain conditions, stipulations, or restrictions that are necessary to ensure compliance with this chapter and protect human health and environment. The commission removed the following language from the Chapter 217 requirements, "Any conditional approval granted may be issued for a specific set of flow situations, wastewater characteristics, and/or required effluent quality." Because these items are examples, they are more appropriately included in this preamble rather than the rule.

Adopted new §217.8, Municipality Reviews, allows certain municipalities to apply for authorization to perform technical reviews of wastewater collection systems within their boundaries, and incorporates requirements of TWC, §26.034(d) and (e).

Adopted new §217.8(g)(8), requires a municipality whose review authority is revoked to inform all applicants for new projects in its jurisdiction of the requirement to contact the executive director for review and approval. The commission adopts this section to ensure that owners are aware of the proper review authority.

Adopted new §217.9, Texas Water Development Board Reviews, provides that if the Texas Water Development Board (TWDB) reviews and approves plans and specifications, in accordance with TWC, §17.276(d), the owner must send a copy of the approval to the executive director. This section ensures that the agency is aware of facilities approved by the TWDB.

Adopted new §217.10, Final Engineering Design Report, contains the requirements for the final engineering design report (report). The rule provides that the report contain the necessary information for a staff engineer to evaluate a project.

Adopted new §217.10(a) requires that an owner submit a report for each facility or system that is adopted for new construction, expansion, re-rating, or material alteration.

Adopted new §217.10(b) requires that the report be signed, sealed, and dated by the engineer that prepared the report.

Adopted new §217.10(c) requires the report to include information and data used to comply with this chapter or to justify variances.

Adopted new §217.10(d) requires that an owner submit any additional requested information within 30 days after the request. This added requirement makes the plans and specification review process more efficient.

The commission will not include the requirements for a preliminary engineering report from Chapter 317 in adopted new Chapter 217. Staff has found that a preliminary engineering report adds cost and time to the review process, but adds little value. Discussions between staff engineers and design engineers resolve most issues.

In adopted new §217.10(e) the commission specifies a list of what is required in the report for wastewater collection systems. These requirements ensure the executive director has sufficient information to evaluate the proposed plans and specifications. For clarity, the new rule adopts separate lists of required elements in the reports for wastewater collection systems and treatment facilities.

In adopted new §217.10(f) the commission specifies a list of what is required in the report for wastewater treatment facilities. These requirements ensure the executive director has sufficient information to evaluate the proposed plans and specifications. For clarity, the new rule adopts separate lists of required elements in the reports for wastewater collection systems and treatment facilities.

Adopted new §217.11, Construction of an Approved Facility, states that approval of plans and specifications alone do not imply that construction of the facility may begin.

Adopted new §217.11(a) states that construction must not begin on a facility with approved plans and specifications until the executive director issues a wastewater permit, unless the commission authorized the applicant to construct before permit issuance, under TWC, §26.027. In most instances, the wastewater permit will be issued before the plans and specifications review, but this requirement covers the contingency that the review may precede the issuance of the permit. This requirement will not affect collection system construction since there is no corresponding permit for collection systems.

Adopted new §217.11(b) requires an owner to obtain plans and specifications approval before the facility may begin constructing or operating at the next permit phase. This requirement ensures consistency between phases included in the wastewater permit, plans and specifications review, and construction. This requirement will not affect collection system construction since there is no corresponding permit for collection systems.

Adopted new §217.11(c) requires that phased construction of a facility correspond to phases included in the associated wastewater permit. If an owner desires to phase construction differently, the owner must request a variance through the procedure outlined in §217.4. This requirement provides notice that the executive director's approval will be based on the phases approved in the issued wastewater permit. This requirement will not affect collection system construction since there is no corresponding permit for collection systems.

Adopted new §217.11(d) prohibits a collection system or treatment facility from creating a bypass that discharges untreated or partially treated wastewater during construction without a commission order. This requirement provides that construction does not justify a discharge of untreated or partially treated wastewater. This requirement applies equally to treatment facilities and collection systems.

Adopted new §217.11(e) states that an owner must meet the design criteria in effect at the time that the plans and specifications for a new, expanded or materially altered system or facility are submitted to the executive director. This requirement eliminates any ambiguity regarding what design criteria apply to a facility or collection system's plans and specifications. This requirement applies equally to treatment facilities and collection systems.

Adopted new §217.11(f) states that an owner is subject to the design criteria in place at the time a new permit application is submitted or when plans and specifications are submitted for approval if the owner's wastewater permit was allowed to lapse or the owner failed to get a plans and specifications approval when the facility was built.

Adopted new §217.11(g) requires the owner of a collection system to meet the collection system design criteria in effect when it is discovered that the plans and specifications of the system have not been approved. Subsections (f) and (g) prevent an owner from claiming to comply with rules that have been superseded.

Adopted new §217.12, Substantial Design Changes, specifies how to address changes to approved plans and specifications.

Adopted new §217.12(a) defines substantial design change. Minor changes dictated by things such as material substitutions, (e.g., cast aluminum walkways instead of steel) unforeseen site anomalies (i.e., an underground boulder in the path of the collection system), and minor design changes (e.g., installing a board fence instead of a chain link fence) will not be submitted to staff engineers for review. Staff engineers plan to review only those design changes that may affect the way a collection system or a treatment facility operates. Some examples of substantial design changes are adding a treatment unit, switching from chlorine disinfection to ultraviolet disinfection, or including 50 extra connections in a collection system.

Adopted new §217.12(b) requires that the request for approval of a substantial design change include the dated signature and seal of an engineer.

Adopted new §217.12(c) authorizes the executive director to deny the substantial design change or require more stringent criteria as necessary to ensure protection of public health or environment.

Adopted new §217.12(d) notifies the regulated community that the executive director may not approve a design change that violates an expressed prohibition in this chapter.

Adopted new §217.12(e) states that a substantial design change is approved unless the executive director notifies the owner in writing within 30 days that further information is requested or that the substantial design change is denied. The commission adopts 30 days to allow sufficient time for the executive director to review a substantial design change request.

Adopted new §217.13, Final Construction Drawings and Technical Specifications, divides construction drawings for collection systems and treatment facilities into two different paragraphs for clarity.

Adopted new §217.13(a) states that an owner must submit final construction drawings and technical specifications only if requested by the executive director. The executive director will request final construction drawings or technical specifications if there is a question about the treatment facility or collection system's ability to protect human health or environment.

Adopted new §217.13(b) requires that any final construction drawings or technical specifications submitted must include the dated signature and seal of an engineer.

Adopted new §217.13(c) lists the items that must be submitted with the final construction drawings and technical specifications. Because the lists are different for collection systems and treatment facilities and for new, expanded, and materially altered projects, the lists are divided. Section 217.13(c)(1) lists the items for a new collection system; §217.13(c)(2) lists the items for a new treatment facility; §217.13(c)(3) lists the items for a materially altered or expanded collection system; and §217.13(c)(4) lists the items for a materially altered or expanded treatment facility.

Adopted new §217.14, Completion Notice, requires an owner to provide notice to the executive director when construction of a collection system or treatment facility is complete.

Adopted new §217.14(a) lists the elements that must be included in a completion notice.

Adopted new §217.14(b) requires the completion notice to include all deviations from the approved plans and specifications and substantial design changes. The completion notice must also certify that any change not submitted for approval does not qualify as substantial design change.

Adopted new §217.15, Inspection, notifies the regulated community that the executive director may inspect a project at any point during construction to determine compliance with the project's plans and specifications, report, approval letters, or other requirements of this chapter.

Adopted new §217.16, Treatment Facility Operation and Maintenance Manual, states that the requirements for an operations and maintenance manual, including emergency procedures. The rule expands the requirements from Chapter 317 to outline more specifically what is required to ensure enough detail for operators to manage the day-to-day and emergency operation of a facility.

Adopted new §217.17, Collection System Records, requires that a collection system owner keep a specific set of records necessary to facilitate operation during the expected life of the system.

SUBCHAPTER B: TREATMENT FACILITY DESIGN REQUIREMENTS

Subchapter B updates the Chapter 317 treatment facility design requirements. A significant amount of flexibility has been incorporated into the design requirements while maintaining the standard of protecting human health and environment.

Adopted new §217.31, Applicability, contains the design values that must be used to determine the size of any wastewater treatment component. Additionally, this section specifically applies Subchapter B to designs for new treatment facilities, upgrades of existing facilities, and re-ratings of existing facilities.

Adopted new §217.32, Organic Loadings and Flows, states the organic loading and flow values that must be used to design a wastewater treatment facility. This section updates past commission practices and procedures, incorporates new procedures requested by the regulated community, and adds new requirements from Chapter 319, General Regulations Incorporated into Permits.

Adopted new §217.32(a) prescribes the method to determine design requirements if there are no pre-existing loading and flow data on which to base calculations. Table B.1 is included to simplify selection of the correct parameters.

Adopted §217.32(b) authorizes an owner to use data from an existing facility in accordance with §217.33, Flow Measurement, when constructing a new facility to serve the same area as an existing facility with sufficient historical data. This requirement allows the design of a wastewater treatment facility to be based on actual data.

Adopted new §217.33, Flow Measurement, outlines the requirements for flow measurement in a treatment facility. Accurate flow measurement is necessary for both reporting and efficient operations.

Adopted new §217.33(a) requires that each facility have a method to accurately measure effluent flow.

Adopted new §217.33(b) requires that the flow-measuring device be located for easy inspection and maintenance.

Adopted new §217.33(c) lists the requirements for primary and secondary flow-measuring devices.

Adopted new §217.34, Re-Rating, Expanding, or Materially Altering an Existing Facility, authorizes existing facilities that are being materially altered, expanded, or re-rated to meet new permit conditions to justify the size of existing or proposed treatment components by using historical data as the design basis. This section updates past commission practices and procedures and adds new requirements from Chapter 319.

Adopted new §217.34(1) lists the requirements that flow data must meet before being used as the basis for design criteria.

Adopted new §217.34(2) lists the requirements that loading data must meet before being used as the basis for design criteria.

Adopted new §217.35, One Hundred-Year Flood Plain Requirements, lists the requirements related to a treatment facility located in or near a flood plain.

Adopted new §217.35(a) requires that the site plan for a proposed wastewater facility include the 100-year flood plain if there is a 100-year flood plain within 1,000 feet of the proposed site. The subsection further outlines the requirements for the 100-year flood plain determination. The subsection also states

that Federal Emergency Management Agency maps are prima facie evidence of flood plain locations. The owner must determine the elevation and design to prevent flood damage to the facility or allow unanticipated discharges of untreated or partially treated wastewater.

Adopted new §217.35(b) requires that the hydraulic profile of the wastewater facility show the 100-year water surface elevation. This requirement is to enable the commission to confirm the protection of all units and the ability of the facility to operate during a 100-year flood event.

Adopted new §217.35(c) prohibits the executive director from approving a proposed treatment unit within the 100-year flood plain unless satisfactory measures to protect all open process tanks and electric units are provided as part of the proposed design. This requirement provides notice to the regulated community that protection from a 100-year flood event is required.

Adopted new §217.36, Emergency Power Requirements, outlines the requirements for emergency power supply for treatment facility components.

Adopted new §217.36(a) requires that an owner obtain the power outage records from the appropriate power company(s) showing the reliability of the power service for the facility. Chapter 317 required the commission to collect the data. The owner has the responsibility to provide the records regarding the power service reliability to the executive director.

Adopted new §217.36(b) requires the power reliability documentation to be included in the report. The executive director will then review the documentation and determine the power service's reliability.

Adopted new §217.36(c) lists the required procedure when the executive director determines that the power supply is unreliable. The commission requires the facility to incorporate an on-site, automatically-starting generator, capable of ensuring continuous operation of all critical facility components for a period equal to the longest power outage in the power records if the executive director determines the power supply is unreliable.

Adopted new §217.36(c)(4) contains the exceptions to the auxiliary power generator requirements for wastewater treatment facilities and off-site lift stations. Included in this paragraph are the requirements for qualifying for an exemption to the requirement for an automatically-starting generator. These requirements were not in Chapter 317. The new requirements are to ensure the disinfection units can operate during a power outage, a minimum air supply is maintained, and pumping requirements are met to prevent an unauthorized discharge into or adjacent to water in the state.

Adopted new §217.37, Disinfection System Power Reliability, contains additional requirements for power reliability and emergency power for disinfection units because their operation is vital even under emergency conditions.

Adopted new §217.38, Buffer Zone and Odor Abatement, lists the requirements for buffer zones and other abatement requirements to manage odor.

Adopted new §217.38(a) states that the buffer zone restrictions in §309.13 apply to all construction of wastewater treatment facilities.

Adopted new §217.38(b) requires the report include any design for odor abatement facilities intended to attain compliance with permit buffer zone requirements. This provision ensures that this information is included in the report and available for staff review.

Adopted new §217.38(c) requires that the executive director consider all odor abatement measures as nonconforming or innovative technologies and review them on a case-by-case basis under §217.7(b)(2), because of the site-specific nature of potential odor issues for a wastewater treatment facility.

Adopted new §217.39, Facility Use of Reclaimed Water, requires the use of reclaimed water for equipment washing and irrigating the treatment facility grounds. It also requires the use of use reclaimed water for any other suitable purpose. An owner may make a determination of other suitable uses based on water quality requirements, such as for chemical mixing, or cost of infrastructure or additional treatment required.

Adopted new §217.39(a) specifies that all facilities designed after the effective date of these rules must use reclaimed water in place of potable water for wash down water and for irrigating the facility grounds. The commission adopts this requirement as a measure to conserve potable water and to be consistent with Chapter 210.

Adopted new §217.39(b) requires that reclaimed water be metered. This requirement is included so that accurate effluent flows for the facility can be determined, since reclaimed water is considered part of the total effluent flow.

Adopted new §217.39(c) requires that water be disinfected before it can be reclaimed for use at the facility. This requirement is included to protect the health of the facility staff and to prevent degradation of any adjacent surface water or groundwater.

Adopted new §217.39(d) authorizes an owner to use water that meets the requirements of either Type I or Type II reclaimed water for any appropriate use. This subsection allows an owner the flexibility to design a reclaimed water system that fits the needs of a particular treatment facility.

Adopted new §217.39(e) reiterates that no further authorization is necessary to use reclaimed water at a treatment facility, provided the requirements in this section are met.

SUBCHAPTER C: CONVENTIONAL COLLECTION SYSTEMS

Subchapter C expands and updates the design requirements for collection systems. This subchapter also adds flexibility, while protecting human health and environment. Alternative collection systems have been separated from conventional collection systems and given their own subchapter.

Adopted new §217.51, Applicability, states that this subchapter covers the design, construction, and testing standards for conventional gravity wastewater collection systems, conventional wastewater lift stations, force mains, and reclaimed water conveyance systems.

Adopted new §217.52, Edwards Aquifer, notifies the regulated community that all wastewater collection systems located over the recharge zone of the Edwards Aquifer must be designed and installed following the requirements of Chapter 213, Edwards Aquifer, in addition to the requirements in these rules.

Adopted new §217.53, Pipe Design, establishes the requirements for all collection system designs, including but not limited to flow design and pipe material. This section specifies requirements for separation distances between wastewater pipes and drinking water pipes, laterals and traps, odor and corrosion control, and structural analysis of flexible and rigid pipe.

Adopted new §217.53(a) specifies the flow design basis for collection systems and the required calculations. This subsection formalizes the existing staff review procedures by specifying the computations involved in determining the flow design basis for collection systems.

Adopted new §217.53(b) specifies that the report must identify the proposed collection system pipes with their appropriate standard numbers for both quality control and installation. This subsection also specifies that quality control includes dimensions and tolerances and that installation includes bedding and backfill. This subsection also lists the considerations for choosing collection system pipes.

Adopted new §217.53(c) lists the requirements for pipe joints. The technical specifications must include the materials and methods used in making joints. This subsection also requires that the technical specifications include an appropriate national reference standard for the joints. This requirement ensures that the executive director has sufficient information to review the joint construction.

Adopted new §217.53(d) requires that the wastewater pipes and manholes maintain certain separation distances from potable water pipes to protect potable water from cross contamination from wastewater.

Adopted new §217.53(e) requires that laterals and taps on a new collection system include manufactured fittings that limit infiltration, prevent protruding service pipes, and protect the mechanical and structural integrity of the collection system. This requirement ensures the mechanical and structural integrity of the collection system. An unprotected pipe may have a higher incidence of infiltration, which could lead to sanitary sewer overflows or hydraulic overload of the treatment facility.

Adopted new §217.53(f) requires that the spacing of supports for carrier pipe through casings ensure and maintain grade, slope, and structural integrity as required by §217.53(k) and (l). This requirement ensures that the carrier pipe has the same slope as the collection system pipe.

Adopted new §217.53(g) specifies that if a pipe deteriorates when subjected to corrosive internal conditions, the collection system must incorporate a corrosion-resistant liner installed by the pipe manufacturer, unless the report demonstrates that the design and operational characteristics of the facility will maintain the structural integrity for at least 50 years.

Adopted new §217.53(h) contains requirements for odor control. If wastewater does not always flow at a constant rate through the pipes, there is a potential for odors. This requirement ensures that potential odors are controlled throughout the life of the collection system.

Adopted new §217.53(i) contains the requirements for laying a collection system near active geologic faults. This subsection requires an owner to locate any active faults within the area of the collection system and minimize the number of pipes crossing faults. This requirement states that the design must use joints that provide maximum deflection and manholes on both sides of a fault so that a portable pump may be used in the event of a collection system failure. Section 217.53(i)(2) states that no collection system service connection may be installed within 50 feet of an active fault. In Chapter 317, both of these provisions were optional. The executive director determined that these requirements are needed to ensure the protection of human health and the environment.

Adopted new §217.53(j) requires that a collection system have the capacity for the service area during the expected life of the system. For example, if there are 100 houses currently in the subdivision with another 100 to be added during the next 10 years, the collection system must be designed to handle 200 houses. This subsection lists the considerations necessary to successfully size a collection system. The considerations are population; institutional, industrial, and commercial flows; peak flows; surcharges; minimum pipe diameters; and storm water drains. The prohibition against allowing storm water in a wastewater collection system is added to be consistent with §281.25 and 40 Code of Federal Regulations (CFR) §122.26.

Adopted new §217.53(k) states the structural analysis requirements for collection systems. Their design must provide a minimum structural life expectancy of 50 years. This subsection also requires an owner to provide inspection during the construction and testing phases of the project. This subsection includes definitions and design analysis requirements for both flexible and rigid pipes.

Adopted new §217.53(l) states the requirements for minimum and maximum slopes to ensure that gravity collection systems flow correctly.

Adopted new §217.53(m) states the alignment requirements for collection systems. The commission will prohibit variances from uniform grade, grade breaks, and vertical curves, without manholes with open cut construction and prohibit construction methods that use flexure of a pipe joint. The prohibitions are necessary to protect human health and environment.

The rule authorizes horizontal pipe curvature if supporting calculations are included in the report and the plans. The executive director receives frequent requests for this type of variance. The rule allows this type of construction with proper safeguards, because it is not always possible to construct straight pipes due to topographic features. The rule sets 300 feet as the maximum allowable manhole spacing for sewers with horizontal curvature and requires that a manhole must be at the point of curvature and point of termination of each curve. These manhole spacing requirements are consistent with §217.55(a)(1).

Adopted new §217.53(n) enumerates the requirements for inverted siphons and sag pipes, including sizing, cleaning, velocity, odors, and testing.

Adopted new §217.53(o) contains requirements for bridged sections. These requirements give the regulated community criteria to design bridged pipelines and allow the executive director to perform consistent reviews of bridged sections.

Adopted new §217.54, Criteria for Laying Pipe, establishes the requirements for pipe embedment material, embedment compaction, envelope size, and excavated trench width. Proper pipe construction is necessary for proper operation and life expectancy of a collection system. This provision will protect human health and the environment.

Adopted new §217.55, Manholes and Related Structures, explains manhole placement, size, structure, types, spacing, and the size increase of a manhole opening. This section requires that manholes be placed at all points of change in alignment, grade, or size of the collection system and lists specific design requirements for manholes. The rule specifies spacing for straight alignment and uniform grade, with modifications in areas subject to flooding. The inside diameter of manhole openings is specified, as well as size of manhole covers and design requirements for manholes in the 100-year floodplain. This section also provides the design specifications for manhole inverts, connections, vents, and cleanouts.

Adopted new §217.55(k) changes the minimum clear opening from 24 inches required in Chapter 317 to 30 inches in diameter for a manhole where personnel entry is anticipated. This diameter requirement will ease the entry of personnel and equipment and provide additional safety when necessary for sewer maintenance and repairs. Additionally, the rule specifies that the opening must be free of any obstructions.

Adopted new §217.55(l)(1)(D) requires that a manhole cover located in a public or private roadway meet the American Association of State Highways and Transportation Officials (AASHTO) standard M-306 in relation to load bearing. The commission adopts this new standard to ensure that manhole covers are strong enough to support vehicle traffic. This standard protects vehicles and the integrity of the manholes.

Adopted new §217.55(m) prohibits steps in a manhole. The environment inside a manhole may be corrosive and cause the steps to deteriorate.

Adopted new §217.55(n) contains the requirements for connections made within and to a manhole.

Adopted new §217.55(o) requires vents be located above the 100-year flood elevation to prevent flooding, and that tunnel venting requirements are consistent with manhole venting requirements.

Adopted new §217.55(p) requires that cleanouts are equal in size to the collection main to allow the cleaning equipment to fit into the cleanouts.

Adopted new §217.56, Trenchless Pipe Installation, describes the trenchless technologies that may be approved through the standard approval process. Trenchless methods other than those listed in this section are subject to the nonconforming technology approval process.

Adopted new §217.57, Testing Requirements for Installation of Gravity Collection Pipes, requires that the design specify an infiltration, exfiltration, or low-pressure air test and that test results are submitted to the executive director upon request. This section also contains the testing requirements. The section requires that a pipe be retested following any remediation action to clarify that a test must ensure that the remediation action was successful.

Adopted new §217.58, Testing Requirements for Manholes, requires that all manholes must pass a leak test and outlines the requirements for leak-testing a manhole. The commission modified these requirements from Chapter 317 by requiring the test to be run after assembly and backfilling the manholes. These requirements conform to the wastewater industry standards for manhole testing and allow an owner to select an appropriate testing method.

Adopted new §217.59, Lift Station Site Requirements, establishes the criteria for lift station sites. They ensure accessibility by authorized personnel only, protection from 100-year flood events, and minimization of odors.

Adopted new §217.60, Lift Station, Wet Well, and Dry Well Designs, establishes criteria for pump controls, flood protection, wet wells, lift station ventilation (including passive ventilation for wet wells and mechanical ventilation in lift stations), wet well slope, hoisting equipment, dry well/vault valve drains, and dry well sump pumps. These requirements ensure proper operations, prevent sanitary sewer overflows, and protect the safety of the surrounding community.

Adopted new §217.61, Lift Station Pumps, establishes general requirements for the pumps that may be used in lift stations. This section incorporates current engineering practices.

Adopted new §217.61(a) requires that all raw wastewater pumps must be capable of passing a sphere equal to or greater than 2.5 inches in diameter.

Adopted new §217.61(b) states that pump design must accommodate easy removal of the rotation elements.

Adopted new §217.61(c), (d), and (e) add requirements to ensure that a lift station does not pump more water into a treatment facility than it can process, unless flow splitting or equalization is provided.

Adopted new §217.61(f) specifies how a self-priming pump must be designed for a collection system.

Adopted new §217.61(g) specifies the provisions for vacuum priming pumps that allow flexibility in selecting pumps for lift stations.

Adopted new §217.61(h) specifies the requirements for vertical positioning of pumps. Because the commission added vacuum-primed pumps in §217.61(g), the rule includes them as exempted pumps for consistency with the requirements for self-priming pumps.

Adopted new §217.61(i) states that a grinder pump that is privately owned, maintained, and operated and serves only one structure is not subject to this chapter because it is considered part of the plumbing of the structure and not part of the collection system.

Adopted new §217.61(j) sets the standards for a pump for a low-flow lift station so that odors do not collect.

Adopted new §217.62, Lift Station Pipes, establishes requirements for pump suctions, valves, and pipes that must be used in the design of lift stations. The rule allows flexibility in the design of lift station piping.

Adopted new §217.63, Emergency Provisions for Lift Stations, establishes provisions for handling a lift station failure. This section incorporates current engineering practices and requires lift station designs to prevent water pollution in the event of an overflow or discharge of raw wastewater.

Adopted new §217.63(e) prohibits the use of spill containment structures to provide service reliability, but authorizes a spill containment structure if service reliability is provided by another approved method.

Adopted new §217.64, Materials for Force Main Pipes, establishes the requirements for materials used for force main pipe. The rule requires that the force main pipes material must withstand the pressure generated by instantaneous pump stoppage due to power failure under maximum pumping conditions.

Adopted new §217.65, Force Main Pipe Joints, incorporates current engineering practices for joints of force mains in buried service. This section requires that joints have either push-on rubber gaskets or be mechanical joints with a pressure rating equal to or greater than the pipe material. Additionally, this section requires that exposed joints be flanged or flexible and adequately secured to prevent movement due to surges. National reference standards for the joints must be included in the project specifications. These requirements specify force main pipe joint requirements for the regulated community.

Adopted new §217.66, Identification of Force Main Pipes, requires a detector metal tape in the same trench above and parallel to the force main. The words "pressurized wastewater" must be repeated continuously on the tape in letters at least 1.5-inch high. The commission adopts this requirement to ensure that the pipe can be located by conventional equipment and by sight.

Adopted new §217.67, Force Main Design, specifies the requirements for velocities, detention time, water hammer from surges, gravity main connections, pipe separation distances, odor control, and air release valves in force main design to reflect current engineering practices and standards.

Adopted new §217.68, Force Main Testing, explains the required pressure testing procedures for force mains. To simplify the calculation for the minimum test pressure, the design pressure was set at 50 pounds per square inch (psi) above the normal operating pressure of the force main.

Adopted new §217.69, Reclaimed Water Facilities, states the requirements for the design of distribution systems that will convey reclaimed water to a user. These requirements are written for consistency with Chapter 210, Use of Reclaimed Water.

Adopted new §217.70, Storage Tanks for Reclaimed Water, is the design requirements for both elevated and ground-level storage tanks. These requirements are written for consistency with the storage requirements in Chapter 210, Use of Reclaimed Water, and Chapter 331, Underground Injection Control.

SUBCHAPTER D: ALTERNATIVE COLLECTION SYSTEMS

Subchapter D expands the requirements for alternative collection systems so that more of these systems can be given a standard review and approval. Under Chapter 317, many of these systems required review and approval under the variance, nonconforming, or innovative technology sections. These rules expand the criteria to provide the owner of an alternative collection system more options for design, management, and oversight of the system.

Adopted new §217.91, Edwards Aquifer, notifies the regulated community that the design of alternative collection systems must comply with Chapter 213, Edwards Aquifer, in addition to the requirements in this chapter.

Adopted new §217.92, Component Sizing, uses current engineering practices to establish that component size must be based on existing flow data from similar systems and service areas whenever such data is available. It contains the formulas for sizing components if there is no comparable data. This section also prohibits roof, street, or other types of drains that permit entrance of storm water runoff into the wastewater collection system because combined collection systems are prohibited by §281.25 and 40 CFR §122.26.

Adopted new §217.93, General Requirements, subsection (a) states that, except where specifically stated in this subchapter, designs for alternative wastewater collection systems must comply with the applicable requirements of Subchapter C, in addition to the requirements of Subchapter D.

Adopted new §217.93(b) requires the owner to prepare a manual that specifies the operating procedures and maintenance practices for each alternative wastewater collection system.

Adopted new §217.93(c) ensures compliance with subsection (b).

Adopted new §217.94, Management, states the requirements for management of an alternative collection system by making them specific. This provision will allow the owner of an alternative collection system to know more precisely what is required for managing these types of systems.

Adopted new §217.94(a) requires that an alternative wastewater collection system discharge to wastewater facility permitted by the commission.

Adopted new §217.94(b) authorizes the owner of an alternative wastewater collection system to operate the system or to contract for management and operation services with a public or private service provider. The owner may terminate the contract if the provider's services are in conflict with the contract requirements, the wastewater permit, the requirements of this chapter, or other commission rules. These requirements provide owner flexibility in the management of an alternative collection system.

Adopted new §217.94(c) exempts grinder pumps and septic tank effluent pumps discharging directly into a conventional wastewater collection system because these items are considered part of a service lateral pipe and not part of the alternative collection system.

Adopted new §217.95, Service Agreements, specifies the requirements for alternative collection system service agreements and establishes that a service agreement must be executed between the system owner and the service provider. These requirements eliminate inconsistencies regarding how the rule is

interpreted. In the past, the executive director has received questions and reviewed submissions regarding the interpretation of these provisions on a case-by-case basis.

*Adopted new §217.96, Small Diameter Effluent Sewers***,** establishes the criteria for the components of a Small Diameter Effluent Sewer, including interceptor tank design, pre-treatment units, tank monitoring, service pipe design, and collection system design, including hydraulic design and vertical alignment.

Adopted new §217.96(a) contains the requirements for interceptor tank design. These requirements were added to ensure consistency with Chapter 285, On-Site Sewage Facilities.

Adopted new §217.96(b) adds requirements for pretreatment units to prevent fats, oils, grease, and sludge from entering the collection system.

Adopted new §217.96(c) contains requirements to ensure that service pipe design conforms to standard engineering practices.

Adopted new §217.96(d) contains requirements for an acceptable SDES design, including hydraulic and vertical design, and to ensure that the executive director can determine compliance with these requirements.

Adopted new §217.97, Pressure Sewers, contains requirements that establish the design criteria for pressure sewers, including pumps service pipes, on-site mechanical equipment, discharge pipes and the

collection system. These requirements are included because of questions from the regulated community regarding pressure sewer requirements. These requirements conform to standard engineering practices.

Adopted new §217.98, Vacuum Sewer Systems, brings the provisions for vacuum sewer systems up-to-date with current technology and industry standards. The requirements in this section clarify that a vacuum sewer system is nonconforming technology and may be reviewed by the executive director in accordance with §217.7(b)(2). Historically, the design criteria rules have not contained specific provisions regarding vacuum sewers and the staff has answered questions on a case-by-case basis or reviewed requests for variances for vacuum sewers. These requirements standardize the requirements for vacuum sewers and eliminate the need for many variances.

Adopted new §217.99, Testing Requirements, requires testing all components of an alternative collection system for leaks. These provisions set the minimum testing requirements that conform to standard engineering practices.

Adopted new §217.100, Termination, requires that an alternative collection system terminate at a treatment facility or into a conventional collection system. It also outlines the parameters of the connection between an alternative collection system and a treatment facility or conventional collection system.

SUBCHAPTER E: PRELIMINARY TREATMENT UNITS

Subchapter E creates a separate place for the requirements relating to the first units in a treatment facility. Chapter 317 combined all treatment facility design requirements into one section. This subchapter allows for better, clearer organization and explanation of the requirements for these units.

Adopted new §217.121, Coarse Screening Devices, specifies that all wastewater treatment facilities must use a coarse screening device, unless otherwise provided in this chapter. This section also incorporates new safety and design requirements for coarse screening devices, including location, screen openings, hydraulics, and corrosion resistance of screens and related structure. These requirements protect the process units in the facility because coarse screening devices prevent large debris from entering the treatment units.

Adopted new §217.122, Fine Screening Devices, provides a definition for a fine screen that conforms to industry standards and explains that, although not required, fine screens may be used in lieu of coarse screens, because of improved technology. This section also provides the circumstances under which it is acceptable to use a fine screen in lieu of a primary sedimentation unit. These requirements incorporate improved technology and ensure consistency with new design parameters.

Adopted new §217.123, Screenings and Debris Handling, specifies that all screenings and debris collected must be managed and disposed of in accordance with 30 TAC Chapter 330, Municipal Solid Waste.

Adopted new §217.124, Grit Removal Systems, requires that all treatment facilities using anaerobic digesters must have grit removal systems, because grit can damage anaerobic digesters. Grit removal must

occur prior to an anaerobic digester to ensure that as little inert material as possible enters the anaerobic digester. The rule also defines what constitutes grit removal and makes grit removal optional for other facilities.

Adopted new §217.125, Grit Chambers, updates the Chapter 317 requirements and adds new requirements for horizontal flow grit chambers, aerated grit chambers, mechanical grit chambers, cyclonic degritters, and vortex chambers. These requirements are based on manufacturer's recommendations and standard engineering practices.

Adopted new §217.126, Grit Handling, explains the requirements for grit washing, storage, and disposal.

Adopted new §217.127, Pre-aeration Units, authorizes pre-aeration to be used for odor control, flocculation of solids, reducing septicity, grease separation, and promoting uniform distribution of solids to clarifiers. It also requires the report to include the basis for pre-aeration system designs. These requirements clarify when a facility requires a pre-aeration unit.

Adopted new §217.128, Flow Equalization Basins, explains design requirements for determining when a flow equalization basin must be used, and the mixing, aeration, volume and pumped flow requirements of equalization basins. These requirements ensure that facilities can handle periodic high flows.

Adopted new §217.129, Primary Clarifiers, establishes the design criteria for primary clarifiers, including the requirements for inlets, scum removal, effluent weirs, basin sizing, including the maximum surface loading at peak flow, maximum surface loading at design flow, minimum effective detention time at peak

flow, and minimum effective detention time at design flow. The requirements for final clarifiers are in Subchapter F for better organization of the requirements. This section also includes the requirements for sidewater depth, freeboard, drains, accessibility, 5-day biochemical oxygen demand (BOD_5) removal, sludge pumping, and sludge pipes.

SUBCHAPTER F: ACTIVATED SLUDGE SYSTEMS

Subchapter F explains the requirements for activated sludge systems, which comprise the majority of treatment facilities. Rule provisions are included to address new technologies, such as sequencing batch reactors and membrane bioreactor systems and other rule provisions are included to allow for flexibility in design methods, such as the volume flux method.

Adopted new §217.151, Requirements for an Aeration Basin, provides the requirements for minimum dissolved oxygen concentration in aeration basins and alternate aeration basin volumes. The requirements ensure that the contents of the basin are thoroughly mixed, allow flexibility in the design of aeration basins, and prohibit the use of contact stabilization for nitrification. These requirements meet current engineering standards for aeration basins.

Adopted new §217.152, Requirements for Clarifiers, provides the requirements for activated sludge clarifier components such as inlets, scum removal, effluent weirs, sludge pipes, sludge collection equipment, pumped inflow, side water depth, and redundancy. This section also provides restrictions on hopper bottom clarifiers, prohibits designs that allow short-circuiting of influent or effluent weirs, and specifies the calculations that are required to determine return sludge pumping capacity. Additionally, the

language notes that the sludge digester or disposal methods must comply with 30 TAC Chapter 312, Sludge Use, Transportation, and Disposal.

Adopted new §217.153, Requirements for Both Aeration Basins and Clarifiers, lists the requirements related to construction material, freeboard, redundancy, and flow control that are common to both aeration basins and clarifiers.

Adopted new §217.154, Aeration Basin and Clarifier Sizing--Traditional Design, subsection (a) provides the standard design values to be used to size aeration basins and clarifiers when using the traditional design approach.

Adopted new §217.154(b) contains the requirements for aeration basin sizing. The size of an aeration basin must be based on the organic loading of the influent and the permitted effluent limits. The aeration basin volume must be calculated to ensure that the organic loading on the aeration basins does not exceed a rate that might cause a violation of permitted effluent limits. This requirement also authorizes loading rates to vary from the requirements of this section, if justified in the report.

Adopted new §217.154(c) contains the requirements for clarifier sizing. It establishes the maximum surface loading rates and the minimum detention times used to determine the size of an activated sludge clarifier.

Adopted new §217.155, Aeration Equipment Sizing, updates, explains, and adds flexibility to the methods for achieving the proper oxygenation of the wastewater by mechanical or diffused aeration systems. It

includes processes formerly considered nonconforming or innovative technologies that have become industry standards. This will streamline the review process and allow the executive director to grant a standard approval to facilities that would have needed a variance under Chapter 317.

Adopted new §217.156, Sequencing Batch Reactors, explains the design criteria for Sequencing Batch Reactors (SBRs), including the number of basins and tanks, aeration requirements, utilization of duplicate controllers, measures for flow variation, and decanting devices. These requirements allow greater flexibility in SBR design options. Staff has identified a trend of increased use of these designs in Texas. SBRs have a significant appeal for small communities because a properly designed SBR can achieve a high degree of treatment at a reduced cost. In order to ensure protection of human health and environment, the rules codify the standards for SBRs that the executive director currently uses to review these designs.

Adopted new §217.157, Membrane Bioreactor Systems, outlines the requirements for Membrane Bioreactor Systems (MBRs) that were considered innovative technology in Chapter 317. MBRs have gained wide acceptance in the wastewater industry. Including standards for these systems informs the regulated community of the standards the executive director will use to review these systems. It also authorizes the executive director to grant a standard approval for MBRs that meet these requirements instead of reviewing each facility for a variance on a case-by-case basis. Standards for these requirements were based on information gathered from other states' rules and numerous engineers, consultants, and vendors experienced in MBR design and operation.

Adopted new §217.157(a) is the applicability statement. It includes the notice that an MBR that does not meet the requirements of this section is innovative technology and is subject to approval under §217.7(b)(2).

Adopted new §217.157(b) contains the acceptable performance standards for MBRs. Any design based on performance standards greater than the ones in this subsection must be justified by supporting data.

Adopted new §217.157(c) contains the design standards for both flat plate and hollow tube MBRs, including parameters for pretreatment, biological treatment, aeration, recycle rates, nutrient removal, use of membranes, membrane design, supporting data, redundancy, other equipment, and disinfection.

Adopted new §217.157(d) contains the standards for operating an MBR including membrane cleaning, operational parameters, and control instrumentation.

Adopted new §217.157(e) outlines the requirements for the use and disposal of chemicals associated with an MBR.

Adopted new §217.157(f) ensures that operators assigned to an MBR are trained and familiar with its operation.

Adopted new §217.157(g) requires an MBR to be covered by a warranty and authorizes the executive director to require a performance bond if there is a question about the MBR's ability to perform to the standards of this chapter.

Adopted new §217.158, Solids Management, specifies the requirements for properly handling sludge within the treatment facility, including recycling, monitoring, wasting, solids blanket, return activated sludge pump design, waste activated sludge pump design, and piping.

Adopted new §217.158(a) requires that the return sludge system operate satisfactorily at all anticipated flow conditions in order to protect human health and environment.

Adopted new §217.158(b) requires adequate equipment to store and/or process the waste activated sludge under all flow conditions. Staff experience has shown that some small facilities did not have adequate sludge wasting equipment, causing unauthorized discharges into waters in the state. This provision prevents this shortcoming to protect human health and the environment.

Adopted new §217.158(c) and (d) contains the sludge pump requirements. This requirement ensures that the facility will be able to pump sludge under all conditions with the largest pump out of service and is consistent with other redundancy requirements in this chapter.

Adopted new §217.158(e) includes the standards for the design of the sludge pipe system that include provisions to address cleaning, flushing, solids settling, and scouring.

Adopted new §217.159, Process Control, provides the criteria for implementing solids retention time (SRT) control and aeration system control.

Adopted new §217.159(a) requires that an activated sludge facility be designed with the necessary equipment for an operator to control the SRT in the aeration tanks by wasting a measured volume of surplus activated sludge regularly. The report and the operating manual must provide the formulas for determining the SRT. This requirement was added because an operator must manage for an activated sludge facility to operate properly.

Adopted new §217.159(b) lists the requirements for aeration control. A facility may be designed to adjust the airflow in proportion to the biological loading of the influent. If this type of control is installed, the aeration equipment must be easily adjustable and must maintain solids in suspension. This requirement allows flexibility in designing aeration controls and conserves energy.

Adopted new §217.160, Operability and Maintenance Requirements, explains the requirements of having equipment that is designed to operate at the temperature extremes of the facility location, being accessible to staff for operation and maintenance, and being housed in facilities with adequate room for removal, repair, and installation. This section was added in response to problems encountered.

Adopted new §217.161, Electrical and Instrumentation Systems, establishes power supply requirements for facility equipment, safety requirements for electrical equipment, and design standards for alarm systems for malfunctioning equipment. These requirements ensure that a facility is monitored and protected from vandalism, natural disasters, power interruptions, and equipment failures.

Adopted new §217.162, Internal Process Flow Measurement, requires facilities with design flows greater than 400,000 gallons per day to include process flow measurement. An operator must be able to

determine the return rates and flow rates to properly operate the facility. This requirement addresses this operational need.

Adopted new §217.163, Advanced Nutrient Removal, provides the requirements for including processing units that removed nutrients other than the standard effluent set (total suspended solids, biochemical oxygen demand, ammonia-nitrogen). Chapter 317 considered advanced nutrient removal innovative technology, but technology has improved and advanced nutrient removal is required at many facilities. It authorizes the executive director to grant a standard approval for advanced nutrient removal designs that meet these requirements instead of reviewing each facility on a case-by-case basis. Standards for these requirements were based on information gathered from other states' rules and numerous engineers and consultants.

Adopted new §217.164, Aeration Basin and Clarifier Sizing--Volume-Flux Design Method, provides an alternative method to determine the size of aeration basins and clarifiers. This requirement was added to allow flexibility in designing a treatment facility and is needed to ensure that the volume-flux design methods are consistent with sound engineer practice. The volume-flux design approach is as protective of human health and the environment as the traditional design method.

SUBCHAPTER G: FIXED FILM AND FILTRATION UNITS

Adopted new §217.181, Applicability, states that this subchapter applies to trickling filters, rotating biological contactors, submerged biological contactors, and filtration systems.

Adopted new §217.182, Trickling Filters--General Requirements, states the general requirements for the use of trickling filters, which are secondary aerobic biological processes used for treatment of wastewater. This section defines biofilters or biotowers as trickling filters that use random or stackable modular synthetic media. This section also provides requirements for determining process applicability and pretreatment requirements.

Adopted new §217.182(a) contains the requirements for process applicability and explains that trickling filters are classified according to applied influent hydraulic and organic loadings.

Adopted new §217.182(b) contains the requirements for trickling filter classification and classifies trickling filters based loading rates. In Chapter 317, trickling filters were distinguished based on their role in treatment. These requirements specify the different types of trickling filters according to their capacity.

Adopted new §217.182(c) contains Table G.1, which contains the hydraulic and organic loadings for different classes of trickling filters. The values in the table update the standards for consistency with current technology.

Adopted new §217.182(d) contain the requirements for pretreatment. All trickling filters must have upstream preliminary treatment units that remove grit, debris, suspended solids, oil, grease, and large particles, as well as control the release of hydrogen sulfide.

Adopted new §217.182(e) contains the requirements for materials and placement of rock filter media. These requirements ensure that the rock media filter material will function properly.

Adopted new §217.182(f) contains the requirements for synthetic (manufactured or prefabricated) media materials. The executive director may consider synthetic media materials to be innovative or nonconforming technology subject to review under §217.7(b)(2). Additionally, the provisions for structural integrity state that the structural design must support the synthetic media, water flowing through or trapped in voids, the maximum anticipated thickness of wetted biofilm. The synthetic media must also support the weight of a person while the trickling filter is in operation, unless separate provisions are made for maintenance access.

Adopted new §217.182(g) contains the requirements for filter dosing and requires that the design include suitable flow characteristics for the application of wastewater to the filters by siphons, pumps, or gravity discharge from preceding treatment units. The commission requires design provisions to control instantaneous dosing rates under both normal operating conditions and filter-flushing conditions. Table G.2 provides design ranges of dosing intensity for normal usage and flushing periods. This requirement is included for consistency with current industry standards and to provide more specific information regarding filter dosing.

Adopted new §217.182(h) includes the requirements for distribution equipment. A trickling filter must include electrically driven, variable speed filter distributors to allow operation at optimum dosing intensity independent of recirculation pumping. This requirement prevents failures from unequal distribution and drying of the media and conforms to standard engineering practices. Additionally, the rule specifies that if existing rectangular trickling filters are retrofitted with rotary distributors, any media that will not be fully wetted must not be considered as part the effective treatment area of the process.

Adopted new §217.182(h)(11) requires that rotary distributors operate at speeds of at least one revolution per 30 minutes to prevent unequal distribution and drying of the media.

Adopted new §217.182(h)(12) requires that trickling filters with a height or diameter that does not allow removal and replacement of distributors by a crane must provide jacking columns and pads at the distributor column. Some trickling filters have been designed without a way to remove the distributors once they are in place. This situation has caused problems when the distributors need to be repaired or replaced and this requirement is included to address the problem.

Adopted new §217.182(i) contains the requirements for recirculation. In paragraph (1), it requires the minimum flow rate be sufficient to keep the rotary distributors turning by requiring designs using hydraulically driven distributors to keep rotary distributors turning at the minimum design rotational velocity. This requirement applies to any facility that treats at least 400,000 gallons per day to remain consistent with the other requirements in this chapter.

Adopted new §217.182(i)(2) contains the requirements to provide recirculation that supplements influent flow if design and flushing dose intensities are not achieved solely by control of distributor operation. Controls for the distributor speed and recycle pumping rate must provide optimum dosing intensity under all anticipated influent flow conditions. This provision is included because recirculation helps to optimize removal efficiencies.

Adopted new §217.182(i)(3) contains the requirements for process calculations. The benefits of recirculation are primarily related to dosing intensity, and may often be achieved by control of the distributor speed only. The report must describe a design that proposes recirculation for removal of remaining organic matter in the wastewater, identify the effect of dilution of the influent on the rate of diffusion of dissolved organic substrates into the biofilm, the effect of reduced influent concentrations on reaction rates in sections of the filter having first order kinetics. This requirement is included because it is consistent with current industry standards and provides more specific direction regarding process calculations.

Adopted new §217.182(i)(4) contains the requirement that recirculation rates may not exceed four times design flow, unless the report provides calculations to justify the higher rate. This requirement was added for consistency with industry standards.

Adopted new §217.182(i)(5) states that if influent organic loadings are constant, a facility must use direct recirculation of unsettled trickling filter effluent and that the distributor nozzles handle the sloughed biofilm. These provisions ensure that distributor nozzles do not become clogged. If influent organic loadings are variable, a facility must recirculate effluent from the final clarifier to either the primary clarifier or to the trickling filter to equalize organic loading. The input point of recirculated influent depends on the content of the influent.

Adopted new §217.182(j) contains the requirements for average hydraulic surface loading. Section 217.182(j)(2) includes “except in roughing applications” to the requirement because roughing applications

can exceed the average hydraulic surface loadings of filters with crushed rock, slag, or similar media. Roughing applications by definition are systems that only partially filter the wastewater.

Adopted new §217.182(k) contains the requirements for underdrain system design. The requirement follows the manufacturer's recommendation to ensure that the media will be properly installed and used.

Adopted new §217.182(l) requires the floors of underdrain systems to be sloped. Trickling filters using stackable modular synthetic media must slope toward the drainage channel based upon filter size and hydraulic loading. Staff has identified an increased use of stackable modular synthetic media and the provision set requirements for stackable modular synthetic media in order to protect human health and the environment.

Adopted new §217.182(m) contains the requirements for passive ventilation that are included to conform to standard industry practice and to protect human health and the environment.

Adopted new §217.182(n) contains the requirements for forced ventilation. Equation G.2 and the values in Table G.3 set minimum airflow rates. These requirements provide an option for nitrification. They establish the minimum criteria for forced air ventilation for trickling systems based on standard engineering practices.

Adopted new §217.182(o) contains the requirements for cleaning, sloughing, controlling nuisance organisms, and corrosion control. Proper maintenance is necessary for proper operation of the equipment.

Adopted new §217.182(p) requires that a trickling filter system include a means to measure flows to the filter and recirculation flows.

Adopted new §217.182(q) contains the requirement for odor control. Paragraph (1) requires that a trickling filter system use ventilation capable of controlling odors at design flow and during periodic flushing. The paragraph also states that the executive director may require a facility with a history of odor complaints to cover its trickling filter. Covers trap odors and the scrubbers or adsorption columns remove the odors from the air before it is vented from the system.

Adopted new §217.182(q)(2) requires that a trickling filter with high influent organic loadings have forced ventilation to minimize odors and lists the options for handling odorous off-gases. These requirements are included to allow design options for odor control.

Adopted new §217.182(r) requires that the final clarifiers be sized to handle the additional total suspended solids due to the biomass.

Adopted new §217.182(s) lists elements that must be included in the report related to fixed film and 74filtration.

Adopted new §217.183, Nitrifying Trickling Filters--Additional Requirements, provides requirements in addition to §217.182 for using trickling filters to provide nitrification sufficient to meet the requirements of a wastewater permit. This section includes requirements for ventilation, temperature, pH, predation, hydraulic application rates, media, tertiary nitrification filter, combined BOD/nitrification filters, and to

update the rules to comply with engineering design advances. Currently, many wastewater permits require nitrification based on modeling of the receiving water for a wastewater discharge. This requirement was added to reduce toxicity and maintain the dissolved oxygen level in receiving waters. To assist facilities in meeting the new nitrification requirements, new engineering standards were developed and these provisions are consistent with current industry standards.

Adopted new §217.184, Dual Treatment Using Trickling Filters, explains the requirements and processes for use of trickling filters or other attached growth units in series with suspended growth processes. This section includes classification of dual treatment processes, design criteria for attached and suspended growth processes, and treatment unit design criteria. Each combination option in this section is protective of human health and the environment.

Adopted new §217.184(c)(1) - (4) require that the design of suspended and attached growth systems include all of the features and operational capabilities required for the same treatment units when used for single-process treatment, as well as pretreatment, snail control, return sludge, and aeration. Additionally, an aeration system for a second-stage treatment unit in a facility designed for nitrification must transfer sufficient oxygen for biomass growth; respiration for both carbonaceous material oxidation and nitrification; and oxygen demand due to biomass sloughing events from the first stage.

Adopted new §217.184(c)(5) requires that a second-stage suspended growth process operate in a way that varies the age of the sludge and that a nitrifying dual system control the total combined mean cell residence time. This provision ensures adequate time for nitrification to occur.

Adopted new §217.184(c)(6) requires a minimum hydraulic residence time for consistency with standard engineering practices.

Adopted new §217.184(c)(7) requires nitrification using a dual treatment process including a sludge re-aeration basin if the second process is an aerated solids contact basin or an intermediate clarifier if the second process is an activated sludge aeration basin. This provision is consistent with standard engineering practices.

Adopted new §217.185, Rotating Biological Contactors, provides the requirements and provisions for the use of improved Rotating Biological Contractors (RBC) units, including pretreatment, enclosures and ventilation, media design, design flexibility, tank configuration, control of unwanted growth in the initial stages, downtime maintenance provisions, bearing maintenance, organic loading design requirements, hydraulic loading design requirements, stages of RBC units, drive systems, and dissolved oxygen.

Adopted new §217.185(a) requires pretreatment of wastewater entering an RBC so that the RBC will operate properly and provide the expected treatment results.

Adopted new §217.185(b) requires that the RBC unit be covered and have adequate ventilation, and to include access doors and observation ports to allow access and a visual inspection of the RBC without having to open the unit.

Adopted new §217.185(c) and (d) contain the required and optional design criteria for RBCs and requires that these items be included in the report.

Adopted new §217.185(e) requires that an RBC tank minimize the zones in which solids will settle out and contains a requirement that an RBC tank must include tank drains to facilitate removal of any accumulated solids. This requirement is included to ensure that the tanks maintain adequate treatment capacity.

Adopted new §217.185(f) authorizes the use of chlorine upstream of an RBC system to control the growth of beggiatoa, which is an unwanted microorganism that may inhibit the initial stage of an RBC system. This requirement was added because chlorine may control the growth of beggiatoa without harming the operation of the RBC.

Adopted new §217.185(g) and (h) contains the provisions for maintenance. An RBC system designed for a facility with a permitted flow of at least 1.0 mgd must have three or more stages in series. A stage must be capable of being taken off-line for maintenance or cleaning. RBC bearings must be easily accessible for inspection and lubrication. These requirements ensure that maintenance can be performed without interrupting operation of the facility.

Adopted new §217.185(i) contains the requirements to base the organic loading for an RBC system on total BOD_5, to adjust the required RBC media area to compensate for the ratio of soluble BOD_5 to total BOD_5, and to set the allowable organic loading for the entire RBC system. In Chapter 317, these requirements were in a table. This provision incorporates them into the adopted rule language to make them more readable.

Adopted new §217.185(j) contains the requirements for an RBC system to include flow equalization when the peak-to-design flow ratio is higher than 2.5 to 1.0 to prevent loss of fixed growth from the media. The first stage of the RBC system must include a means of spreading the influent evenly across the media to ensure that the fixed growth is not scoured. This provision is consistent with industry standards.

Adopted new §217.185(k) contains the requirements for stages. A stage includes one or more RBC unit divided by a vertical baffle or wall. An RBC system designed for BOD_5 removal must have at least three stages in series, unless the report justifies a lesser number.

Adopted new §217.185(l) requires that an RBC drive system handle the maximum anticipated media load and allows a variable speed drive system and the RBC units to be mechanically or air driven.

Adopted new §217.185(m) contains the requirements for dissolved oxygen in an RBC and states that the executive director may require supplemental aeration.

Adopted new §217.186, Nitrifying Rotating Biological Contactors, provides additional requirements for RBCs used for BOD_5 removal and nitrification.

Adopted new §217.186(a) requires that an RBC system designed for BOD_5 removal and nitrification in a single system include four stages. This subsection also sets the maximum overall organic loading rate to be consistent with industry standards.

Adopted new §217.186(b) requires that a nitrifying RBC system include capabilities for chemical addition if the influent pH is below 7.0. This requirement ensures that the pH can be raised to a neutral level if the pH is too acidic. The fixed growth media does not function efficiently if the pH is below 7.

Adopted new §217.186(c) requires that the report justify the nitrification rate of the system to ensure that the executive director can efficiently review the design of the nitrification rate of the system.

Adopted new §217.186(d) states that a nitrifying RBC system may be subject to the requirements of §217.7(b)(2).

Adopted new §217.187, Dual Treatment Systems Utilizing Rotating Biological Contactors, explains the requirements for allowing RBC units to be used in conjunction with other units and to conform to engineering design advances. These combined systems may be subject to the requirements of §217.7(b)(2). This provision allows an owner the flexibility to use RBC units in conjunction with existing treatment units.

*Adopted new §217.188, Submerged Biological Contactor***,** proscribes the process for designing SBCs using criteria similar to RBC criteria except that two air headers are required for each SBC unit and any submerged bearings must be sealed. These changes comply with current engineering standards.

Adopted new §217.188(a) states that an air driven SBC system does not require a cover, since 60% of a unit is submerged and the possibility of the media drying out is low.

Adopted new §217.188(b) requires an SBC system to use the same pretreatment as an RBC and must meet the criteria §217.184 with two exceptions, headers and bearings.

Adopted new §217.189, Dual Treatment Systems Utilizing Submerged Biological Contactor, authorizes an SBC unit to be used in conjunction with other systems. This provision allows an SBC system to be used as a roughing unit in series with activated sludge and to be installed in existing activated sludge basins to create a combination fixed and suspended growth process. The rule requires that the report include supporting data, calculations, process descriptions, and vendor information to describe how the proposed system will provide the required treatment levels; and specifies that these designs may be subject to the requirements of §217.7(b)(2). These provisions allow flexibility to use existing systems when expanding an existing facility and are consistent with standard engineering practices.

Adopted new §217.190, Filtration, states the general requirements for filtration systems such as permit water quality requirements, redundancy, source of backwash water, disposition of backwash water, sequence of treatment units, overload conditions, and control of slime growth.

Adopted new §217.190(a)(1) requires that a treatment facility with tertiary effluent limitations (e.g., total suspended solids effluent limit less than 15 milligrams per liter) use filtration to supplement suspended solids removal.

Adopted new §217.190(a)(2) authorizes a treatment facility with secondary or advanced secondary effluent limitations to use filtration to supplement operation if filters are not necessary to meet permitted effluent limitations. Filtration reduces oxygen-demanding substances by removing the non-soluble

fraction of the clarifier effluent and normally provides effective removal for suspended biological floc and residual materials that remain after secondary clarification.

Adopted new §217.190(b) requires that a treatment facility using filtration to provide tertiary treatment for have a minimum of two filter units, and must provide adequate filtration with the largest filter unit out of service. If a filter is not required to meet permit requirements, only one filter is required. This may save the owner of the facility the expense of installing two filters.

Adopted new §217.190(c) requires a filtration system to use filtered effluent as the source of backwash water to ensure that the backwash sufficiently cleans the filter.

Adopted new §217.190(d) requires that a filtration system to return backwash water containing material cleaned from the filter to the head of the treatment facility for processing. Chapter 317 required that the wastewater be returned to an upstream treatment unit. This provision defines “upstream treatment unit.”

Adopted new §217.190(e) requires that a final clarifier designed in accordance with Subchapter F precede a filter unit. A filter system may be used in conjunction with disinfection tanks to provide additional detention time. These provisions will allow by rule a practice that the executive director has allowed by variance. This process is protective of human health and the environment.

Adopted new §217.190(f) requires a facility design include a method to prevent effluent from overflowing from the wastewater treatment units. If not properly designed, during peak flows or excessive

carryover of suspended solids from the final clarifier for an extended period of time, the filter units may overload and overflow.

Adopted new §217.190(g) requires that a filtration system provide periodic disinfection of the filters to control slime growth in the filter and backwash storage tank.

Adopted new §217.191, Additional Requirements for Deep Bed, Intermittently Backwashed, Granular Media Filters includes the design criteria required in addition to the requirements in §217.190 for deep bed, intermittently backwashed, granular media filters, including application rates, media design, backwash system, underdrain system, tank design and controls.

Adopted new §217.191(a) sets application rates for single, dual, and mixed media filters. This subsection also requires that filters be able to treat the peak flow with one filter out of service.

Adopted new §217.191(b) contains the requirements for media design, including uniformity coefficient, particle size, depth of media, and underdrain systems.

Adopted new §217.191(c) contains the requirements for backwash systems. Backwash systems are critical to the operation of filters. These requirements ensure that the backwash systems function properly and adequately clean the filters.

Adopted new §217.191(d) requires that the underdrain system provide a uniform distribution for filter backwash without excessive head loss or plugging.

Adopted new §217.191(f) lists the requirement regarding tank design in relation to backwashing filters. These requirements are in place to ensure that filter media is not lost during backwashing.

Adopted new §217.191(g) sets the requirements for the backwash system control mechanism. These requirements ensure that the controls are adequate to allow proper monitoring and operation of the backwash process.

Adopted new §217.192, Additional Design Requirements for Multi-Compartmented, Low Head, Automatically Backwashed Filters, updates and explains that in addition to meeting the requirements in §217.191, additional design criteria for multi-compartmented, low head, automatic backwash filters including application rates, media design, backwash system, and traveling bridge apply.

Adopted new §217.192(a) sets the application rate for single, dual, and multi media filters. This option allows short-term overloading of the unit because it will not impair its function.

Adopted new §217.192(b) specifies media sizes and depths consistent with standard engineering practices.

Adopted new §217.192(c) contains the requirements for automatic backwash systems. This requirement changes the Chapter 317 requirement of 10 gallons per minute to 20 gallons per minute to reduce the backwash duration. The provision reduces the requirement of "30 to 60 seconds" in the Chapter 317 rules

to "at least 20 seconds" to correspond to the increased gallons per minute. This change allows the filters to return to service more quickly.

Adopted new §217.192(d) provides that a traveling bridge that provides support and access to the backwash pumps and equipment must be constructed of corrosion-resistant materials, have adequate bridge tracking, safe support of the power cords, and automatic initiation of the backwash cycle. The requirement responds to questions from the regulated community regarding what is required for a traveling bridge and is consistent with current industry standards.

Adopted new §217.192(e) provides for automatic and regular removal of any floating material. Floating materials that are too large to pass through the filter system must be returned to the head of the facility to pass through a bar screen. This requirement ensures that floating material is properly processed.

Adopted new §217.193 Alternative Designs for Effluent Polishing, explains that the use of other processes for tertiary suspended solids removal, such as microscreens or countercurrent, continuous filtrate and backwash flow filters, will subject to the nonconforming technology requirements of §217.7(b)(2).

SUBCHAPTER H: NATURAL TREATMENT FACILITIES

Subchapter H addresses natural treatment systems separately from mechanical treatment facilities. This separation lets the commission address the different criteria and requirements needed to construct and operate treatment lagoons.

Adopted new §217.201, Applicability, states that this subchapter applies to Imhoff tanks, constructed wetlands, facultative lagoons, aerated and partially aerated lagoons, stabilization lagoons, treated effluent storage lagoons, evaporative lagoon systems, and overland flow processes.

Adopted new §217.202, Primary and Secondary Treatment Units, is the requirements for primary and secondary treatment units in natural treatment systems.

Adopted new §217.203, Design Criteria for Natural Treatment Facilities, updates and groups the requirements that apply to one or more of the natural treatment facilities or units. Natural treatment include flow distribution, windbreaks and screening, maximum liner permeability, embankment design and construction, disinfection, sampling point significance, and storm water drainage. These criteria provide more flexibility by allowing options that combine treatment methods. These options allow better use of the surrounding land features and better long range planning.

Adopted new §217.203(a) requires the shape and size of these treatment facilities to ensure even distribution of the wastewater.

Adopted new §217.203(b) requires that all natural treatment units include windbreaks if spray irrigation is used in a location where drift presents a risk of contact with the general public and allows the use of vegetative screening. The use, the type, and the extent of windbreaks or vegetative screening are subject to approval by the executive director.

Adopted new §217.203(c) contains the requirements for maximum liner permeability. These rules provide greater flexibility than the Chapter 317 rules and may allow a cost savings for the owner of the facility. Section 217.208 and §217.209 establish liner and permeability requirements for evaporative lagoon facilities or overland flow facilities systems.

Adopted new §217.203(d) contains the requirements for testing and compliance with the liner permeability requirements and requires that the report include the results of any tests required in this subsection. This testing protocol is consistent with the commission's current permit requirements and is more cost effective. This subsection establishes protocols to eliminate the need for a variance for using amended in-situ soils because amended in-situ soil protocol is as protective as using in-situ soils. The provision also requires a synthetic liner to have a thickness of 40 millimeters to protect groundwater from contamination.

Adopted new §217.203(e) contains the requirements for embankment design and construction. It will allow access for vehicles and maintenance equipment. It also prohibits steep embankments because these slopes have a greater potential to fail and make it difficult to maintain a vegetative cover. All embankments must be protected against erosion by planting grass, paving, riprapping, or other approved methods.

Adopted new §217.203(f) specifies that chemical or ultraviolet disinfection is not required if a detention time of at least 21 days is provided in a entire, free-water surface, natural treatment unit. This requirement is consistent with 30 TAC Chapter 309.

Adopted new §217.203(g) requires that holding time in a storage lagoon cannot be used to meet the permit 21-day detention time requirement for disinfection. Treated effluent storage lagoons may be used for municipal permit storage requirements or for reclaimed water projects and must comply with other requirements of Chapter 210.

Adopted new §217.203(h) requires that a natural treatment facility prevent storm water drainage into the treatment units.

Adopted new §217.204, Imhoff Tanks, provides updated design criteria for constructing Imhoff tanks that address settling compartments, surface loading, scum baffles, gas vents, digestion compartment loading, Imhoff tank dimensions, sludge removal, odor management, treatment efficiency, material, and construction. The design criteria regulating Imhoff tanks were repealed by the commission in 1990. These requirements are standard engineering designs for Imhoff tanks and are consistent with other commission rules.

Adopted new §217.205, Facultative Lagoons, provides the design criteria for facultative lagoons, including configuration of inlets and outlets, depth, organic loading, odor control, and removal efficiency. This provision allows flexibility in the design of lagoons protecting human health and the environment.

Adopted new §217.206, Aerated Lagoons, provides updated requirements for completely and partially mixed aerated lagoons. The requirements address redundancy, piping, monitoring, location temperature, sizing, and scouring. The requirements offer flexibility as well as protection of human health and the environment.

Adopted new §217.207, Stabilization Lagoons, requires lagoons that are designed as secondary units to treat suspended and dissolved organic matter in wastewater. It addresses primary treatment, odor management, the number of lagoons, dimensions of the lagoons, water level considerations, hydraulic and pipe considerations, maximum organic loading, and inlet and outlet structures.

Adopted new §217.207(a) requires primary treatment to remove the settleable and floatable solids in the influent wastewater prior to the stabilization lagoons, which treat suspended and dissolved organic matter in wastewater.

Adopted new §217.207(b) requires an owner to include measures to manage odors from stabilization lagoons.

Adopted new §217.207(b)(1) requires that a stabilization lagoon be located so that prevailing winds will be toward less populated areas to minimize nuisance odors.

Adopted new §217.207(b)(2)requires that the lagoons must be pre-filled to the two-foot level at start-up, if uncontaminated water is available. This requirement is included to encourage the rapid start-up of the biological process and to discourage odor.

Adopted new §217.207(b)(3) requires that a lagoon system must include a pipe arrangement that allows the recirculation of effluent. Surface spray may be used to assist in maintaining aerobic conditions at the lagoon surface and reduce potential odors. These requirements are included because recirculation

provides active algal cells to the upstream feed area, which provides photosynthetic oxygen for organic digestion. Recirculation also provides a more completely-mixed environment within the lagoon system.

Adopted new §217.207(c) requires that a facility must have at least two stabilization lagoons if they are used to meet effluent limits. The stabilization lagoons must be in series with each other following the primary treatment unit.

Adopted new §217.207(d) contains the design requirements for stabilization lagoons.

Adopted new §217.207(d)(1) requires a minimum length-to-width ratio of a stabilization lagoon to ensure that the wastewater is properly treated.

Adopted new §217.207(d)(2) avoids dead zones and ensures proper treatment by prohibiting islands, peninsulas, or coves within the lagoon boundaries.

Adopted new §217.207(d)(3) specifies the normal water depth for stabilization lagoons to ensure the proper stratification of water treatment.

Adopted new §217.207(d)(4) specifies that inlet and outlet structures must allow for adjusting water levels to assist in controlling weeds and other vegetative growth to ensure proper operation and maintenance of the facility.

Adopted new §217.207(d)(5) requires that a stabilization lagoon have a 2.0 foot minimum freeboard if less than 20 acres and a 3.0 foot minimum freeboard if 20 acres or more. The potential for white-capping on a larger lagoon surface may encourage erosion. A deeper freeboard compensates for the erosion potential in lagoons with larger surface areas.

Adopted new §217.207(e) contains the requirements for hydraulic and pipe considerations. These requirements are included to ensure that an operator has flexibility to manage the lagoons properly in normal and worst-case conditions.

Adopted new §217.207(f) contains the requirements for the maximum surface organic loading rate for stabilization lagoons. The provision is included to specify that the loading rates are based on the BOD_5 influent load after the preliminary treatment units.

Adopted new §217.207(g) contains the requirements for inlet and outlet structures.

Adopted new §217.207(g)(1) requires that an outlet must include removable baffles to prevent floating material from being discharged and be constructed to operate varying surface levels under normal operating conditions.

Adopted new §217.207(g)(2) specifies that the discharge must be submerged. If a lagoon does not have submerged outlets, the lagoons may have a discharge that contains algae and high fecal coliform.

Adopted new §217.207(g)(3) specifies that multipurpose control structures may be used to facilitate normal operational functions to and allow the operator to properly operate and maintain the facility.

Adopted new §217.207(g)(4) specifies that all pipe embankment penetrations must have seep water-stop collars to prevent wastewater from leaking through or eroding an embankment.

Adopted new §217.207(g)(5) specifies that a stabilization lagoon must have a drainage system to allow scheduled maintenance or emergency repair on the lagoon.

Adopted new §217.208, Evaporative Lagoons, establishes the requirements for evaporative lagoons, including size and number, odor management, liners, and configuration of depth and loading, embankment, and inlet and outlet structures of the lagoon. These requirements are included in response to questions from the regulated community regarding minimum design criteria for evaporative lagoons.

Adopted new §217.208(a) is the minimum design criteria necessary for using evaporative lagoons in a treatment facility.

Adopted new §217.208(a)(1) requires that an evaporative lagoon process must have a minimum of two lagoons. Redundancy is necessary to keep the treatment process operating during repairs and maintenance.

Adopted new §217.208(a)(2) specifies that the primary evaporative lagoon must provide at least 60% of the total surface area. These provisions are consistent with standard engineering practices.

Adopted new §217.208(a)(3) requires the minimum number and size of evaporative lagoons provide adequate evaporation of the design flow during periods of low evaporation. During low evaporation or wet weather periods, secondary lagoons may be required to provide adequate evaporative surface area to accommodate influent flows and precipitation.

Adopted new §217.208(b) specifies that evaporative lagoons be located so that the local prevailing winds will be toward less populated areas to minimize nuisance odors.

Adopted new §217.208(c) contains the requirements for evaporative lagoon liners.

Adopted new §217.208(c)(1) requires that evaporative lagoons be constructed with synthetic membrane liners with a minimum thickness of 40 millimeters. The provision requires synthetic membrane liners because they are less likely to crack than clay liners.

Adopted new §217.208(c)(2) requires that the liners have an underdrain leak detection system consisting of at least a leachate collection and a detection system to ensure that the liner is intact and groundwater is not threatened.

Adopted new §217.208(c)(3) specifies that the liner construction requires proper compaction of soils beneath the liner so that the liner is not compromised by settling or shifting.

Adopted new §217.208(c)(4) specifies that the liner material must be capable of receiving constant sunlight without degrading to lengthen the functional life expectancy of the liner.

Adopted new §217.208(d) contains the requirements for configuration, depth, and loading.

Adopted new §217.208(d)(1) authorizes an evaporative lagoon to be constructed in round, square or rectangular style shapes to ensure that an evaporative lagoon can be designed to fit the topography of the location.

Adopted new §217.208(d)(2) specifies that the depth of an evaporative lagoon is dependent on its location within the lagoon system. These requirements are included for consistency with standard engineering practices.

Adopted new §217.208(d)(3) contains the evaporation and organic loading requirements.

Adopted new §217.208(e) specifies that the owner must construct embankments for evaporative lagoons in accordance with §217.203(e). This requirement is included to maintain consistency throughout the design criteria rules.

Adopted new §217.208(f) contains the requirements for inlet and outlet structures to be consistent with standard engineering practices.

Adopted new §217.209, Constructed Wetlands, includes general requirements for artificially constructed wetlands designed to simulate natural wetland ecologic conditions based on advances in engineering design.

Adopted new §217.209(a) authorizes the construction of wetlands at wastewater treatment facilities that are either free surface water systems (FWS) or subsurface flow systems (SFS).

Adopted new §217.209(b) prohibits the use of natural wetlands in order to protect them and clarify that constructed wetlands may not use any water in the state, as defined by TWC, §26.001(5).

Adopted new §217.209(c) established the general design criteria for constructed wetlands. Later sections address the two different types of constructed wetlands.

Adopted new §217.209(d) specifies that a constructed wetland must have a diverse vegetative community. This subparagraph also specifies that a constructed wetland may have both emergent and floating aquatic vegetation to maintain a diverse vegetative community suitable to local growing conditions. An acclimated and diverse vegetative community helps minimize adverse impacts from potential disease, insect pests, or species-specific toxicity.

Adopted new §217.209(d)(4) requires that the plans for harvesting aquatic plants from waters of the state must be reviewed with the United States Corp of Engineers to determine if regulatory coordination is required. This requirement is consistent with 40 CFR §122.2 and the Clean Water Act, §404. The use of

indigenous plants is recommended, if the species have demonstrated they are effective for use in a constructed wetlands wastewater environment.

Adopted new §217.209(d)(5) requires that procurement of seed plants from natural wetlands must assure minimum impact on the harvested plant community. The use of indigenous plants is recommended, if these species have demonstrated they are effective for use in a constructed wetlands wastewater environment.

Adopted new §217.209(d)(6) specifies that the Texas Parks and Wildlife Department must approve use of all harmful or potentially harmful wetlands plants and organisms, as described in 31 TAC §§57.111 - 57.118 and 31 TAC §§57.251 - 57.258. This rule requires that the report identify the wetlands plants and organisms that will be used so that the executive director can ensure compliance with this requirement.

Adopted new §217.209(e) sets the maintenance requirements for constructed wetlands.

Adopted new §217.209(e)(1) prohibits the use of herbicides, insecticides, and fertilizers. Without an individual review of each chemical being discharged, a chemical could cause a water quality violation in the receiving stream.

Adopted new §217.209(e)(2) contains the requirements for floating material removal. For proper functioning, constructed wetlands systems must remove the primary treated effluent algal mat or other floating materials prior to entering the wetlands. The use of covered primary treatment systems may eliminate the need for algal mat removal. The rule also requires the removed floating material be stored

and disposed of in a way to minimize nuisance odors. The disposal practices must conform to the requirements in Chapter 330.

Adopted new §217.209(e)(3) requires that the facility operations and maintenance manual include the maintenance of emergent and aquatic vegetation in constructed wetlands. Periodic removal of dead plant matter and detritus must prevent damage to living plants, liners, and system hydraulics. Constructed wetlands maintenance may include promoting active growth, controlling of mosquitoes, maintaining hydraulic capacity, and must not result in a deterioration of water quality. This provision is included to ensure that the manual contains the information necessary to operate the facility and so that the executive director can ensure compliance during the executive director's review.

Adopted new §217.209(f) requires that a properly functioning wetlands system be allowed to mature before wastewater effluent is processed. This requirement is included to ensure that constructed wetlands have adequate time for flow ecosystems to mature since mature ecosystems are required for effective wastewater treatment. It also requires the report to include the plan for establishing the constructed wetland before wastewater is introduced

Adopted new §217.209(g) specifies that the liners for wetlands systems must comply with the requirements of §217.203(3) and (4) and prohibits synthetic liners in wetland systems. A minimum 6-inch layer of productive topsoil must be placed above the liner to encourage subgrade root penetration. This requirement is included to protect against contamination of groundwater and to conform to standard engineering practices.

Adopted new §217.209(h) contains the requirements for berms. These requirements are included to prevent erosion of the side slopes and to conform to standard engineering practices and to allow synthetic side slopes to provide flexibility in designing berms.

Adopted new §217.209(i) requires that a constructed wetland must be protected from a 100-year flood event in accordance with the requirements of §217.35.

Adopted new §217.209(j) specifies that all constructed wetlands intended to provide nitrification are innovative and nonconforming technology, subject to §217.7(b)(2). The provision authorizes the executive director to consider these facilities on a case-by-case basis because of the inherent site-specific nature of nitrification at an individual treatment facility.

Adopted new §217.209(k) authorizes constructed wetlands to be used as secondary treatment units, advanced secondary treatment units, or as a means of polishing wastewater effluent. This provision specifies how the engineer may use FWS wetlands and SFS wetlands.

Adopted new §217.210, Constructed Wetlands--Free Water System (FWS) Design, contains the design criteria for FWS wetlands, which are shallow open water bodies and populated principally by emergent plants. Wastewater flows through the wetland, primarily in a horizontal direction, and is treated by a variety of physical, biological, and chemical processes.

Adopted new §217.210(a) requires a FWS wetlands design to be based on a maximum water depth of no more than 24 inches in emergent vegetation areas at design flow. Chapter 317 set the maximum depth at 18 inches, but 24 inches allows greater flexibility in design and plant selection.

Adopted new §217.210(b) sets the standards for plants in an FWS. Plant spacing must allow for growth of the wetlands flora ecosystem under normal conditions. The rule prohibits floating plants because flowing water would continually displace them.

Adopted new §217.210(c) requires the FWS to meet permitted effluent limits with any single cell removed from service. This requirement ensures that the design will be able to meet a wastewater facility's permit requirement during routine maintenance or emergency repair of an FWS cell.

Adopted new §217.210(d) requires that an FWS wetland cell have adequate bottom slope to facilitate drainage for maintenance and to maintain appropriate wetlands water depth range along the entire wetlands length under all anticipated operational flow conditions. This allows flexibility to meet local conditions in the design of the cell.

Adopted new §217.210(e) requires parallel treatment trains to increase operational flexibility and to allow routine maintenance without compromising the system.

Adopted new §217.210(f) requires that an FWS wetland cell be oriented to avoid cross winds perpendicular to the process flow direction or use elevated berms or vegetative windbreaks to prevent cross winds. The provision allows the use of elevated berms or vegetative windbreaks, which were not

allowed in Chapter 317, to provide more flexibility to meet the needs of the topographical area of the constructed wetland.

Adopted new §217.210(g) contains the requirements relating to FWS inlets and outlets.

Adopted new §217.210(g)(1) requires that the FWS inlets and outlets of a wetland assure uniform flow across the cell. This requirement is included to prevent localized overloading on the treatment system.

Adopted new §217.210(g)(2) requires inlets and outlets to minimize erosion of wetlands substrate by controlling locally high flow velocities.

Adopted new §217.210(g)(3) requires inlet and outlets to allow variations in operational water level to ensure that the cell can treat a fluctuating flow volume.

Adopted new §217.210(g)(4) requires that the inlets be submerged under normal operational conditions to reduce the potential for odors.

Adopted new §217.210(g)(5) specifies that the design allow inspecting and cleaning of inlet and outlet devices for routine maintenance.

Adopted new §217.210(i) contains the design requirements for organic loading and treatment efficiencies of an FWS.

Adopted new §217.210(i)(1) authorizes a constructed wetlands design to be based on organic loading of the facility's primary or secondary effluent. This requirement is included because suspended solids removal efficiency normally does not require separate design consideration, being equally efficient or more efficient than organic removal efficiency.

Adopted new §217.210(i)(2) requires the organic removal treatment efficiency for FWS wetlands be based on the areal loading rate equation (Equation H.3), unless the report justifies an alternate method, the source of the method, and all supporting calculations. This provision is included to allow more site-specific calculations for each FWS wetland.

Adopted new §217.210(j) contains the requirements for vector control.

Adopted new §217.210(j)(1) requires mosquito control using mosquito fish, (Gambusia) other natural predators, aerobic conditions, and other biological controls.

Adopted new §217.210(j)(2) requires design controls to minimize the potential damage to wetlands caused by mammals such as nutria and muskrats, which can damage FWS wetland systems by burrowing into the berms.

Adopted new §217.211, Constructed Wetlands--Subsurface Flow System (SFS) General Design, contains the design criteria for SFS constructed wetlands, which are shallow water bodies populated by various floating and emergent plants. Wastewater flow in SFS wetlands is maintained below the surface of a

porous media, such as gravel, where the emergent plants are rooted. Wastewater flows primarily in a horizontal direction and is treated by a variety of physical, biological, and chemical processes.

Adopted new §217.211(a) specifies that SFS media must allow root penetration. Treatment efficiency generally improves with effective root penetration through the entire wetted media depth. The provision requires the report to identify the wetted subsurface media so that the executive director can ensure compliance.

Adopted new §217.211(b) requires that the operational water depth of an SFS wetland not exceed the lesser of 18 inches at design flow or the maximum anticipated root penetration for the emergent plant species.

Adopted new §217.211(c) requires seasonal draw down of the water level to encourage deeper root penetration into the wetted media. This requirement ensures plants have adequate root penetration to grow to maturity and encourages new plant growth.

Adopted new §217.211(d) requires that plant spacing must not exceed 36 inches and be based on the size of the mature plant. The vegetation in an SFS wetland system will take at least one full growing season to mature and that adequate spacing allows for growth of the plants. The requirements for plant spacing are included to ensure that the wetland system will reach maturity in an efficient time frame.

Adopted new §217.211(e) contains the configuration requirements for SFS.

Adopted new §217.211(e)(1) requires multiple cells that may be operated independently, allowing individual cells to be removed from service while maintaining system operations. This provision allows the number of cells that are in service to match the amount of flow that the facility is receiving.

Adopted new §217.211(e)(2) requires that the size of the cells continue to meet permit effluent limits with any single cell out of service. This provision allows the operator to perform routine maintenance without compromising the treatment system.

Adopted new §217.211(e)(3) contains the hydraulic design requirements. An SFS wetland must maintain a minimum media cover to ensure that the cell does not dry out.

Adopted new §217.211(e)(4) specifies that the maximum wetted media depth of an SFS wetland is the lesser of 24-inches at design flow, or the maximum anticipated root penetration for the planned primary population of emergent plant species. Additionally, an SFS wetland must have a dry media cover depth of 6 to 9 inches above the design flow hydraulic gradient. These requirements are included because the hydraulic profile of SFS wetlands may be significantly steeper than FWS systems.

Adopted new §217.211(e)(6) specifies that an SFS wetland must provide parallel treatment trains must be provided to increase operational flexibility. This rule ensures consistency with the free water surface system requirements in this section.

Adopted new §217.211(f) requires the design to include minimum flow distribution, submergence, maintenance, and staged influent feed standards for an SFS system. Constructed wetlands treatment

efficiency depends on effective flow distribution, loading, maintenance, and depth of the water. These requirements are included to ensure that the design meets certain minimum standards.

Adopted new §217.211(g) contains the requirements for SFS organic loading and treatment efficiency. This provision is included to allow more site-specific calculations to determine the total suspended solids (TSS) and biochemical oxygen demand (BOD) information for each SFS wetland.

Adopted new §217.211(h) requires that temperature the design of the SFS be adequate to provide treatment at the temperatures expected.

Adopted new §217.211(i) specifies that the vegetation maintenance practices be part of an SFS design. This requirement is included to reduce mosquito breeding opportunities.

Adopted new §217.211(j) requires that the media must be hard rock, slag, or other clean, comparable media material. Synthetic media is nonconforming technology and subject to §217.7(b)(2). These requirements ensure that the proper media is included in the design of an SFS.

Adopted new §217.212, Overland Flow Process, requires that an overland flow process be reviewed as a nonconforming technology. This system does not have a successful track record in Texas.

Adopted new §217.213, Integrated Facultative Lagoons, sets the requirements for new engineering design of integrated facultative lagoons, which the executive director will consider nonconforming technology.

The section provides design criteria for integrated facultative lagoons including configuration of inlets and outlets, depth, organic loading, odor control, and removal efficiency.

All the requirements in this section are based on research conducted by Texas Tech University. Research using small-scale facilities has shown that a deeper pit in a facultative lagoon located in the center of the lagoon allows the lagoon to produce a higher quality of effluent using a smaller amount of land. The commission is incorporating the research into this section to provide another option for designing integrated facultative lagoons. This technology can help to reduce the cost and natural resources required for a lagoon system. To ensure that lagoons designed using this research are appropriate for full-scale facilities, the executive director will review all integrated facultative lagoons as nonconforming technology.

SUBCHAPTER J: SLUDGE TREATMENT UNITS

Subchapter J contains more detailed requirements than were contained in Chapter 317. Sludge management and sludge handling technology has advanced as disposal has become more expensive and more of a public issue. Today, there are more environmentally compatible ways to manage sludge, many, such as beneficial land application, enhance the environment rather than taxing it like landfilling sludge.

Adopted new §217.241, General Requirements, sets the minimum design requirements for sewage sludge treatment processes and treatment units; defines the sludge process to include thickening, stabilization, and dewatering; and requires the engineer to base the selection and operation of the sludge unit processes on the final sludge product. Additionally, this section requires that all municipal wastewater treatment facilities that dispose of sludge under Chapter 312 must stabilize the sludge and that all municipal

wastewater treatment facilities that dispose of sludge under Chapter 330 must comply with the requirements of that chapter.

Adopted new §217.242, Control of Sludge and Supernatant Volumes, contains the requirements for controlling sludge supernatant volumes. This section ensures that the facility will transfer waste sludge to the sludge digester in a manner that minimizes the volume of digester supernatant. The supernatant from thickeners and digesters must be returned to the head of the treatment works or to the aeration system.

Adopted new §217.243, Sludge Pipes, provides the requirements for pipes used in the treatment of sludge. The piping design must be an adequate size, allow for cleaning, and prevent blockages and corrosion.

Adopted new §217.244, Sludge Pumps, contains the design standards for sludge transfer pumps, based on the quantity and character of the anticipated solids load and adequate redundancy.

Adopted new §217.245, Exclusion of Grit and Grease from Sludge Treatment Units, incorporates provisions of Chapter 312 into the design criteria for wastewater treatment facilities. These provisions are included to ensure that the design criteria rules are consistent with Chapter 312 requirements.

Adopted new §217.246, Ventilation and Odor Control, provides the ventilation requirements for wastewater treatment facilities to eliminate the presence of fumes or gases. This requirement is included to ensure that the design of the ventilation system eliminates the danger to human health and the environment in areas where the presence of fumes or gases rise to a level that might constitute a public

health hazard or a threat to air quality. It also requires the sludge treatment design to minimize potential nuisance odors.

Adopted new §217.247, Chemical Pretreatment of Sludge, establishes criteria incorporating new state and federal requirements from 40 CFR Part 503 and Texas Health and Safety Code, Chapter 361, for the use and handling of chemicals used to enhance solids removal, necessary for many sludge treatment or processing units.

Adopted new §217.247(a) requires that chemical used in the pretreatment of sludge be compatible with the treatment process and not affect water quality.

Adopted new §217.247(b) requires that the choice and amount chemicals be based on pilot or field data.

Adopted new §217.247(c) requires chemicals to be stored safely.

Adopted new §217.247(d) states the requirements for a liquid storage tank.

Adopted new §217.247(e) requires activated carbon properly stored due to its combustible properties.

Adopted new §217.247(f) requires explosion-proof electrical devices in areas where volatile or explosive chemicals are used.

Adopted new §217.247(g) prohibits the discharge of volatile chemicals.

Adopted new §217.247(h) requires the facility to maintain a 30-day supply of needed chemical to ensure uninterrupted operations, unless an alternate method of ensuring uninterrupted service is included in the report.

Adopted new §217.247(i) requires chemical tanks to be an adequate size to operate at design flow.

Adopted new §217.247(j) requires written procedures for measuring chemical mixed into solutions to ensure that solutions contain the appropriate amount of each chemical required for treating sludge.

Adopted new §217.247(k) requires tank and pipe material to be appropriate to the chemicals being used. The material should be resistant to any reaction caused by the chemicals in use.

Adopted new §217.247(l) prohibits mixing chemicals prior to preparing the feed solution to prevent unintended chemical reactions.

Adopted new §217.247(m) prohibits storing a concentrated liquid acid in an open vessel and requires it be transferred directly to the point of use. This requirement is included to prevent the chemical reactions that can concentrated acids can undergo when exposed to air or moisture.

Adopted new §217.247(n) requires concentrated liquid acid storage containers be able to prevent discharge or unintended chemical reactions.

Adopted new §217.247(o) requires a toxic material to be transferred by a device that is engaged by the action of a person or automatic controller upon demand. This requirement is included to protect facility staff, human health, and the environment.

Adopted new §217.247(p) requires that a facility have a method for dust control during the transfer of dry chemicals. This requirement is included to protect facility staff, human health, and the environment.

Adopted new §217.247(q) requires disposal of chemicals and chemical containers be done in compliance with the waste disposal requirements in Chapter 335.

Adopted new §217.247(r) contains the requirements chemical feed equipment, including structures, redundancy, design, capacity, spill containment, controls, scales, protection, water supply, solution tanks, and application. These requirements are included to ensure that the sludge pretreatment process is designed for adequate and safe operation.

Adopted new §217.248, Sludge Thickening, establishes minimum criteria for sludge thickening for use in volume reduction and conditioning as an aid to processing and managing the sludge waste stream. Sludge thickening is optional. If sludge thickeners are used, the criteria outlined in this section must be used.

Adopted new §217.248(a) contains general requirements for thickeners. Section 217.248(a)(1) requires that the thickeners be capable of operating during the two-hour peak flow. The commission adopts this requirement to be consistent with clarifier design requirements and disinfection design requirements. Section 217.248(a)(2) requires that the sludge thickening system have a bypass. All facilities with a

design flow greater than 1.0 mgd must have dual units, an alternate means of thickening, or an alternate disposal method. This requirement ensures that the facility is designed to manage its sludge if the sludge thickening system is out of service.

Adopted new §217.248(b) contains the requirements for mechanical gravity thickeners that ensure these thickeners will meet engineering standards and properly thicken the sludge by allowing the solids to settle and the liquid to be scraped away. The requirements also ensure that the executive director has sufficient information to review the design of the thickeners.

Adopted new §217.248(c) contains the design criteria for dissolved air flotation thickeners, which includes equipment feature requirements and design requirements.

Adopted new §217.248(d) contains the design criteria for centrifugal thickeners. The executive director may require pilot or field data for the review of any centrifugal thickener design.

Adopted new §217.248(e) contains the design criteria for gravity belt thickeners, which includes equipment feature requirements and design requirements.

Adopted new §217.249, Sludge Stabilization, contains the requirements for sludge stabilization based on requirements in 40 CFR Part 503 and Chapter 312. This provision addresses the stabilization processes including anaerobic digestion, aerobic sludge digestion, heat stabilization, and alkaline addition. In addition, the section states the requirements for anaerobic digesters. Additionally, the design requirements for the stabilization processes in this section are based on the assumption that the process is the sole

stabilization process employed at the facility. If a facility employs series of two or more stabilization processes or methods, the report must justify a variance for reducing these requirements.

Adopted new §217.249(c) contains the requirements for anaerobic digestion. Section 217.249(c)(1) requires that a facility with a design flow exceeding 0.4 mgd have a minimum of two anaerobic digesters, so each digester may be used as a first stage or primary reactor for treating primary and secondary sludge flows. Each digester must have the means for transferring a portion of its contents to other digesters. A facility without multiple digesters must have an emergency storage basin, so the digester may be taken out of service. This provision allows the operator to perform routine maintenance without compromising the treatment system.

Adopted new §217.249(d) specifies that the anaerobic digester must provide a minimum of six feet of storage depth for supernatant liquor. This requirement is included to be consistent with standard engineering practice.

Adopted new §217.249(e) requires that the design allow access to all units that require maintenance. This provision allows the operator to perform routine maintenance without compromising the treatment system.

Adopted new §217.249(f) requires that a digester bottom slope towards the withdrawal drain pipe. The rule prohibits a flat-bottomed digestion chamber. The requirement is included to ensure the effective removal of the digester contents.

Adopted new §217.249(g) requires that the top of the digester have at least two access manholes and a gas dome. One manhole must have sufficient diameter to permit the use of mechanical equipment to remove grit and sand. A digester system must have a separate side wall manhole at ground level. This requirement is included to ensure that the digester is accessible for maintenance without compromising the system.

Adopted new §217.249(h) requires that the operation and maintenance manual require the use of non-sparking tools, rubber-soled shoes, safety harness, gas detectors for flammable and toxic gases, and at least one self-contained breathing apparatus. These requirements are included to ensure that unsafe working conditions for facility staff do not interrupt or stop the functions of the facility. An interruption of the treatment processes at a facility could compromise the protection of human health and the environment.

Adopted new §217.249(i) requires that a digester have multiple sludge inlets, outlets, and at least three recirculation sections and discharge points to facilitate effective mixing of the digester contents. One inlet must discharge above the liquid level and be located at the center of the digester. Raw sludge inlet discharge points must be located to minimize short circuiting to the supernatant draw-off. This requirement is included to ensure consistency with standard engineering practices.

Adopted new §217.249(j) contains the requirements for digester capacity. The digester capacity must be designed to process the expected volume and character of the sludge. The report must include the calculations to justify the basis of design. These requirements are included to ensure that the executive director has sufficient information to review the design for digester capacity and to be consistent with requirements in Chapter 312 and 40 CFR Part 503.

Adopted new §217.249(k) contains the requirements for gas collection pipes, storage, and appurtenances. This rule is included to be consistent with standard engineering practices and to allow routine maintenance without compromising the treatment system.

Adopted new §217.249(l) requires that the waste gas burners be accessible and must be located at least 50 feet away from any structure if placed at ground level. The waste gas burners may be located on the roof of the control building. The waste gas burners must not be located on top of the digester. The discharge of less than 100 cubic feet per hour (CFH) of digester gas through a return bend screened vent with a flame trap terminating at least 10 feet above the walking surface is allowed. These requirements are included to ensure that unsafe working conditions for facility staff do not interrupt the functions of the facility. An interruption of the treatment processes at a facility could compromise the protection of human health and the environment.

Adopted new §217.249(m) requires that all underground enclosures connected to anaerobic digesters tanks, gas pipes, or sludge equipment have forced ventilation in accordance §217.246. All underground enclosures must include tightly fitting, self-closing doors to minimize the spread of gas. This requirement is included to prevent the accumulation of explosive gases in underground enclosures.

Adopted new §217.249(n) requires that the system have a gas meter with a bypass to measure total gas production, which is an indicator of the activity in the digester. This requirement is included to authorize the operator to monitor the activity in the digester.

Adopted new §217.249(o) requires that the gas manometers have shut-off vents and vent cocks. The vent pipes must extend outside the buildings. The vent pipe openings must have screens and be arranged to prevent the entrance of rainwater, which can cause fouling of the manometers. The safety devices are required for the manometer pipe system.

Adopted new §217.249(p) requires the gas pipes for anaerobic digesters be equipped with pressure gauges. These requirements are included to ensure that unsafe working conditions do not interrupt the functions of the facility. An interruption of the treatment processes at a facility could compromise the protection of human health and the environment.

Adopted new §217.249(q) contains the requirements for digestion temperature control. These requirements are included to be consistent with standard engineering practices.

Adopted new §217.249(r) contains the requirements for supernatant withdrawal. This requirement is included to ensure the proper operation of the digester, to prevent damage to the unit, and to ensure that the executive director has sufficient information to review the report.

Adopted new §217.249(s) contains the requirements for digester covers. It prohibits uncovered anaerobic digesters; requires pipes be arranged to minimize air in the gas chamber; requires a digester cover to include a gas chamber, be gas tight, be tested, and be equipped with an air vent with a flame trap, a vacuum breaker, and a pressure relief valve.

Adopted new §217.249(t) contains the requirements for aerobic sludge digestion and applies to the stabilization of waste sludge to Class B biosolid by aerobic digestion. Class B biosolid is defined in Chapter 312. This requirement is included to be consistent with Chapter 312 and to ensure that the executive director has sufficient information to review the report. Adopted new §217.249(t)(5) - (7) is included to ensure the efficient operation of the system and to be consistent with Chapter 312 and 40 CFR Part 503.

Adopted new §217.249(u) contains the requirements for heat stabilization. The system must operate continuously to minimize additional heat input required to start up the system. This requirement is included to be consistent with standard engineering practices Chapter 312 and 40 CFR Part 503.

Adopted new §217.249(v) requires that the report must identify the method of treatment for recycle streams from heat treatment. The recycle streams must not impact effluent quality or the facility's treatment processes. This requirement is included to ensure that the executive director has sufficient information to review the report and to be consistent with standard engineering practices.

Adopted new §217.249(w) contains the requirements for alkaline stabilization. The design must include provisions for maintenance and repair based on data from comparable facilities and adequate storage for process, feed, and downtime. This requirement is included to be consistent with standard engineering practices Chapter 312 and 40 CFR Part 503, for vector and pathogen reduction. It also ensures the executive director has sufficient information to review the report.

Adopted new §217.250, Sludge Dewatering, contains the minimum design criteria for comprehensive consideration of sewage sludge dewatering unit processes, including general requirements, sludge conditioning, sludge drying beds, innovative sludge drying beds, rotary vacuum filtration, centrifugal dewatering, plate and frame presses, and belt presses.

Adopted new §217.250(a) requires the report to include justification for the sludge dewatering design.

Adopted new §217.250(b) requires the sludge dewatering design be based on mass balance principles.

Adopted new §217.250(c) contains general dewatering requirements. Section 217.250(c)(1) requires the drainage from beds and centrate or filtrate from dewatering units to be returned to the head of the facility for treatment. The organic loading from the centrate or filtrate must be included in the design of the facility's treatment units.

Adopted new §217.250(c)(2) requires that the dewatering system not allow the release of constituents that threatens water quality or wastewater permit compliance.

Adopted new §217.250(c)(3) contains the requirements for redundancy. This provision is included to allow operations during breakdowns and routine maintenance without compromising the treatment system and to be consistent with standard engineering practices.

Adopted new §217.250(c)(4) contains storage requirements. These requirements are included to prevent nuisance odor conditions, to be consistent with standard engineering practice, and to ensure the protection of human health and the environment.

Adopted new §217.250(c)(5) requires that the dewatering system have sampling stations before and after each dewatering unit or any other segment of the unit identified in the report and allow periodic evaluation of the dewatering process. This requirement is included to ensure efficient operation of the facility.

Adopted new §217.250(c)(6) requires that all dewatering system units must have bypass capabilities to allow maintenance. This provision is included to authorize the operator to perform routine maintenance without compromising the treatment system.

Adopted new §217.250(d) contains the requirements for sludge conditioning. These requirements are included to be consistent with standard engineering practices and to ensure that the executive director has sufficient information to review the report.

Adopted new §217.250(e) contains the requirements for sludge drying beds. The sludge drying beds size must be based on data from similar facilities in the same geographical area with the same influent sludge characteristics. If such data is unavailable or if the executive director determines that the data is not appropriate for the proposed facility, the sludge drying bed design must be based on the requirements in §217.250(e)(2) - (5). These requirements are included to authorize a sludge drying bed to be designed for

the geographic region, consistent with current engineering practices, and protective human health and the environment.

Adopted new §217.251, Sludge Storage, contains specific criteria for the storage of residuals after processing and prior to final disposal or removal from the site, including general criteria, solids storage, dewatered solids storage, and dried solids storage to protect the environment. Staff experience has shown that some facility designs have failed to include sludge storage.

Adopted new §217.251(a) specifies that this section applies to sludge after processing and before disposition or disposal.

Adopted new §217.251(b) states that sludge may be stored in liquid, dewatered, or dry forms, if properly processed.

Adopted new §217.251(c) contains general requirements. These requirements are included to ensure that the sludge storage minimize nuisance conditions. Additionally, the requirement that the report include a solids management plan is to ensure that the executive director has sufficient information to ensure compliance with these rules.

Adopted new §217.251(d) contains the requirements for non-dewatered solids storage that are consistent with standard engineering practices. Section 217.251(d)(2) authorizes a storage facility to store anaerobically digested solids in covered basins that control odor. The executive director determined that this option is protective of human health and the environment.

Adopted new §217.251(e) contains the requirements for dewatered solids storage. The commission adopts these requirements to be consistent with standard engineering practices.

Adopted new §217.251(f) contains the requirements for open stockpiles, including an impervious pad and the ability to collect rainfall runoff and return it to the head of the treatment facility. Because rainfall runoff from stockpiles will not meet the discharge limits for storm water, the water must be treated.

Adopted new §217.251(g) contains the requirements for dried solids storage. This requirement is included to be consistent with standard engineering practices.

Adopted new §217.252, Final Use or Disposal of Sludge, contains the criteria for the final use or disposal of sewage sludge, including quantities of solids, pollutants, pathogens, vector attraction, emergency provisions and weather factors.

Adopted new §217.252(b) requires the quantity of solids generated by the treatment process must be based on similar full scale facilities or pilot facilities and a mass balance. This requirement is included to be consistent with Chapter 305.

Adopted new §217.252(c) requires the sludge use or disposal option be based on the character of the sludge. The pollutant levels must be less than the levels specified in §312.82 and determined by Standard Method's laboratory test procedures.

Adopted new §217.252(d) requires that metals, pathogens, and vector attraction meet the requirements of Chapter 312 concerning the ultimate use or disposal method.

Adopted new §217.252(e) requires that the design include a backup plan in the event of equipment failure or conditions that prevent the facility's primary use or disposal method. The requirement to include the secondary plan in the report ensures that the executive director has sufficient information to review the design.

Adopted new §217.252(f) requires the design to include contingencies for weather factors such as rainfall, wind conditions, and humidity in the selection of the use or disposal of sewage sludge. This requirement is included to account for site-specific conditions.

SUBCHAPTER K: CHEMICAL DISINFECTION

The requirements in this subchapter are related to disinfecting treated effluent with chlorine and the subsequent dechlorination of the effluent. Chlorine and sulfur dioxide are toxic, oxidizing chemicals, which makes them very effective for disinfection and dechlorination. But, both are harmful or fatal if inhaled. These required specifications represent commonly accepted best practices for the safe handling of these hazardous chemicals and should be considered minimum requirements to protect facility staff, the public, and the environment.

The requirements also ensure consistency with permitting requirements for facilities that use chlorination disinfection and have a Texas Pollutant Discharge Elimination System (TPDES) permit that are required to conduct biomonitoring. Dechlorination is a requirement of these permits.

Adopted new §217.271, Chlorine (Cl_2) Disinfection and Sulfur Dioxide (SO_2) and Dechlorination System Redundancy Requirements, contains the redundancy requirements to ensure continuing operation of the disinfection system.

Adopted new §217.271(a) requires each chlorine disinfection system to have at least two banks of chemical cylinders.

Adopted new §217.271(b) requires that a bank of cylinders automatically switch from an empty bank to a full bank of cylinders in a manner that ensures continuous disinfection.

Adopted new §217.271(c) requires that the facility to have sufficient space to store empty cylinders.

Adopted new §217.271(d) requires that the chemical delivery system so that the pound per day requirements in §217.272 are met with the largest chlorinator, sulfonator, or evaporator out of service.

Adopted new §217.271(e) requires that a chemical delivery system include backup pumps for any injector water supply systems requiring booster pumps. These requirements are included to ensure that this subsection is consistent with the other redundancy requirements in this rule.

Adopted new §217.272, Capacity and Sizing of Chlorine (Cl_2) Disinfection and Sulfur Dioxide (SO_2) Dechlorination Systems, contains the requirements for determining capacity and size of the system.

Adopted new §217.272 (a) requires the capacity of the chlorine and sulfur dioxide gas withdrawal systems be based on the two-hour peak flow in accordance with organic and hydraulic loading requirements in §217.32(1), EquationK.1 (a standard engineering equation), and Table K.1 (minimum concentration needed for disinfection). This requirement is included to ensure consistency in the design criteria rules.

Adopted new §217.272(b) establishes the minimum chlorine dosage necessary for disinfection in Table K.1.

Adopted new §217.272(c) requires the dechlorination system design to include at least an equal amount of sulfur dioxide as chlorine.

Adopted new §217.273, Cylinder Requirements for Chlorine (Cl_2) Disinfection and Sulfur Dioxide (SO_2) Dechlorination Systems, contains the general requirements for using chemicals stored in cylinders for disinfection and dechlorination.

Adopted new §217.273(a) requires gas withdrawal rates to be based on Equation K.2, using the variables in Table K.2 and sets maximum withdrawal rates for liquid chemicals. It also prohibits the use of heating blankets on chlorine gas cylinders.

Adopted new §217.273(b) sets the number of cylinders required based on Equation K.3.

Adopted new §217.274, Dosage Control for Chlorine (Cl_2) Disinfection and Sulfur Dioxide (SO_2) Dechlorination Systems, requires systems to have automatic controls that adjust chemical levels to meet effluent flow levels.

Adopted new §217.275, Requirements for Chlorine (Cl_2) Disinfection and Sulfur Dioxide (SO_2) Dechlorination Systems Using 150 pound (lb) Cylinders, contains the requirements for the smaller of the two cylinder sizes that facilities can use. Chemicals are always withdrawn from this size cylinder in a gaseous state.

Adopted new §217.275(a) states the requirements for storing cylinders in heated rooms.

Adopted new §217.275(b) states the requirements for using heating blankets on cylinders. Heating blankets are prohibited on chlorine cylinders because of the inherent dangers of chlorine. Heating blankets may be used on sulfur dioxide cylinders, but only if it does not heat the cylinder above 100 degrees and has the required safety features.

Adopted new §217.275(c) requires that chlorine and sulfur dioxide cylinders are stored separately and are handled so that they never come into close proximity to each other.

Adopted new §217.276, Requirements for Chlorine (Cl_2) Disinfection and Sulfur Dioxide (SO_2) Dechlorination Systems Using Gas Withdrawal from One-Ton Cylinders, contains the requirements for using the larger cylinder size and drawing the chemicals from them in the gaseous state.

Adopted new §217.276(a) requires the equipment that injects the chemicals into the effluent to be in a temperature controlled room because temperature affects gas pressure and therefore the chemical dosing levels.

Adopted new §217.276(b) states the requirements for storing cylinders outdoors, including the requirements for sizing, storage facilities, and piping.

Adopted new §217.276(c) prohibits the use of heating blankets on chlorine cylinders and proscribes the requirements for using heating blankets on sulfur dioxide cylinders.

Adopted new §217.276(d) states the requirements for maintaining the separation between chlorine cylinders and sulfur dioxide cylinders.

Adopted new §217.277, Requirements for Chlorine (Cl_2) Disinfection and Sulfur Dioxide (SO_2) Disinfection Systems Using Liquid Withdrawal from One-Ton Cylinders, contains the requirements related to withdrawing chemicals from large cylinders in a liquid state.

Adopted new §217.277(a) requires the equipment that injects the chemicals into the effluent to be in a temperature controlled room because temperature affects gas pressure and therefore the chemical dosing levels. Even with liquid withdrawal, chemicals are in a gaseous state when injected into the effluent stream.

Adopted new §217.277(b) requires withdrawal at the limits set in §217.273(a)(2).

Adopted new §217.277(c) states the requirements for maintaining the separation between chlorine cylinders and sulfur dioxide cylinders.

Adopted new §217.278 Housing Requirements for Chlorine (Cl_2) Disinfection and Sulfur Dioxide (SO_2) and Dechlorination Systems, contains the requirements for housing facilities for chemicals, including drainage, door and windows, ventilation, and gas detectors and protection.

Adopted new §217.278(a) requires that the drainage system for a room that contains either chlorine or sulfur dioxide be separate from every other drain system to ensure that chlorine or sulfur dioxide does not migrate into other areas and does not mix with any other substances.

Adopted new §217.278(b) contains the requirements for openings into a room that contains chlorine or sulfur dioxide equipment or cylinders. These requirements ensure the safety of facility staff and the safe operation of the disinfection system.

Adopted new §217.278(c) requires that any room that contains chlorine or sulfur dioxide equipment or cylinders have ventilation sufficient to prevent a buildup of chemical fumes. These requirements ensure the safety of facility staff and the safe operation of the disinfection system.

Adopted new §217.278(d) requires that any room that contains pressurized chlorine or sulfur dioxide equipment or cylinders have detection and protection devices. These requirements ensure the safety of facility staff and the safe operation of the disinfection system.

Adopted new §217.279, Equipment and Material Requirements for Chlorine Disinfection (Cl_2) and Sulfur Dioxide (SO_2) Dechlorination Systems, includes the specification necessary to ensure that equipment and material used in chlorine/sulfur dioxide systems are appropriate for that use.

Adopted new §217.279(a) ensures that equipment and materials used in these systems were designed and manufactured to be compatible with these chemicals.

Adopted new §217.279(b) ensures that cylinders are stored appropriately.

Adopted new §217.279(c) contains the requirements for gas piping for chlorine/sulfur dioxide systems. These requirements ensure the safe transfer of chemicals in a gaseous state.

Adopted new §217.279(d) contains the requirements for piping for liquid chlorine/sulfur dioxide. These requirements ensure the safe transfer of chemicals in a liquid state.

Adopted new §217.280, Design of Sodium Hypochlorite (NaClO) Disinfection and Sodium Bisulfite ($NaSO_3$) Dechlorination Systems, contains the requirement for systems that use alternate chemicals to achieve chlorination and dechlorination.

Adopted new §217.280(a) contains the requirements to ensure that the system can operate during times that a pump is out of service.

Adopted new §217.280(b) contains the capacity sizing requirements for a sodium hypochlorite/sodium bisulfite system. These requirements ensure that the designed size of the system is appropriate for the amount and properties of the facility's effluent.

Adopted new §217.280(c) contains the requirement for automatic control of positive-pressure chemical dosing.

Adopted new §217.280(d) contains the requirements for proper chemical handling, including storage and temperature considerations. These requirements ensure the safe storage and transfer of sodium hypochlorite and sodium bisulfite.

Adopted new §217.280(e) requires that the equipment and materials used in a sodium hypochlorite/sodium bisulfite system be designed and manufactured to be compatible with these chemicals.

Adopted new §217.280(f) contains the safety requirement for a hypochlorite/sodium bisulfite system, including ventilation, tank indicator, spill containment, and emergency and protective equipment for facility staff. These chemicals are liquid and are therefore not as great a safety risk as chlorine and sulfur dioxide.

Adopted new §217.281, Application of Chlorination and Dechlorination Chemicals, contains the requirements to ensure that chemicals are added to effluent in an effective manner.

Adopted new §217.281(a) requires that chlorine is thoroughly mixed with effluent before the calculation of the chlorine contact time begins.

Adopted new §217.281(b) ensures that chlorine contact basins are properly sized to allow the necessary chlorine contact time.

Adopted new §217.281(c) ensures that the effluent is dechlorinated sufficiently to meet the limits of the facility's permit.

Adopted new §217.282, Other Chemical Disinfection or Dechlorination Processes, requires that any chemical process not covered by Subchapter K must be approved through the variance process in §217.7(b)(2).

Adopted new §217.283, Post-Disinfection Requirements, contains the design requirements necessary for the treatment train after the disinfection units.

Adopted new §217.283(a) requires the design include a sufficient number access points from which effluent samples may be taken so that the system may be monitored and adjust to keep the disinfection/dechlorination process within the limits of the wastewater permit.

Adopted new §217.283(b) requires that the disinfection/dechlorination system be designed to be capable of maintaining the permitted dissolved oxygen levels in the effluent. For facilities with high dissolved oxygen minimum limits, the report must justify the design.

SUBCHAPTER L: ULTRAVIOLET LIGHT DISINFECTION

This subchapter regulates the use of ultraviolet light to disinfect wastewater. Ultraviolet (UV) is a growing segment of the disinfection technology. An advantage of UV disinfection is that it does not require the addition of chemicals and thereby avoids the environmental impact of production, transport, and disposal of disinfection chemicals.

Adopted new §217.291, Ultraviolet Light Disinfection System Definitions, contains definitions specific to this subchapter.

Adopted new §217.292, Ultraviolet Light Disinfection Systems Effluent Limitations, requires UV systems to be designed with the capability of meeting the permit limits regarding disinfection in the facility's wastewater permit.

Adopted new §217.293, Ultraviolet Light Disinfection Systems Redundancy Requirements, requires UV systems to have sufficient backup equipment to be able to provide disinfection during equipment outages for maintenance or repairs.

Adopted new §217.294, Ultraviolet Light Disinfection Systems Monitoring and Alarms, contains the monitoring and alarm requirements that allow an operator to monitor and adjust the UV system and alert an operator of a problem. This requirement is included to ensure proper operations during normal operating and emergency situations.

Adopted new §217.295, Ultraviolet Light Disinfection Dosage and System Sizing, contains the requirement for designing the amount of UV required and the size of the UV system. This requirement is included to ensure that a UV system is capable of delivering adequate disinfection to meet permitted effluent limits.

Adopted new §217.296, Ultraviolet Light Disinfection Bioassay Test Procedure, contains the requirement for the bioassay test used as the basis for UV dosing and system sizing. This requirement is included to ensure the reliability of the bioassay.

Adopted new §217.297, Ultraviolet Light Disinfection Reactor Design, contains the specifications for a UV reactor. This requirement is included to ensure the UV reactor meets engineering standards.

Adopted new §217.298, Ultraviolet Light Disinfection System Cleaning and Maintenance, contains the requirement that the design of a UV system must allow adequate cleaning and maintenance. This requirement is included because cleaning and maintenance are essential for proper operation of a UV system.

Adopted new §217.299, Ultraviolet Light Disinfection System Safety, contains the requirement that personal safety equipment must be worn by any person entering the UV area. This requirement is included to protect operators, contractors, investigators and any other person who might be exposed to UV light by the UV disinfection system.

Adopted new §217.300, Post-Disinfection Requirements, contains the design requirements necessary for the treatment train after the disinfection units.

Adopted new §217.300(a) requires the design include a sufficient number of access points from which effluent samples may be taken so that the system may be monitored and adjust to keep the disinfection process within the limits of the wastewater permit.

Adopted new §217.300(b) requires that the disinfection system be designed to be capable of maintaining the permitted dissolved oxygen levels in the effluent. For facilities with high dissolved oxygen minimum limits, the report must justify the design.

SUBCHAPTER M: SAFETY

Subchapter M is included to ensure that wastewater collection systems and treatment facilities provide safe working conditions. Safety-related incidents often result in an environmental threat or incident. To protect public health and the environment, a system or facility must be designed to be safe for the workers who operate it.

Adopted new §217.321, Safety Design, specifies the general safety guidelines for designing collection systems and treatment facilities.

Adopted new §217.321(a) requires a facility design to be based on a widely accepted safety design standard. This requirement is included to ensure that unsafe working conditions for staff do not interrupt the facility's functions.

Adopted new §217.321(b) requires collection system and treatment facility designs to address workplace safety and the safety of the public located near the system or facility.

Adopted new §217.321(c) requires the design specifies treatment processes that use non-hazardous, non-toxic, less hazardous, less toxic, dilute chemicals, and a minimum inventory of chemicals. This requirement is included to ensure that only the minimum amount of chemicals needed to produce a quality effluent are used. This will limit the likelihood of human exposure, spills, and contamination of groundwater or surface water.

Adopted new §217.321(d) requires that the applicable standards in 29 CFR Part 1910, Occupational Safety and Health Administration (OSHA), be the basis for the safety elements in the design of a collection system or treatment facility.

Adopted new §217.321(e) requires the owner to demonstrate compliance with this section by implementing §217.322 and §217.323. This requirement is included to ensure that the safety aspects of the design are verifiable.

Adopted new §217.322, Safety and Security Audits, requires a collection system or treatment facility owner to conduct a safety audit of the working conditions. The commission envisions these audits being conducted by the owner, the design engineer, and facility staff. The intent of this requirement is to ensure that safety is an integral part of any design. Security audits are not required but are strongly encouraged.

Adopted new §217.322(a) requires that the owner of an existing facility being materially altered or expanded review the safety related injuries and incidents from the prior three years, identify problem locations and tasks, report any corrective action taken, and address any outstanding problems in the design of the facility upgrade.

Adopted new §217.322(b) authorizes an owner to evaluate the security of a collection system or treatment facility based on *Asset Based Vulnerability Checklist for Wastewater Utilities* by the Association of Metropolitan Sewerage Agencies (AMSA) or its equivalent. This section is included to be consistent with the National Homeland Security Act. At this time, the United States Department of Homeland Security is recommending, but not requiring, a security audit.

Adopted new §217.323, Hazardous Operation and Maintenance, requires an owner to perform an analysis of hazardous operation and maintenance activities for new, expanded, or materially altered facilities. From that analysis, the owner must develop an inventory of necessary equipment, tools, and supplies needed for each task. The tools supplied must be sufficient to allow workers to safely and properly operate equipment, to perform required preventive maintenance, and to make repairs according to manufacturers' recommendations.

Adopted new §217.324, Chemical Handling, requires that the necessary equipment is available for personnel to handle chemicals safely and to address any accident that may happen.

Adopted new §217.325, Railings, Ladders, Walkways, and Stairways, specifies criteria for the use of railings, ladders, walkways, and stairways contained in safety requirements from the Occupational Safety and Health Act, §1910.23.

Adopted new §217.326, Electrical and Fire Code Compliance, requires that electrical design must conform to local electrical codes or if none, to the National Electrical Code.

Adopted new §217.327, Non-Potable Water, explains that when non-potable water is made available to any part of the plant, all yard hydrants and outlets must be properly marked.

Adopted new §217.328, Facility Access Control, requires that the facility area be completely fenced, have lockable gates at all access points, and have a means of access during 100-year flood conditions. This requirement is included to allow flexibility in the access control design of a treatment facility.

Adopted new §217.329, Color Coding of Pipes, specifies the color coding for pipes used in a wastewater facility. Standardization of color coding makes it safer for staff who change facilities and commission investigators who visit many facilities. These colors were chosen because they correspond with national standards provided by the American Water Works Association (AWWA) and the Water Environment Federation (WEF). The colors for the wastewater and related pipes are from the WEF and the colors for water and related pipes are from the AWWA.

Adopted new §217.330, Public Drinking Water Supply Connections, requires a facility with a potable water connection to have double check backflow preventers at the water main and atmospheric vacuum

breakers for all potable water wash down hoses. These requirements protect the potable water supply from cross contamination.

Adopted new §217.331, Freeze Protection, requires the facility design to prevent ice formation on equipment that might be damaged by ice and to prevent personnel from walking on icy surfaces.

Adopted new §217.332, Noise Levels, requires that the noise levels in all working areas must remain below standards established by the Occupational Safety and Health Act, and prohibits removable noise attenuations.

Adopted new §217.333, Confined Spaces, requires that the design of collection systems and treatment facilities minimize the use of confined spaces as defined in 29 CFR §1910.146. Confined spaces present an inherent danger to personnel required to work in them.

FINAL REGULATORY IMPACT ANALYSIS DETERMINATION

The commission reviewed this rulemaking in light of the regulatory analysis requirements of Texas Government Code, §2001.0225, and determined that the rulemaking is not subject to §2001.0225, because it does not meet the criteria for a "major environmental rule" as identified in that statute. Major environmental rule is defined as a rule, the specific intent of which, is to protect the environment or reduce risks to human health from environmental exposure and that may adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, or the public health and safety of the state or a sector of the state. This rulemaking does not adversely affect, in a material way, the economy, a section of the economy, productivity, competition, jobs, the environment, or

the public health and safety of the state or a sector of the state. The intent of this rulemaking is to update the design standards and criteria for wastewater treatment systems to current engineering practices and include recent advances in wastewater treatment technologies. Additionally, the adopted rules will allow increased flexibility to attain the design standards and criteria; update the standards and criteria to reflect the commission's related permitting practices; and amend and specify the commission's review and approval process for proposed wastewater treatment facility projects. Furthermore, the rulemaking does not meet any of the four applicability requirements listed in Texas Government Code, §2001.0225(a). Specifically, the adopted rule does not exceed a federal standard because no applicable federal standards exist. The adopted rule does not exceed an express requirement of state law nor exceed a requirement of a delegation agreement. The adopted rule was not developed solely under the general powers of the agency; but also under the specific authority of TWC, §26.034. Under Texas Government Code, §2001.0225, only a major environmental rule requires a regulatory impact analysis. Because the adopted repeals do not constitute a major environmental rule, a regulatory impact analysis is not required. The commission solicited public comment regarding this draft regulatory impact analysis determination. No comments were received on the draft regulatory impact analysis determination.

TAKINGS IMPACT ASSESSMENT

The commission performed an assessment of these rules in accordance with Texas Government Code, §2007.043. The specific purpose of the rulemaking is to update the design standards and criteria for wastewater treatment systems to current engineering practices and include recent advances in wastewater treatment technologies. Additionally, the adopted rules will allow increased flexibility to attain the design standards and criteria; update the standards and criteria to reflect the commission's related permitting practices; and amend and specify the commission's review and approval process for adopted wastewater treatment facility projects. Promulgation and enforcement of these rules will constitute neither a statutory

nor a constitutional taking of private real property. This rulemaking will impose no burdens on private real property because the adopted rule neither relates to, nor has any impact on the use or enjoyment of private real property, and there is no reduction in value of the property as a result of this rulemaking.

CONSISTENCY WITH THE COASTAL MANAGEMENT PROGRAM

The commission reviewed the adopted rulemaking and found that the proposal is subject to the Coastal Management Program (CMP) in accordance with the Coastal Coordination Act, Texas Natural Resources Code, §33.201 *et.seq*, and therefore must be consistent with all applicable CMP goals and policies. The commission conducted a consistency determination for the adopted rules in accordance with Coastal Coordination Act Implementation Rules, 31 TAC §505.22 and found the adopted rulemaking is consistent with the applicable CMP goals and policies.

CMP goals applicable to the adopted rule are: to protect; preserve; restore; and enhance the diversity, quality, quantity, functions, and values of coastal natural resource areas (CNRAs); to ensure sound management of all coastal resources by allowing for compatible economic development and multiple human uses of the coastal zone; and, to balance the benefits from economic development and multiple human uses of the coastal zone, the benefits from protecting, preserving, restoring, and enhancing CNRAs, the benefits from minimizing loss of human life and property, and the benefits from public access to and enjoyment of the coastal zone.

CMP policies applicable to the adopted rule include the standards for the discharge of municipal and industrial wastewater to coastal waters in 31 TAC §501.14(f) and standards for development in critical areas in 31 TAC §501.14(h).

The rules are consistent with the goals and policies of the Coastal Management Program because, even though these rules do not directly govern wastewater discharge permits but rather set the minimum criteria for designing wastewater treatment facilities, the rules are written to support the commission's rules that do govern wastewater discharge permits. Additionally, these rules are as stringent as the existing design criteria; therefore, there will be no reduction in the quality of the effluent reaching the receiving waters.

Promulgation and enforcement of these rules will not violate or exceed any standards identified in the applicable CMP goals and policies. The adopted rules are consistent with these CMP goals and policies, because these rules do not create or have a direct or significant adverse effect on any Coastal Natural Resource Areas, and because the adopted rules do not reduce the quality of the effluent reaching the receiving waters. The commission invited public comment regarding the consistency of the rules with the CMP. No comments were received regarding the consistency of the rules with the CMP.

PUBLIC COMMENT

The proposal was published on March 14, 2008 in the Texas (33 TexReg 2126). The commission held a public hearing on this proposal in Austin on April 10, 2008, at 10:00 a.m. at the Texas Commission on Environmental Quality Complex located at 12100 Park 35 Circle in Building B, Room 201A. The comment period closed on April 14, 2008. No comments were received at the hearing.

The Commission received comments from the City of Garland (Garland), Process Engineered Equipment Company (PEECO), Trojan Technologies (Trojan), UtraTech Systems, Inc. (UltraTech), Water Environment Association of Texas (WEAT), Texas Parks and Wildlife Department (TPWD), Harris

County, and seven individuals. The comments received addressed specific technical issues or requested clarification of certain sections of the rule. The commission requested and received clarification from Trojan regarding its comments.

RESPONSE TO COMMENTS

GENERAL COMMENTS

Comment

An individual asked what modifications or changes in equipment would trigger the new design criteria to be required for an existing system.

Response

Only new construction or changes that alter the efficiency of a treatment facility or collection system will be subject to the new design criteria. TWC, §26.034(b) gives the commission the authority to review plans and specifications for any proposed construction or material alterations that affect the efficiency of a treatment works. To clarify the rule and to more closely reflect the statute, the commission inserted a definition of "materially alter." The commission also changed rule language that referred to "modify," "modification," and "substantial modification" to "materially alter" or "material alteration."

Comment

An individual asked what modification would trigger a requirement that an existing lift station install generator connections.

Response

Existing lift stations will not be subject to §217.36, Emergency Power Requirements, unless the lift station is materially altered, such as a change in capacity or location.

Comment

An individual asked what procedures would be used to address wastewater treatment facility and collection system projects that are under way.

Response

Projects that have been approved and are under construction at the time new Chapter 217 becomes effective are not subject to the new design criteria. Section 217.1(c) has been edited to clarify that collection system or treatment facility projects submitted for review between the effective date of this rule and March 1, 2009 will be evaluated by the design criteria that were in effect when the project engineering began. The commission intends on granting variances for designs that meet Chapter 317 standards for the first six months that the new Chapter 217 is in effect.

Comment

An individual stated that the terms "modify," "modification," and "substantial modification" are not defined. The individual stated that no portion of a facility or collection system is grandfathered under the rule when new work takes place or changes are made in another portion of the facility or collection system. The individual suggested the phrase "construct or materially alter the efficiency of" (TWC,§26.034) be used in lieu of defining modification.

Response

The commission agrees with the comment. A definition of "materially alter" has been added to the rule in §217.2(28) that reflects the definition found in TWC, §26.034(b). All references to "modify," "modification," "substantially modify," and "substantial modification" have been changed to "materially alter" or "material alteration."

Comment

An individual stated that the rules do not address structural design of treatment units with respect to concrete standards. The individual stated that American Concrete Institute (ACI) Code 350 is written to address concrete in environmental structures. The individual suggested that the rule include a requirement for all treatment units to meet the ACI 350 standard.

Response

The commission does not review the structural portions of the design. The commission requires that a licensed professional engineer design be employed to design wastewater treatment facilities. The Texas Engineering Practice Act and the Texas Board of Professional Engineers govern engineering standards. The commission accepts the seal of the engineer to certify that the design meets all applicable engineering standards.

Comment

An individual stated that the rules do not include a requirement to meet a fire code. The individual suggested that the rule require compliance with either the IBC Fire Code or the NFPA Fire Code.

Response

The commission agrees with this comment. Section 217.326 was amended to include a requirement to comply with the local fire code or to the National Fire Protection Association Uniform Fire Code if there is no local code.

Comment

An individual stated that collection systems are inadvertently excluded from several requirements because "facility" is defined as the treatment plant. She lists affected sections as §§217.2(15) & (39), 217.6(c), 217.10(a), 217.11, 217.16, and 217.322.

Response

The commission agrees in part with this comment. References to collection systems were added to §§217.2(39), 217.6(c), 217.10(a), and 217.11, as well as §217.7. No changes were made to §§217.2(15), 217.16, or 217.322 as these sections correctly included references to treatment facilities only.

Comment

An individual commented that this chapter includes provisions directed at operations and construction and suggested renaming the chapter *Design Criteria and Selected Operations and Construction Standards for Domestic Wastewater Systems.*

Response

The commission disagrees with this comment. The chapter refers only to projected operations as an element of design. Certain operating parameters affect the bases for designing both collection systems and treatment facilities.

Comment

An individual commented that 30 TAC Chapter 210, Use of Reclaimed Water, refers to design standards in 30 TAC Chapter 317.

Response

The commission did not propose to correct cross-references in other chapters, such as Chapter 210, that reference Chapter 317. Chapter 217 establishes design criteria for reclaimed water use, consistent with Chapter 210. Cross-references will be changed when chapters are opened for substantive changes.

Comment

An individual commented that "30" and "thirty" are used inconsistently and suggested use of "30" in all instances.

Response

The commission agrees with the comment. The rule was edited to use the numeral in all instances.

Comment

WEAT commented that the reference to 50-year projection of a collection system's performance is not feasible. There is no scientific means to predict how infrastructure material will perform in 50 years.

Response

The commission disagrees with this comment. Although there may not be scientific testing to predict all material performance, it is industry standard to design a collection system for a minimum 50-year lifespan.

Comment

WEAT commented that the rule makes reference to "no surcharge" and should be clarified to include only preventable occurrences of surcharge. WEAT commented that wastewater infrastructure in rivers, creeks, fields/easements will always be required, and especially common when utility infrastructure is constructed in advance of development. The accumulation of extraneous water around an infrastructure access point (manhole) or "ponding" is common in both street and non-street conditions. Ponding in a low point of an asphalt constructed street is very common and documented to enable extraneous water to enter the collection system.

Response

The commission disagrees with the comment. The collection system design should handle the maximum flow under expected conditions, based on the location of the system. If a collection system is proposed for a low lying area that is prone to collect water, the system should be designed to handle the resulting surcharge.

Comment

A white paper titled *The High Performance Biofiltration Concept: The "Workhorse" Technology of*

Distributed Treatment Systems was received from an individual. No accompanying comment was received.

Response

The commission reviewed the paper. A treatment facility designed to use this technology would be considered innovative and require that it be reviewed under the provisions of §217.7(b)(2).

SUBCHAPTER A

§217.1(c)

Comment

An individual asked why a variance would be needed if as the requirement says "…if the plans and specifications for the project meet the design criteria."

Response

The commission agrees that the requirement is vague. The requirement was edited to read, "…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

Comment

An individual commented that "annual average flow" should be "annual average daily flow."

Response

The commission disagrees with this comment. This term and definition are the same as the ones used in the TPDES permits.

Comment

An individual commented that the definition for "building lateral" is confusing and suggested a definition. Another individual commented that a building lateral connects to an "off-site component," not an "on-site component."

Response

The commission agrees in part with these comments. The definition of "building lateral" has been amended to read: "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." The rule rightly refers to an on-site component. The on-site component most frequently located at the terminus of a building lateral is a grinder pump.

Comment

An individual suggested substituting "If a sample of filter media is analyzed, effective diameter D10 is the diameter of the particle size at 10% finer-by-weight as plotted on a semi-log grain size distribution curve." for the first sentence in the definition of "effective size".

Response

The commission agrees that the definition of "effective size" is unclear. The first sentence of the definition has been changed to read: "The result of an analysis of a sample of filter media equals the effective diameter, D10, which is the diameter of the particle size at 10% finer-by-weight as plotted on a semi-log grain size distribution curve."

Comment

An individual suggested that the words "the terminus of" be deleted from the definition of grinder pump.

Response

The commission agrees with this comment and the change was made.

Comment

WEAT and an individual commented that the definition of "lift station" effectively excludes many current and future lift stations. The static head at a lift station does not always exceed frictional headlosses.

Response

The commission disagrees with these comments. The highest head a pump may provide is at the no flow (static head) point of the pump curve. If the overall system head requirements are higher than the static head, no flow can occur.

Comment

An individual suggested that the definition for "minimum grade effluent sewer" be moved to the alternative collection system subchapter since it only applies to that subchapter.

Response

The commission agrees in part with this comment. The definition has been clarified so that the term applies to alternative collection systems only but was not moved.

Comment

An individual commented that the phrase "a prolonged period of wet weather" is vague. The individual suggested defining it as "three or more consecutive days of wet weather with average rainfall intensity of at least 0.5 inches per hour" or a similar description that allows for calculation.

Response

The commission disagrees with this comment. What constitutes a prolonged period of wet weather is different for east and west Texas. Near the Louisiana border, average rainfall exceeds 56 inches annually, while in parts of extreme West Texas, rainfall averages less than 8 inches. Average annual precipitation in Dallas (1971–2000) was 34.7 inches; in El Paso, 9.4 inches; and in Houston, 47.8 inches.

Comment

An individual commented that the word "and" should be eliminated from the title "Final Engineering Design and Report."

Response

The commission agrees and the change was made.

§217.4(e) and §217.10(d)

Comment

An individual commented changing "variance request sealed by an engineer" to a more definitive term such as "design engineer" or "the design engineer or an engineer employed by the owner."

Response

The commission finds the wording is clear and accurate. The Texas Engineering Act and the Texas Board of Professional Engineers govern the actions of licensed professional engineers. The commission declines to limit an owner's choice of engineers who may seal a variance request. The design engineer may be unavailable. An engineer other than the design engineer may review the design and seal the variance request.

§217.5(a)

Comment

An individual stated that although this subsection clearly required submittal of plans and specification for collection systems, the rest of the section was unclear because of the referral to "facility," which is defined in this chapter as the wastewater treatment facility. The individual suggested editing this section by specifying which items for collection systems, lift stations, and treatment works must be submitted for plan and specification review.

Response

The commission agrees with this comment. Clarifications that specify which plans and

specifications are required were added to §§217.5, 217.6, and 217.7.

Comment

An individual stated that there is an inconsistency in terms regarding plans and specification approval in §217.5(a), §217.6(e), and §217.11(a) & (b). The individual suggested adding "or the plans and specifications granted tacit approval in accordance with §217.6(e)" to §217.11(a) & (b).

Response

There is no inconsistency because the commission provides a general rule, §217.5(a), which states that an owner must build a wastewater collection system or treatment facility according to plans and specifications approved by the executive director. The commission also provides specific rules, §217.6(e) and §217.11(a) & (b), that apply in certain circumstances. Section 217.11(a) states that the executive director must issue a wastewater permit before an owner of a facility with approved plans and specifications may begin construction. Section 217.11(b) states that an owner must obtain plans and specifications approval for a particular permit phase prior to construction or operation under that phase. The approval in §217.6(e) is conditional and does not apply when in conflict with any other rule in the chapter that requires affirmative executive director approval.

§217.6(e)

Comment

An individual suggested adding "by fax or letter" after "notify an owner."

The commission agrees. The change was made.

§217.6(f)

Comment

An individual suggested revising the requirement to say "submit the following within 30 days after receipt of notification."

Response

The commission agrees. The change was made. An additional change was made to add "by fax or letter," as suggested in the comment regarding §217.6(e).

§217.7(b)(1)

Comment

An individual stated that this requirement does not specify whether an owner is required to wait for confirmation or if the 30 day approval (as in §§217.6(e)) applies when more information is requested on a project with no variances.

Response

The commission agrees that this requirement is not clear. The commission's position is that a confirmation is not required and §217.6(e) applies when there are no requested variances and the project complies with all other applicable sections of Chapter 217. However, in order to clarify a situation where more information is requested, the commission included an additional provision, §217.6(g), which states: "If the executive director does not notify an owner of any insufficiency within 30 days after receipt of any additionally requested information, the project is approved."

§217.7(b)(2)

Comment

An individual suggested revising the requirement by adding (A) Innovative and nonconforming technologies may be approved as a variance in accordance with §217.4 of this title (relating to Variances)." Existing (A) through (F) would then need to be renumbered.

Response

The commission agrees that this clarification is needed. However, it was added to §217.7(b)(2) rather than creating a new (A).

§217.7(b)(2)(A)

Comment

An individual commented that the reference in this requirement should be §217.6(c).

Response

The commission agrees and the change was made.

§217.7(b)(2)(E)

Comment

An individual suggested renumbering this section or revising this requirement to say "The performance bond required in §217.7(b)(2)(D) must cover:".

Response

The commission agrees with the suggestion and revised the requirement as suggested.

§217.7(b)(3)(A)

Comment

An individual commented that "of" was omitted from "for a specific set [of] operating conditions."

Response

The commission agrees and the change was made.

§217.8(a)

Comment

An individual suggested revising this requirement to say "The executive director may grant approval authority to a municipality that requests…"

Response

The commission agrees and the change was made. The word "director" was added and "request" was changed to "requests".

§217.8(b)

Comment

Two individuals commented that this requirement seems to require concurrent submittals to TCEQ and to a municipality that has approval authority. It is unclear who the approval would come from.

Response

The commission disagrees with the comment, but will clarify the requirement. The rules do not intend to require concurrent submittals to TCEQ and to a municipality that has approval authority. Owners may submit plans to the state if they choose. TWC, §26.034(e) states that "if the commission finds that a municipality's review and approval process does not provide for substantial compliance with commission standards, the commission shall require all plans and specifications reviewed by the municipality under Subsection (d) to be submitted to the commission for review and approval." No concurrent submittal is required unless the commission has revoked a municipality's approval authority. The word "shall" will replace the word "may" in §217.8(b) to clarify the intent of the rule.

§217.8(i)

Comment

An individual asked how this requirement applies to completed projects or projects under construction at the time the commission revokes a municipality's review authority.

Response

Section 217.8(i) states: "If the municipality does not achieve the required compliance within the timeframe established by the executive director, the commission may revoke the review authority of a municipality and require that all plans and specifications reviewed by the municipality under these rules be submitted to the executive director for review and approval." Section 217.8(k) states that 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(a). Section 217.8(l) states that after revocation of authority, 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. Completed projects or projects under construction are excluded from the mandatory language in §217.8(k) and §217.8(l).

In order to clarify the exclusion, the commission adds subsection (m) and changes the language in §217.8(i) to read: "If the municipality does not achieve the required compliance within the timeframe established by the executive director, the commission may revoke the review authority of a municipality. If the commission revokes the authority, subsections (j), (k), (l), and (m) apply." Subsection (m) reads: "If the commission revokes the authority of a municipality, owners of any completed projects or projects under construction whose plans and specifications were approved prior to revocation are not required to seek approval from the commission."

§217.8(k)

Comment

An individual commented that the reference in this subsection should be §217.6.

Response

The commission agrees with this comment. The reference was corrected.

§217.9

Comment

An individual stated that it is unclear whether a copy of another state agency's project approval is a courtesy copy and whether the TCEQ will honor the other agency's approval or whether TCEQ will still review the project.

Response

Section 217.9 requires the owner of a wastewater collection system or treatment or disposal facility to send a copy of approval from the TWDB to the executive director. Under TWC, §17.276(d), the TWDB "shall review and approve or disapprove plans and specifications …in a manner that will satisfy commission requirements for design and criteria and permit conditions…" and TWC, §17.276(e) states that "… decisions, and other actions of the board under this subchapter do not require the concurrence or approval of any other governmental agency, board, commission,… or other governmental entity." Therefore, TCEQ will honor an approval by the TWDB and will not review the project. Although TWDB copies the commission on all of their approvals, it is the owner's responsibility to make sure the commission has copies of all of its approvals. Sometimes TWDB does not include enough identifying information to match the approval with the appropriate TCEQ permit.

§217.10(a)

Comment

An individual stated that this requirement is inconsistent with §217.6(f)(2) regarding when a Report must be submitted. She suggested adding "If requested by the ED" to this requirement.

Response

The commission disagrees with this comment. These requirements are consistent. Section 217.5(f)(2) refers to the action the owner must take when the executive director notifies an owner of the intent to review a facility's design. Section 217.10(a) outlines the owner's required steps in submitting a final engineering design report.

§217.11

Comment

WEAT asked if the commission has considered how this requirement will be applied in "design-build projects."

Response

The commission has not yet been asked to review a design-build project. For the commission to approve a design-build project, the owner of the project would have to assure the commission the project would meet all permitting requirements, minimum design criteria, and buffer zone rules. The project's as-built plans would be subject to commission review prior to operation and could result in the commission requiring changes to siting, equipment, or treatment units.

§217.11(e)

Comment

An individual suggested adding "unless granted a variance in accordance with §217.1(c)."

Response

The commission agrees with the comment. The phrase was added to the requirement.

§217.13(c)(2)

Comment

An individual suggested un-capitalizing all but the first word in this subtitle to be consistent with other subtitles.

Response

The commission agrees with this comment. The initial letters of the words "construction drawings and technical specifications" were changed to lower case.

§217.13

Comment

An individual asked if the final plans and specification required by this section are "as-built" or "construction" plans and specifications.

Response

The commission is asking for the final construction plan in this section.

§217.13(c)(1)(C)

Comment

An individual stated that separation distances are rarely known prior to excavation and construction. This requirement will unnecessarily increase the cost of designing collection system installations, replacements or rehabilitations.

Response

The commission disagrees with the comment and declines to eliminate the requirement. The commission agrees it may be costly to determine the location of other utilities, but expects it will be more costly to relocate a collection system that does not meet the separation distances. Separation distances are necessary to protect human health.

§217.13(c)(2)(A)

Comment

An individual suggested requiring a piping and instrumentation diagram. They are very useful drawings and provide a great deal of information about a treatment plant in one location.

Response

The commission agrees that the piping and instrumentation diagrams (P&IDs) are useful. The commission is not requiring them since electrical drawings generally provide the necessary information. Although optional, P&IDs for projects that have complex configurations and/or control systems would simplify the commission's review of the project.

§217.13(c)(4)

Comment

An individual suggested revising the requirement to say "submit additional information relating to the plans and specifications within 30 days after receipt of notification."

Response

The commission agrees. The requirement was changed from "30 days after the date of the request" to "30 days after receipt of notification."

§217.16(b)(1)(E)

Comment

Harris County requested that the sample daily activity report include a section to document instances of noncompliance with notification requirements in paragraph (7) of the *Definitions and Standard Permit Conditions* section of TPDES permits. Harris County is not directly notified of releases that adversely impact human health and the environment. This results in underreporting to Harris County. Adding this requirement would greatly enhance Harris County's ability to monitor the operations of a treatment facility and collection system and assist with unauthorized discharge and unintentional bypass investigations.

Response

The commission agrees that recording noncompliant activities in the operator's daily log may have merit, but declines to address it in this chapter. It would be more properly addressed in Chapter 305, Consolidated Permits.

§217.16(b)(3)

Comment

An individual stated that the requirements for safety in the operation and maintenance are not covered in Subchapter M. The individual suggested adding a new item,"(C) other information in accordance with

sections §§217.247(q), 217.299, 217.323(b), and 217.324;" changing current item (C) to "(D) evacuation, shelter, and shelter-in-place plans;" adding new item: "(E) first aid precautions, location of first aid supplies, and description of appropriate emergency medical treatment;" renumbering (F) through (H); and adding new item: "(I) safety training curriculum for new staff."

Response

The commission agrees with the suggested changes. Although the format of the changes made is somewhat different, the information contained in the changes is essentially the same.

§217.16(b)(3)(E)

Comment

Harris County requested that this requirement specifically include pre- and post-hurricane preparedness and response plans. Harris County stated that mitigating the adverse environmental impact from storm-compromised wastewater treatment facilities in coastal counties is critical for protecting human health.

Response

The commission disagrees with this comment. The phrase "other site specific emergency situations that may develop" requires coastal facilities to address hurricane preparedness and facilities in the Panhandle to address blizzard conditions. It is the commission's position that the Texas climate is too varied to require the same emergency planning of all wastewater facilities.

§217.17

Comment

An individual commented that the first paragraph of this requirement is missing its "(a)" paragraph number.

Response

The commission disagrees. According to *Texas Register* formatting guidelines, there can be no subsection (a) without a subsection (b). Implied (a) is any text that follows a section title but precedes a designated subdivision of the section.

SUBCHAPTER B

§217.32(a)

Comment

PEECO requested that the commission reconsider the minimum peak factor of 4.0 for treatment facilities with no flow records. A 4.0 peak factor indicates that 33% of the total design daily flow is expected to occur within a 2-hour period. A 3.0 peak factor indicates that 25% of the total design daily flow is expected to occur within a 2-hour period. For a new treatment plant with a new collection system in a housing subdivision, a 3.0 to 3.5 peak factor should be sufficient. Unnecessarily high peak flow factors result in long clarifier retention times, which can result in difficulty maintaining dissolved oxygen and can cause problems for nitrifying bacteria. Excessive peak flow factors can also cause problems with the calibration and operation of instruments and chemical feed equipment. A 4.0 peak factor means that instruments would be operating at 25% of full range when the flow is at design average daily flow and at time may be operating in the lower 10% to 20% of full range. PEECO requested a peak factor minimum

of 3.0.

Response

The commission disagrees with the comment. The commission anticipates that very few facilities will have to use the default peaking factor. The peak factor should be based on existing flow data for an existing facility. The peaking factor for a new facility should be based on the design and the location of the facility or on a similar facility in a similar location.

§217.32(a)(1)(B)

Comment

PEECO asked that the difference between "design" and "permitted" flow and loadings be clarified.

Response

Treatment facilities are sometimes designed for a higher hydraulic or nutrient load than what is currently permitted. This is typically done when an owner anticipates adding additional connections or an increased flow in the foreseeable future.

§217.35

Comment

An individual suggested strengthening this section by requiring that a detailed hydrologic and hydraulic analysis be done for any treatment facility in the 100-year flood plain. The individual also suggested a requirement to comply with FEMA criteria or a FEMA Letter of Map Revision (LOMR).

Response

The commission disagrees with this comment. A detailed hydrologic and hydraulic analysis would be cost prohibitive for many small businesses and local governments. FEMA maps are prima facie evidence of flood plain designations.

§217.35(a)

Comment

An individual suggested clarifying the first sentence: "If the 100 year flood plain is within 1,000 feet of…"

Response

The commission agrees with the comment. The words "the 100-year flood plain is" were inserted.

§217.36(d)(1)

Comment

An individual stated that this section allows a treatment plant to be virtually without back up power. The individual stated that the rules are more stringent for lift stations than for treatment plants.

Response

The commission disagrees with this comment. The exceptions to the auxiliary power generator requirement are specific and based on whether a facility will have sufficient storage to hold the peak flow during the longest period of outage on record. The same requirement applies to lift stations.

§217.36(d)(2)(A)

Comment

An individual recommended deleting this requirement since lift stations that pump less than 100 gallons per minute (gpm) were not allowed under the previous rule.

Response

The commission disagrees with this comment. Lift stations that pump less than 100 gpm are allowed by this rule. At times, there are few options to installing small volume lift stations in remote sections of a collection system.

§217.38(a)

Comment

An individual asked if this requirement is meant to restrict construction of laboratory and office facilities within the 150 foot buffer zone.

Response

The requirement was not intended to restrict the siting of laboratory or office facilities. The commission revised this requirement to clarify that it is only the treatment units in a facility that are subject to the buffer zone requirements.

§217.39(a)

Comment

An individual commented that the preamble states that the use of reclaimed water at the treatment facility is optional for "any other suitable use" and that the rule actually requires the use of reclaimed water for "any other appropriate use."

Response

The commission agrees with this comment. A treatment facility owner is required to use reclaimed water for "any other appropriate use" but has the latitude to determine appropriate uses. The preamble has been edited to reflect the correction.

§217.40

Comment

Harris County requested adding a new section: "All wastewater treatment facilities shall have instruments installed to monitor required operator attendance; effluent chlorine residual, if applicable; and effluent turbidity at the last process unit prior to discharge. These instruments shall notify the operator of potential TPDES effluent excursions via a telemetry system."

Harris County requires homeowners to use a similar system for on-site sewage facilities and this had lead to great improvements in compliance. Given the advancement of technology, associated costs are very minimal and compliance with state regulations has been greatly enhanced. Implementation of similar technology to WWTPs would greatly improve the ability to monitor WWTPs. Historically, the majority of violations observed by Harris County's Water Surveillance Program relates to insufficient chlorine residual and elevated bacteria levels. While Harris County acknowledges that turbidity is not a permit parameter, increases in turbidity levels can provide advanced notice of potential upset conditions.

Response

The commission disagrees with the comment. This requirement would be cost prohibitive for a small wastewater treatment facility. Mid-size and large facilities already monitor most of these parameters.

SUBCHAPTER C

§217.53(c)(2)(C)

Comment

An individual suggested that "high compression polyurethane" was a typographical error and what was intended was "high density polyethylene compression joints."

Response

The commission agrees and has corrected the requirement.

§217.53(d)(4)(B)

Comment

An individual stated that a nine-foot separation cannot be applied between manholes and water mains. The individual suggested that the requirement specify a minimum of 6-inch clearance between water mains and manholes when the water main is cased or sleeved and the backfill around the manhole is cement stabilized.

Response

The commission disagrees with this comment. The commission requires a variance request for a manhole that cannot meet the separation distance requirement. The commission will review these plans on a case-by case basis.

§217.53(e)

Comment

An individual stated that laterals are not defined in the rule. The individual also suggested that there should be minimum separation distance established between laterals and water mains.

Response

The commission agrees in part with this comment. Laterals are not defined in the rule, but building laterals are. This subsection was edited to refer to "building laterals" instead of "laterals."

§217.53(j)(3)

Comment

WEAT commented that the calculation for expected peak flow in a pipe should be referenced in this requirement.

Response

The commission disagrees with the comment. The peak flow is defined in §217.2(38) and the term is used extensively throughout the rule.

§217.53(j)(7)(B)

Comment

An individual stated that the rule appears to require piping to be sized according to average flow but that industry practice has been to size piping for peak flow plus an allowance for inflow and infiltration.

WEAT commented that daily average sewer flow and the expected peak flow should be applied in this requirement.

Response

The commission agrees in part with these comments. The language in the rule has been changed to require piping to be sized for peak flow based on the daily average sewer flow. The owner may, but is not required to, include a factor for inflow and infiltration based on how water-tight the collection system is designed to be at the end of the life of the collection system. An owner may choose to build a tighter collection system rather than a larger one.

§217.54(c)

Comment

An individual stated that the rules should set a minimum design for pipes less than 12 inches in diameter while allowing the design engineer to design the bedding, haunching, and backfill.

Response

The commission disagrees with the comment. The requirement for an adequate envelope ensures that pipe will not be damaged during installation and will perform as designed and for the expected

lifespan. An alternate plan that provides equivalent safeguards may be submitted as a variance request.

§217.54(c)(1)

Comment

An individual stated that it is impossible for the rules to address all situations adequately and that this provision is too prescriptive and will have the effect of compromising designs rather than promoting the best design for the conditions.

Response

The commission disagrees with the comment. The requirement sets a minimum for clearance around a pipe in an installation trench. The requirement for an adequate envelope ensures that pipe will not be damaged during installation and will perform as designed and for the expected lifespan. An alternate plan that provides equivalent safeguards may be submitted as a variance request.

§217.54(l)(2)(G) and (H)

Comment

An individual stated that these two requirements conflict.

Response

The commission disagrees with this comment. The invert is needed to keep the bottom of the manhole free of solids. A well-designed drop pipe has a 90-degree bend at the base of the manhole

that is anchored to the wall and directed along the invert toward the effluent pipe.

§217.55(l)(1)(A)

Comment

Garland commented that requiring a 30-inch diameter manhole opening should be based on the depth of the manhole and not be subjective to anticipation of future personnel entry. A manhole 3 feet deep does not need a 30 inch lid. A manhole 20 feet deep may need a larger opening.

Garland also commented that the rule should require ductile iron for manhole covers because ductile iron is stronger, lighter, and safer than cast iron.

Response

The commission disagrees with the comments. The rule states that if personnel entry is not planned, the manhole does not need to meet the 30-inch clear opening. The 30 inches requirement is the minimum opening if personnel entry is anticipated. A 3-foot deep manhole may require getting repair or rescue equipment into the manhole.

The criteria does not state what the manhole cover be made of but does require the manhole meets the American Association of State Highways and Transportation Official Standard for load bearing. Collection system owners may choose the cover material as long it meets this standard. In practice, the commission sees very little use of cast iron covers for new or renovated manholes.

§217.55(c) and (p)

Comment

Garland commented that cleanouts should be prohibited in collection systems. The City states that cleanouts have no operational or maintenance value. The cost of a manhole is insignificant over 50 years or longer and offers better access to the collection system.

Response

The commission disagrees with the comment. Cleanouts with an opening size suitable for cleaning equipment can be an economical option, in conjunction with manholes, in the design of collection systems.

§217.56(a)

Comment

WEAT commented that there are more current trenchless technologies that should be included: horizontal auger boring; pipe jacking; and horizontal directional drilling.

Response

The commission disagrees with the comment and has included terms generally describing the three techniques above in §217.56(a)(4) - (6). The commission will review requests for variances for any technologies not included in this rule.

Horizontal Auger Boring Machines are used to bore horizontally through soil or rock with a cutting head and auger. The majority of ABMs are used to install pipe casing under railroads, highways, airport runways, creeks or any area of the surface ground that cannot be open cut or disturbed in

any way. This technology is described in §217.56(a)(4).

Horizontal Directional Drilling process is a steerable trenchless method of installing underground pipes, conduits and cables in a shallow arc along a prescribed bore path by using a surface launched drilling rig, with minimal impact on the surrounding area. There are three main stages, including piloting (drilling of a pilot hole), reaming (pilot hole enlargement in stages), and pullback (installation of the carrier pipe and/or utilities). This technology is described in §217.56(a)(5).

Pipe Jacking is a method of tunnel construction where hydraulic jacks are used to push specially made pipes through the ground behind a tunnel boring machine or shield. This technique is commonly used to create tunnels under existing structures, such as roads or railways. This technology is described in §217.56(a)(6).

§217.56(g)

Comment

An individual stated that this requirement is not compatible with most trenchless construction methods.

Response

The commission agrees that the rule is overly restrictive. The requirement was changed to require the method dealing with building laterals be included in the report, as required in §217.56(f)(6).

§217.57(a)(2)(C)

Comment

An individual stated that it is impossible to meet this requirement. The only water level available for infiltration testing is the groundwater level and this requirement requires a water level of two feet above the ground water level.

Response

The commission agrees in part with the comment. The commission will change the word "infiltration" to "exfiltration" based on this comment. The test described is an exfiltration test and the water level [head] in the pipe is set at 2 feet above the crown of the pipe at the uphill manhole by parameters in §217.57(a)(2)(C).

§217.58(b)(2)(D)

Comment

An individual commented that this requirement is overly prescriptive and should be performance based.

Response

The commission agrees with the comment. The requirement was changed to state, "An owner shall ensure that the cover is secured to the top of a manhole."

§217.59(b)(3)

Comment

An individual stated that other 30 TAC rules define intruder-resistant fencing as being six feet tall with three strands of barbed wire or eight feet tall.

The commission agrees in part with this comment. All instances of intruder resistant fence in this rule have been edited to read "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."

§217.60(a)(5)

Comment

An individual stated that this requirement is too prescriptive but should require that motor control centers be mounted above grade to prevent water intrusion and corrosion from standing water in contact with the bottom of the enclosure.

Response

The commission agrees and will reword the rule to say "motor control centers shall be mounted at least 4.0 inches above grade to prevent water intrusion and corrosion from standing water in the enclosure."

§217.60(a)(6)

Comment

An individual stated that the prior rules required explosion-proof construction in wet wells and allowed conventional construction in dry wells. The individual suggested that the rules incorporate a reference to design for hazardous location in the National Electric Code to clarify and simplify the requirement.

Response

The commission agrees in part with the comment because the rule already references the National Electric Code. The reference was clarified as the National Fire Prevention Association (NFPA) 70 National Electric Code.

§217.60(b)(4)

Comment

An individual asked if this requirement applies to all pumps or just the lead pump.

Response

All influent gravity lines into a wet well must be located where the invert is above the "off" setting liquid level of all the pumps, and should be located above "on" setting of the lead pump.

§217.60(b)(6)

Comment

An individual asked if valves could be installed above grade in an enclosure rather than in a vault or dry well.

Response

All operating equipment and valves should be secured and tamper proof whether in a sumpor building, below or above ground.

§217.60(b)(7)

Comment

An individual suggested that a requirement be added to the table of minimum pump cycle times that required the cycle time to be longer if recommended by the manufacturer.

Response

The commission disagrees with the comment. The requirement is a minimum cycle time and the cycle time may be increased, based on manufacturer's recommendations or the engineer's best professional judgment.

§217.60(d)(1)(B)

Comment

An individual stated that this requirement is vague and would be better if it referred to the NEC hazardous environment requirements.

Response

The commission agrees with the comment and will add a reference to hazardous environment requirements in NFPA 70, *National Electrical Code,* and NFPA 820, *Standard for Fire Protection in Wastewater Treatment and Collection Facilities,* to this section. Hazardous environment requirements are contained in these references.

§217.60(d)(2)(B)

Comment

An individual stated that mechanical ventilation of wet wells may not be necessary in all circumstances.

Response

The commission agrees with the comment. Section 217.60(d)(1) allows for passive ventilation of wet wells.

§217.60(h)(2)(A)

Comment

An individual suggested the following rewording: "Sump pumps must use separate pipes that discharge above the maximum liquid level of the associated wet well."

Response

The commission declines to reword the requirement. Using the word "above" is ambiguous. "Above" can mean at a higher elevation or at a greater capacity. The rule uses "more than" because it is referring to the volume that the pipes must be able to discharge.

§217.61(j)

Comment

An individual asked why the rules allow lift stations that pump less than 100 gallons per minute.

Response

The commission allows lift stations that pump less than 100 gpm because portions of a collection system may serve a limited number of equivalent dwelling units and require a small lift station to transfer wastewater to the collection system main.

§217.63

Comment

Harris County requested that the commission add the following requirement: "The engineer must include sufficient capability in the lift station system controls to prevent over-pumping from the lift stations upon resumption of normal power after a power failure. Backup or standby units must be electrically interlocked to prevent them from running at the same time that other lift stations pumps are operating only on the resumption of normal power after a power failure."

Harris County reported seeing many cases in which once power is restored, the lift station control system causes all the pumps, including standby units, to come on at once. When this happens, the design hydraulic capacity of the lift station and the treatment plant can be exceeded. Results can be hydraulic overload and incomplete treatment and wastewater or mixed liquor in the plant will overtop the structure walls and spill on the ground. This section would require sufficient control logic to prevent all pumps from starting simultaneously following a power outage.

Response

The commission agrees with the comment. A requirement, §217.63(g), will be added to ensure that lift station pumps do not operate at the same time that back-up or standby units are operating. New subsection (g) states, "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."

§217.63(b)

Comment

An individual requested that lift stations equipped with telemetered monitoring be prohibited from having a light and alarm bell. The individual stated that the alarms disturb residents in a wide area and do nothing to alert sewer system staff.

Response

The commission disagrees with the comment. In the event of a lift station overflow, lights and alarm bells alert nearby residents to call the owner of the collection system. The rule has provided for an exception to the audiovisual alarms by providing a Supervisory Control and Data Acquisition (SCADA) system that is connected to a continuously monitored location.

§217.63(e)(1)

Comment

An individual suggested the word "sole" be inserted between "a" and "means."

Response

The commission agrees with this comment. The change has been made.

§217.67(f)(1)

Comment

An individual stated that any restriction to pool water in the manhole to reduce odor will cause solids

deposition and result in increased odors due to septic conditions that will develop when the force main is not flowing.

Response

The commission agrees with the comment. The requirement is to reduce odor and not cause new problems. The design must include odor reduction equipment or processes. Section 217.67(f)(1)&(2) requires a forced main to terminate in a way that the pipe is facing the outlet along the invert. The water level at maximum design flow would be the top of the outlet pipe plus any head required to deal with turbulence in the manhole.

§217.69(h)(1)(B)

Comment

An individual stated that this requirement is too prescriptive but should require that motor control centers be mounted above grade to prevent water intrusion and corrosion from standing water in contact with the bottom of the enclosure.

Response

The commission agrees with the comment. The language has been changed to require motor control centers to be mounted "at least 4.0 inches above grade to prevent water intrusion and corrosion from standing water in the enclosure."

SUBCHAPTER E

§217.121(g)(3)

Comment

An individual stated that this section is overly prescriptive and wanted to know the rationale for the requirement. The individual also stated that the rule is not clear.

Response

The commission disagrees with this comment. The maximum depth of the inlet channel to the coarse screen maintains sufficient velocity to suspend the settleable solids and wash them into the grit chamber rather than letting solids accumulate in the bottom of the coarse screen's inlet flow channel.

§217.122(a)

Comment

An individual stated that this requirement conflicts with §217.122(g).The individual suggested the following: "When the manufacturer of the fine screen recommends prescreening before the fine screen, a coarse screening device must be provided ahead of the fine screen."

Response

The commission agrees in part with this comment. Although the two subsections are not in conflict, §217.122(g) was edited to require the manufacturer's recommendations be followed regarding prescreening.

§217.122(h)

Comment

An individual stated that it is impossible to remove all fats, oils, and greases before the fine screen. The individual recommended deleting the requirement.

Response

The commission has clarified the requirement. The commission agrees that it may be impractical to eliminate all fats, oils, and grease, but they quickly foul a fine screen, rendering it ineffective. A concerted effort, including a pretreatment program for restaurant and industrial dischargers, should be made to prevent fats, oils, and grease from reaching a treatment system's fine screen. The subsection now says, "(h) Collection system equipment prior to the fine screen must be designed to minimize fats, oils, and grease in the wastewater before the wastewater reaches the headworks if fine or micro screens are used."

§217.125(e)(3)

Comment

An individual stated that this section is overly prescriptive and wanted to know the rationale for the requirement. The individual stated that this requirement would limit the ability of equipment manufacturers to innovate and design more efficient grit chambers.

Response

The commission disagrees with this comment. A vortex grit chamber design is common for this type of equipment. Section 217.125(d) allows for cyclonic grit chambers. Innovative designs will be

reviewed on a case-by-case basis in accordance with the variance provisions in §217.7(b)(2) and (3).

§217.129(d)(3)(A) & (B)

Comment

An individual asked if it was intended that (B) override (A).The individual recommended removing the words "overflow rate and" from (B)(iii).

Response

The commission disagrees with comment and finds both (A) and (B) are worded correctly. Surface loadings must meet both requirements.

SUBCHAPTER F

§217.152(e)

Comment

PEECO requested that "design flow of 10,000 gpd" be changed to "design average daily flow of 25,000 gpd." PEECO stated that it has supplied more than 100 treatment systems with design daily flow ranging from 3,000 to 35,000 gpd that use tanks with a nominal capacity of 5,000 each. They state that for plants up to about 15,000 gpd, they use one of these tanks as a clarifier. They use two 5.5 ft square (top), 3.75 ft deep hoppers than mount below the bottom of the tank. The tank has an 8.58 ft straight side wall depth down to the two 60 degree hoppers. For plants between 15,000 and 30,000 gpd, they provide two clarifiers. They state that they have not experienced operator problems or complaints with these systems

and operating results have been good.

Response

The commission disagrees with the comment. The ability to clean a clarifier or make repairs while continuing to provide wastewater treatment is essential. The executive director would consider a variance request submitted with actual operation data showing that the design of the proposed equipment is capable of removing the sludge from the clarifier without an interruption of service.

§217.152(c)(6)

Comment

An individual stated that this requirement eliminates some very good peripheral-feed clarifier designs from being used as final clarifiers. The individual suggested removing this requirement because it will stifle innovation.

Response

The commission agrees with the comment. The requirement has been changed to reflect that it applies to center-feed clarifiers. Most circular clarifiers in the state are center-feed and the requirement was intended for a center-feed clarifier. A peripheral-feed clarifier is subject to the effluent weir overflow rate.

§217.152(c)(7)

Comment

An individual asked why the maximum weir overflow rates do not apply to circular clarifiers. The

individual recommended removing this requirement.

Response

The commission agrees to remove this requirement. Because center-feed circular clarifiers will meet the effluent weir overflow rate by design, it is a redundant requirement.

§217.152(h)

Comment

Harris County requested that hopper bottom clarifiers not be allowed. Although the existing and proposed Design Criteria requires steeply sloped hopper walls, sludge settles on the sides of the hoppers and will not fall to the bottom without being physically pushed with a squeegee. If a squeegee is used, it stirs the solids and causes a significant loss of solids over the clarifier weirs. If on the other hand it is not squeegeed and allowed to settle, denitrification and the resulting nitrogen gas bubbles will lift mats of settled sludge to the surface of the clarifier, again causing loss of solids over the weirs. Because hopper bottom clarifiers have poorly functioning skimming systems (consisting of a small overflow pipe), the floating sludge and any accumulated sum escapes under the scum baffle and over the effluent weirs. Therefore, Harris County has found that hopper bottom clarifiers are not capable of producing effluent quality better than 20 mg/l TSS when at design capacity, particularly for smaller plants. Limiting the use of this design to the smaller plants of 10,000 gpd or less makes it even more difficult for them to function properly.

PEECO requested that this requirement be changed to "A hopper bottom clarifier without mechanical sludge collection equipment is prohibited for design average flow rates of more than 15,000 gpd." This

change would require the addition of a scraper mechanism if an individual clarifier unit is designed for 15,000 gpd or more.

Response

The commission declines to change the requirement. The commission has found that hopper bottom clarifiers are often not operated correctly and have a poor compliance history. The adopted rule reduces the maximum size treatment facility that can have a hopper bottom clarifier from 25,000 gpd to 10,000 gpd. The commission will continue to monitor the performance of treatment facilities with hopper bottom clarifier to evaluate if they should be allowed in the future.

§217.152(j)(3)

Comment

An individual stated that the range for sludge pumping capacity is too narrow and should be widened.

Response

The commission disagrees with the comment. The range of 200 - 400 gpd/square foot is sufficient for most return sludge systems. A variance may be requested if a system needs a capacity out of the stated range.

§217.152(j)(4)

Comment

An individual requested that the requirement for controlling pumping capacity be strengthened by

requiring variable pumping capacity be provided through the use of variable speed drives or other reliable methods.

Response

The commission disagrees with the comment. The commission finds that throttling, variable speed drives, or multiple pump operation are all reliable methods of varying pumping capacity.

§217.153(c)(1)

Comment

An individual requests that redundant aeration basins and clarifiers for plants larger than 0.4 MGD not be required in the initial phase of a plant's construction, but allowed to be added later as the plant expands.

Response

The commission disagrees with the comment. Redundancy is necessary throughout the life of a treatment facility. Maintenance and repairs may necessitate shutting down a treatment train. If there is no redundant train to treat the incoming wastewater, there may be a threat to human health or the environment. A permittee is under no obligation to complete any part of a permitted treatment facility. In practice, many planned expansions are delayed or cancelled.

§217.155(b)(2)(A)(i)

Comment

PEECO recommend that the word "clean" be replaced with the word "wastewater." 30 TAC §317.4(g)(4)(i) and other published data suggests that this minimum "clean" water efficiency should be

6%, and that the minimum "wastewater" transfer efficiency should by 4%. PEECO has used these minimum values successfully for more than 30 years.

Response

The commission disagrees with changing from clean water to wastewater, but agrees to change the minimum clean water efficiency from 4% to 6%. The clean water efficiency test has been the standard in Texas and has proven effective. The commission agreed to change the minimum efficiency to 6% to provide a greater margin of error.

§217.155(b)(2)(C) and (D)

Comment

PEECO commented that these two paragraphs are specific to diffusers that have been tested at 12 feet submergence. A diffuser tested at 8 or 10 feet should be able to use the test results without being subject to these paragraphs and Table F.5. If they are forced to use the values in Table F. 5, the blowers furnished would have to be 83% larger in capacity, which is directly proportional to the power requirement. Capitol and replacement cost would increase by approximately 35% and operating cost by 40%.

Response

The commission declines to change the requirement, but will accept variance requests supported by actual equipment data in place of the minimum design standard in accordance with §217.7(b)(2).

SUBCHAPTER J

§217.248(a)(1)

Comment

WEAT commented on the requirement that a sludge thickener must be capable of operating at the peak flow rate. WEAT suggested that the design basis for sludge thickeners be changed to the maximum monthly sludge production.

Response

The commission agrees with the comment and language was changed. A sludge thickener does not have to be able function at the peak flow rate.

§217.250(e)(7)

Comment

WEAT suggested that the requirement to have a duplicate belt press available if a single unit operates for more than 60 hours in a five day period be removed. WEAT stated that the redundancy requirements in §217.250(c)(3)(B) addresses all dewatering facilities.

Response

The commission agrees with the comment. The language was removed.

§217.271(a) and (b)

Comment

TPWD requested that this section include a requirement for redundancy for dechlorination systems.

Chlorine can be toxic to aquatic animals at very low concentrations. A short term excursion of chlorinated water could wipe a reach of stream completely free of chlorine-sensitive species. Department staff have attributed several fish kills to lack of dechlorination.

Response

The commission agrees with the recommendation. The Environmental Protection Agency also considers chlorine a toxic pollutant. A new subsection (f) was added to this section requiring emergency power for both chlorination and dechlorination systems. It has always been the intention of the commission that emergency power be available to the chlorination system. The commission has now included the dechlorination system in the emergency power requirement.

§217.272(c)

Comment

An individual stated that most systems use only about half as much sulfur dioxide as chlorine but the rule requires a facility owner to have equal amounts of the chemicals on site.

Response

The commission disagrees with this comment. The actual amount necessary to fully dechlorinate 1.0 pound of chlorine is 0.9 pound of sulfur dioxide. The one to one ratio is appropriate.

§217.281(b)(4)

Comment

Harris County requested the addition of a new requirement: "The disinfection contact basin or chamber

must include mechanical sludge collection equipment." Harris County has found even under normal (non-upset) operating conditions, a facility operating within its permit parameters will discharge enough solids to form a sludge bank in the receiving stream. Additionally, some of the solids settle to the bottom of the chlorine contact basin to create sludge deposits, which can turn septic. The associated gas bubbles will resuspend the sludge, allowing it to discharge over the weir. The requirement for mechanical sludge collection equipment will help to protect the water quality of receiving streams.

Response

The commission declines to add a new requirement. The contact basin design must include a method of sludge removal but it does not have to be mechanical.

SUBCHAPTER L

Comment

UltraTech suggested that the results of bioassays be made public. The advantage of making the bioassay public is to invite review and comments by other experts and peers. Actions and procedures that could compromise the results would have less chance of going unnoticed and this closer scrutiny would ensure fair and accurate methodology. This procedure would not give one manufacturer an advantage over any other.

Response

The commission agrees with the comment. No change in the rule is necessary. All information submitted to the agency is public information and subject to a public information request.

Therefore, the results of bioassays will be public information and available for review at any time and available for comment during the permit process.

Comment

UltraTech stated that the rule requires proper redundancy. Full scale equipment must be capable of treating the maximum flow with one bank out of service. It is crucial that this requirement remain because it provides the important safety margin necessary in equipment responsible for disinfection. A bank of UV lamps can only be interpreted as lamps capable of providing treatment across the entire width of the contact channel.

Response

The commission agrees with this comment. The full cross-section of the channel must provide treatment at all times. Minimum outage for cleaning of horizontal design systems is one row of lamps for a maximum of 30 minutes.

§217.293(b)

Comment

Trojan recommends that unless a UV system is designed to treat to a reuse standard, the wording of this section be changed to: "A UV light disinfection system must be designed so that the dosage requirements determined in §217.295 are met under one of the following two conditions depending on system design: a) if the system employs mechanical chemical in-situ cleaning, one spare UV module be provided in the design; or b) if the system does not employ mechanical chemical in-situ cleaning, one additional UV bank

must be provided in the design." Trojan states that system design now allows removal of one module at a time as modules are now electrically independent, which reduces the requirement for a redundant bank. Trojan subsequently clarified the spare modules and banks need to be on-site and not part of the operating system.

Response

The commission agrees in part with this comment. The requirement was divided into two subsections and changed to be performance-based. A UV system must be able to meet permitted limits under all operating conditions. An owner must maintain a readily available supply of spare parts sufficient to repair a UV system that is malfunctioning for any reason.

§217.294

Comment

Trojan recommends that the second sentence be changed to: "A telemetry system must notify a facility operator in the event of a major UV alarm." A major UV alarm is defined as one that may jeopardize disinfection performance and a minor UV alarm does not jeopardize disinfection or require immediate attention.

Response

The commission disagrees with the comment. Proper operation of the system is dependent on operator awareness of the condition of the UV disinfection system. A minor alarm may not require immediate response by an operator, but the operator should be aware of minor problems. Telemetry should include minor alarms because a series of minor events may indicate a pending

major alarm condition.

§217.295

Comment

Trojan recommends using the scale-up recommendations specified in the NWRI 2003 *Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse*, which states, "the scale-up factor for a given reactor shall be limited to 10 times the number of lamps used in the test reactor."

An individual commented that allowing a bioassay with less than 80 lamps might be a problem due to boundary layers (wall effects can be more pronounced in smaller units). The NWRI UV guidelines allow for a scale up factor of 10.

Response

The commission agrees with Trojan's comment and the recommendations of the NWRI 2003 *Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse,* except for the paragraph for reuse water that recommends larger reactors. These guidelines may be used as bioassay standards if all hydraulic profiles are the same. The commission will require any proposed scale-up factor above 10 be reviewed through the variance procedure. A variance approval may include a requirement for a commissioning bioassay of the treatment unit before putting the unit into service and/or a performance bond.

The commission disagrees with the individual's comment that a bioassay with less than 80 lamps could cause a problem due to boundary layers. As long as the scale-up factor is not more than 10, the bioassay will provide a reliable prediction of the operation of the UV system.

§217.295(a)(3)

Comment

UltraTech suggested that a minimum number of UV lamps tested be reduced to 10 or 20, but the existing 10 to 1 maximum scale up requirement be retained.

Trojan commented that validating a system using 80 lamps has historically been considered impractical because of the scale-up factors contained in the NWRI guidelines. Trojan subsequently clarified this comment and requested that the minimum number of bulbs be set at two.

Response

The commission agrees in part with the comments. After a search of the relevant literature, the commission set the minimum number of lamps in a bioassay at four. This is the minimum in the bioassay protocol of the *NSF International 40CFR35.6450 Environmental Technology Verification Protocol* (October 2002). The commission requires four lamps as the minimum because there are no scientific standards for scaling down a bioassay for an operating unit smaller than the test unit. There are small treatment facilities in Texas that have a total four lamps in their UV disinfection system.

§217.295(b)

Comment

UltraTech recommended that in the event that energy conservation is to be accomplished by reducing the power to the UV lamps at diminished flows, additional bioassay certification must be provided to confirm

what UV dose is provided at specific flow reductions and the corresponding reduced electrical input to the UV lamps. Bioassay verification must be provided for each electrical reduction proposed.

Response

The commission agrees with the intent of this comment. The rule was not changed. The requirement is sufficient to certify the UV dose at specific flow reductions and corresponding reduced electrical input to the UV lamps.

§217.296

Comment

An individual commented that the requirements in this rule for the collimated bioassay would reduce variability and uncertainty leading to narrower bioassay boundaries. The requirements are: suspension prepared in buffered sterile saline, Petri dish depth limited to one centimeter, reasonable rate for revolving stir bar to prevent spatter, and Petri dish sized the same as the collimated beam.

Response

The commission agrees that the collimated bioassay would reduce variability and uncertainty leading to narrower bioassay boundaries. The commission disagrees with the term "saline" because it is not specific. The protocol has been changed to require a buffered sterile solution with a single total dissolved solids concentration within the range of the expected effluent concentration.

§217.296(a)

Comment

Trojan recommended that this section be revised as follows:

The UV system will be designed to deliver the required UV dose at peak flow, in effluent with a UV transmission stated at end of lamp life (EOLL) after reductions for quartz sleeve fouling. The basis for evaluating the UV dose delivered by the UV system will be the independent third party bioassay without exception. Bioassay validation methodology to follow protocols described in *NWRI Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse* (May 2003) and/or applicable section of the US EPA Design Manual – Municipal Wastewater Disinfection (EPA/625/1-86/021).

The UV dose will be adjusted using an EOLL factor of 0.5 to compensate for lamp output reduction over the time period corresponding to the manufacturer's lamp warranty. The use of a higher lamp aging factor will be considered only upon review and approval of independent third-party verified data that has been collected and analyzed in accordance with protocols described in *NWRI Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse* (May 2003).

The UV dose will be adjusted using a quartz sleeve fouling factor of 0.8 when sizing the UV system in order to compensate for attenuation of the minimum dose due to sleeve fouling during operation. The use of a higher quartz sleeve fouling factor will be considered only upon review and approval of independently verified data that has been collected and analyzed in accordance with protocols described in *NWRI Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse* (May 2003).

Trojan states that the majority of the section dealing with collimated beam dose response curves imposes restrictions that are not necessary. Many of the restrictions could be considered good guidance and good

practice, but there is no reason to set restrictions. A peer-reviewed paper, *Standardization of Methods for Fluence (UVT Dose) Determination in Bench-Scale UV Experiments,* by Bolton and Linden (2003) details the most recent industry standard best practices for performing collimated beam testing and should be the basis for this section.

Trojan subsequently requested that subsection (a) be revised to say: "A bioassay procedure must conform to the applicable sections of publications USEPA (1986) *Design Manual: Municipal Wastewater Disinfection*, EPA/625/1-86/021 and/or NWRI *Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse* (May 2003) and/or NSF International 40CFR35.6450 (October 2002) *Environmental Technology Verification Protocol, Water Quality Protection Center, Verification Protocol for Secondary Effluent and Water Reuse Disinfection Applications.*"

Response

The commission agrees in part with the comments. The requirement has been edited to allow an owner to choose to base a bioassay on any of the three protocols, but not to mix and match sections of the protocols. For example, if an owner chooses to base a bioassay on the EPA 1986 protocol, each of the parameters of that protocol must be met. The rule is the same for the other two protocols. The commission does not allow a piecemeal approach because the commission does not have the resources to evaluate a bioassay based on a protocol that has not previously been proven valid.

§217.296(a)(1-12)

Comment

An individual stated that the following UV bioassay minimum protocol should be used to ensure that the bioassay results are reliable, fairly correlate to performance, provide disinfection, and protect public health and the environment.

The concentration of MS-2 (or any bio-tracer) should be at least 1,000,000 organisms per milliliter to allow a clear enumeration of a three log reduction in kill for the bioassay.

The suspension should be prepared using buffered, sterile saline.

The depth of the Petri dish should be 1 cm.

The speed of the mixing bar should be such that the solution does not spatter, is not too depressed in the center from mixing cavitationreu, move at a reasonable rate, and if possible, be reported.

The collimating tube should be about the same diameter as the Petri dish and the sides of the lamp shielded.

Since there are UV lamps that have a variable output, the analyst should demonstrate that the lamps are being operated at 100%. The UV equipment manufacturer's data should not be used to meet this requirement. Instead the lamp manufacturer should provide the electrical input needed for 100% output and evidence of monitoring these operating parameters should be recorded during the test.

With variable output UV lamp systems, energy conservation goals can be achieved by reducing the output of the lamps rather than turning lamps on and off in relation to flow.

There should also be a requirement that bioassay data is conducted to indicate the delivered UV dose under reduced output conditions.

Trojan objected to items (1) through (11) because they are unclear or overly restrictive. Trojan subsequently commented that paragraphs (3) regarding organism density and (11) regarding mixing bar speed were acceptable; paragraphs (1) regarding the bioassay solution, (6) regarding triplicate solutions and (8) regarding the diameters of the Petri dish and the collimating tube are overly restrictive; and paragraph (12) regarding lamp intensity measurements is unclear.

An individual commented that UV units should be bioassayed under the same conditions in which they would operate. If units are operated with variable output, they should be bioassayed under a range of UV outputs and flow conditions. If lamps are to be turned off for energy conservation, the unit should be bioassayed with those same lamps off.

Response

The commission agrees that the requirements in this section need to be edited to be clearer and more equitable to all UV systems. This section was changed in response to these comments and a further search of the relevant literature.

Subsection (a)(1) - (12) were moved to subsection (b). Paragraph (1) now states, "The test organism

must be introduced into buffered sterile solution with a single total dissolved solids concentration within the range of the expected effluent concentration." Paragraph (2) was not changed. Paragraph (3) now states, "The organism density must be 10^5 to 10^7 plaque forming units or colony forming units per milliliter." Paragraph (4) was not changed. Paragraph (5) now states, "Runs must be in at least triplicate, each from a separate dilution of the stock suspension." Paragraph (6) was deleted. Paragraphs (7) - (12) were renumbered to (6-11). The content in new paragraphs (6) - (9) was not changed. New paragraph (10) was changed to a performance-based standard and now states, "The speed of the mixing bar must not cause spatter or cavitation." New paragraph (11) states, "Any difference between the velocity profile in the bioassay and the velocity profile in the full-scale unit must be justified." The new paragraph (12) states, "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 full-scale unit must be justified." New paragraph (13) states, "The lamp intensity data obtained in the bioassay must be used to set the operating parameters of the lamps."

The requirements in subsection (b) edited and was moved to new paragraphs (a)(14) - (16) to better organize the requirements for a bioassay. Paragraph (14) states, "Lamp intensity used in the flow through test reactor shall be set after a 100-hour burn in and stabilization period." Paragraph (15) states, "Electrical input for 100% lamp output must be recorded and verified." Paragraph (16) states, "Lamp intensity in the bioassay must be measured at the exact height of the surface of the suspension." Paragraph (17) states, "No operating condition may be used that has not been proven effective by the bioassay." Paragraphs (18) through (19) were added. Paragraph (18) states that if the procedures in this subsection are not met, an owner may request a variance. The executive director will review the variance and its supporting documentation using industry best practices as

a guideline. Paragraph (19) requires that a bioassay be signed and sealed by a licensed professional engineer.

§217.296(a)(3)

Comment

An individual commented that a concentration of 1,000,000 (10^6) organisms per milliliter is sufficient to demonstrate four logs of inactivation.

Response

The commission agrees with the comment. The rule was changed to require a range of 10^5 - 10^7 plaque forming colonies per milliliter. The one-million organisms per milliliter level suggested in the comment is within the range that meets quality assurance requirements for reproducibility. The commission adopted the range of concentration that EPA uses in its *Environmental Technology Verification*, ETV publications.

§217.296(b)

Comment

Trojan requested subsection (b) be revised to say: "The UV system will be designed to deliver the required UV dose at peak flow, in effluent with a UV transmission stated at end of lamp life (EOLL) after reductions for quartz sleeve fouling. The basis for evaluating the UB dose delivered by the UV system will be the independent third party bioassay, without exception. Bioassay validation methodology to

follow protocols described in NWRI Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse (May 2003) and/or applicable sections of the US EPA Design Manual- Municipal Wastewater Disinfection (EPA/625/1-86/021).

UltraTech suggested the rule retain the requirement for testing for end of lamp life at 75% output. The desired protection to guarantee proper treatment after lamp depreciation can be accomplished by increasing the required UV dosage by 10% at the 100% lamp output.

Response

The commission agrees in part with Trojan's comment. The commission disagrees with UltraTech's comment. The requirement was changed to allow operational parameters be set by the bioassay results. An owner has the flexibility to verify disinfection with the percent output at which the lamps would be replaced. For example, if an owner tests lamps at 65% in the bioassay, lamps in the operating system would have to be replaced when they reached 65% maximum output. The percent output parameter would determine the number of lamps necessary to provide disinfection in the UV system.

§217.298

Comment

Trojan recommends that one spare module for all UV systems that employ in-situ mechanical chemical cleaning for all non-reuse applications. One spare bank should be provided for UV systems that do not employ in-situ mechanical chemical cleaning.

Response

The commission agrees with this comment. The requirement was changed to be performance based. A UV unit must have the necessary spare parts to provide continuous disinfection based on the maintenance schedule and failure scenarios likely within the unit.

SUBCHAPTER M

§217.321(e)

Comment

An individual commented that the references in this requirement should be §217.322 and §217.323.

Response

The commission agrees with the comment and corrected the references.

§217.322 and §217.323

Comment

An individual suggested that the rule grandfathers no portion of a treatment facility in relation to the requirements of these two sections, *Safety and Security Audits*, and *Hazardous Operation and Maintenance*.

Response

The commission disagrees with the comment. Facilities will be brought into compliance with

§§217.321, 217.322, and 217.323 requirements as owners expand or materially alter existing facilities. Requiring all facilities statewide to meet these requirements would cause a burden on the facilities and could exceed the availability of consultants qualified to perform the work. Owners are encouraged to implement these requirements voluntarily, as they add benefit to operations and compliance through risk identification and management.

§217.322(b)

Comment

An individual suggested putting everything after (b) Security audit into subsection (1) to be consistent with the structure of (a) Safety audit. The individual also asked if it is intentional that security audits are optional.

Response

The commission agrees with the comment. The change was made. The commission corrected the preamble to clarify that security audits are optional. The subsection reflects that security audits are currently recommended but not required by the US Department of Homeland Security.

§217.323(c)

Comment

An individual suggested changing this requirement to read, "The owner shall provide the necessary items identified in §217.323(b) above in such quantity and at such locations as to be sufficient to: . . ."

Response

The commission disagrees with this comment. Section 217.323(c) is intended to cover all tool requirements at a wastewater facility, not only those needed for the hazardous tasks discussed in §217.323(b).

§§217.326 and 217.329(e)(9)

Comment

An individual commented that "National Electric Code" should be changed to "NFPA 70 National Electrical Code."

Response

The commission agrees with the comment. The change was made.

§§217.327, 217.328(b), and 217.329(d)

Comment

An individual suggested that warning signs be both in English and Spanish.

Response

The commission agrees with the comment. The change was made. The change is consistent with other commission rules that require warning signs in Spanish and English.

§217.328(b) and (c)

Comment

An individual asked if levees and walls are considered solid material fencing and suggested that the

requirement needs clarification.

Response

The commission agrees in part with this comment. Section 217.328(b) was edited to remove the reference to levees and clarify that the signs must be within sight of each other and on each gate. Section 217.328(c) was edited to standardize the intruder resistant fence requirement throughout the rule.

§217.329(a), (d), and (e)(10)

Comment

An individual commented that these requirements are inconsistent with 30 TAC §210.25(g).

Response

The commission disagrees with this comment. Section 217.329(a), (d), and (e)(10) are applicable to new or modified domestic wastewater systems. The exemption in §210.25(g) is for existing facilities and does not apply to new or modified facilities. The commission will clarify this requirement in Chapter 210 when it is opened for other changes

SUBCHAPTER A: ADMINISTRATIVE REQUIREMENTS

§§217.1 - 217.17

STATUTORY AUTHORITY

The new rules are adopted under the authority of Texas Water Code (TWC), §5.013, which provides the commission's general jurisdiction; §5.103, which provides the commission's authority to adopt any rules necessary to carry out its powers and duties under the laws of Texas; §5.105, which provides the commission's authority to, by rule, establish and approve general policy of the commission; §5.120, which provides the commission's authority to administer the law to promote conservation and protection of the quality of the environment; §26.027, which authorizes the commission to issue permits; §26.034, which provides the commission's authority to adopt rules for the approval of disposal system plans; and §26.121, which provides the commission's authority to prohibit unauthorized discharges.

The adopted new rules implement TWC, §§5.013, 5.103, 5.105, 5.120, 26.027, 26.034, and 26.121.

§217.1. Applicability.

(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, 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.

(1) **Advanced nutrient removal--**A process to remove phosphorus and/or nitrogen and produce effluent of higher quality than normally achieved by secondary treatment processes.

(2) **Alternative 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.

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

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

(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.

(6) **Bypass**--The intentional diversion of a waste stream from any portion of a treatment facility.

(7) **Collection system**--Pipes, conduits, lift stations, force mains, and all other constructions, devices, and appurtenant appliances used to transport wastewater.

(8) **Constructed Wetland**--A water treatment facility built to duplicate the processes occurring in natural wetlands, which are complex, integrated systems in which water, plants, animals, microorganisms and the environment (sun, soil, and air) interact to improve water quality.

(9) **Design flow**--The average daily flow rate for a treatment facility permitted by the commission.

(10) **Diurnal Flow**--The daily cycle of high and low influent flows to a wastewater treatment system.

(11) **Domestic Wastewater**--Sewage 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 residential dwelling.

(12) **Effective size**--The result of an analysis of a sample of filter media that equals the effective diameter, 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 particles are finer and 90% are larger than the effective size.

(13) **Engineer**--A professional engineer with expertise in wastewater design and construction licensed by the Texas Board of Professional Engineers.

(14) **Equivalent dwelling unit**--Any building or section of a building that produces wastewater of a composition and quantity comparable to that discharged by a single, private residence.

(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.

(17) **Firm pumping capacity**--The maximum flowrate under design conditions with the largest pumping unit out of service.

(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 station to a discharge point.

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

(21) **Grinder pump**--A 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 to a lift station or a collection system.

(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 and the first chance to treat the flow, typically by removing large solids and 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.

(25) **Innovative technology**--A process not addressed in this chapter or a process specifically identified as innovative by this chapter.

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

(27) **Lift station--**A belowground structure that collects wastewater and 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 headlosses.

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

(29) **Membrane bioreactor system**--An activated sludge biological treatment system that uses membrane filtration rather than secondary clarification for solids separation and conventional filtration.

(30) **Minimum grade effluent sewer--**An alternative wastewater collection system pipeline with a constant downward slope.

(31) **Multiple equivalent dwelling unit** :

(A) a group of 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.

(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 this chapter.

(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 located outside a wastewater treatment facility's site boundary.

(35) **On-site component**--Equipment, structure, or pipe located within a wastewater treatment facility's site boundary.

(36) **Overflow**-- A flow over the weir of a treatment unit.

(37) **Owner**--A person who owns a collection system or a treatment facility or part of a system or facility.

(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.

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

(40) **Project**--A TCEQ permitted wastewater collection system or treatment facility on which construction has begun but that is not yet complete.

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

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

(43) **Report--**The final engineering design report prepared, signed, sealed by the design engineer that contains calculations and written descriptions of processes, equipment, and structures that demonstrate compliance with this chapter, as described in §217.10 of this title (relating to Final Engineering Design Report).

(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 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

(E) **Idle**--The sludge is removed from the basin.

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

(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.

(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.

(48) **Variable grade effluent sewer**--A small diameter gravity wastewater collection system that does not require a uniform gradient, but will allow inflective gradients where sections of the collection system are below the hydraulic grade line. May be used with septic tank effluent pumps.

(49) **Variance**--A deviation from a specific requirement of this chapter.

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

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

§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 treatment and disposal facilities . The minimum design criteria are not 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 treatment facility if the executive director determines it is necessary to protect public health or to meet water quality standards established by the commission.

§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.

(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 that additional information is requested or that a variance is denied within 30 days after receiving a signed and dated variance request that has been sealed by an engineer, the variance is approved.

(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 build a wastewater collection system or treatment facility according to the plans and specifications approved by the executive director.

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

(c) The executive director's approval of a wastewater permit does not relieve an owner of the responsibility to obtain a plans and specifications approval for a facility in accordance with this chapter.

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

§217.6. Submittal Requirements and Review Process.

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

(b) A 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.

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

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

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

(3) the county(s) 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;

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

(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;

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

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

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

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

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

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

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

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

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

(1) a complete set of plans and specifications;

(2) a complete report;

(3) any requested variances; and

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

(g) If the executive director does not notify an owner of any insufficiency within 30 days after receipt of any additionally requested information, the project is approved.

§217.7. Types of Plans and Specifications Approvals.

(a) Approval given by the executive director or other authorized review authority does not relieve an owner of any liability or responsibility with respect to designing, constructing, or operating a collection system or treatment facility in accordance with applicable commission rules and the associated wastewater permit.

(b) The executive director or other authorized review authority may grant the following types of approvals:

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

(2) Approval of innovative and nonconforming technologies in accordance with §217.4 of this title (relating to Variances).

(A) An owner who requests approval for an innovative or nonconforming technology must submit a summary transmittal letter in accordance with §217.6(c) 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.

(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. 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 may be submitted in addition to or in lieu of 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 nonconforming equipment has provided a performance bond that:

(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 innovative or nonconforming equipment or process.

(E) The performance bond required in §217.7(b)(2)(D) of this section must cover:

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

(ii) the replacement of all failing processes and equipment with corresponding processes and equipment that conforms to these rules;

(iii) all associated engineering costs necessary for the removal and replacement of any failing process 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 report on the performance of a nonconforming or innovative technology after a collection system or treatment facility is built 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 by the executive director are met. Operating outside the conditions, stipulations, or restrictions in a conditional approval is a violation of this section.

§217.8. Municipality Reviews.

(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).

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

(1) a municipality, 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 the private engineering consultant charged with the design of 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 for review and approval.

(c) If a municipality seeks to perform technical reviews of wastewater collection systems, the municipality shall submit a map or maps to the executive director delineating the municipality's jurisdictional boundaries for the area it is seeking responsibility for review of plans and specifications at least 30 days before commencing to review 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 program must incorporate the following requirements:

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

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

(3) The municipality shall issue a document that approves and details each project approved for construction.

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

(g) The executive director may perform periodic audits of the review and approval 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 a minimum of five working days prior to beginning review of municipal files related to an audit.

(2) The municipality shall provide to the executive director an opportunity to review any existing project files relating to its review and approval activities under this chapter.

(3) The municipality shall 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 that a municipality's review and approval process 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 authority of a municipality. If the commission revokes the 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 authority and shall include a justification for revoking the authority.

(k) 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 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.

(m) If the commission revokes the authority of a municipality, owners of any completed projects or projects under construction whose plans and specifications were approved prior to revocation are not required to seek approval from the commission.

§217.9. Texas Water Development Board Reviews.

If the Texas Water Development Board reviews plans and specifications for a wastewater collection systemor treatment or disposal facility in accordance with Texas Water Code, §17.276(d), 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 report 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.

(c) The report must demonstrate compliance with this chapter or justify variances from this chapter in accordance with §217.4 of this title (relating to Variances) by including all pertinent calculations, analyses, graphs, formulas, constants, tables, geologic information, hydraulic and hydrological information, historical data, and technical assumptions.

(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 receiving a request.

(e) The report for a wastewater collection system 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 effect on an associated existing system's capacity;

(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 treatment facility to receive and adequately treat the anticipated peak flow;

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

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

(12) the calculations and 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.

(f) The report for a wastewater treatment facility must include the following:

(1) The quantity and characteristics of any existing wastewater influent, any proposed changes, and any anticipated changes.

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

(A) a map of the proposed facility and the area surrounding the facility, the area included in the facility site, the area that makes up the buffer zone, any 100-year flood event floodway or floodplain, 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);

(D) a sludge management plan, including:

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

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

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

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

(E) The methods to control bypassing, including:

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

(ii) operational arrangements such as flexibility 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.

(F) information and calculations demonstrating the facility's compliance with the design requirements of this chapter, including:

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

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

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

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

(II) the anticipated operation mode of the facility;

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

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

§217.11. Construction of an Approved Facility.

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

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

(d) A person is prohibited from allowing a bypass of untreated or partially treated wastewater during construction without a commission order for such discharge.

(e) An owner that materially alters or expands an existing collection system or treatment 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 §217.1(c).

(f) A treatment facility owner that must apply for a new permit or that never received a plans and specifications approval for an existing facility 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.

(g) A collection system owner that never received a plans and specifications approval for an existing collection system 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.

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

(c) If the executive director determines that a substantial design change may potentially endanger public health or environment, the executive director may deny the design change or require 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 that additional information is requested or that a substantial design change is denied within 30 days after receiving a signed and dated substantial design change request that has been sealed by an engineer, the substantial design change is approved. 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.

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

§217.13. Final Construction Drawings and Technical Specifications.

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

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

(c) The final construction drawings and technical specifications must include all items in the following paragraphs that are applicable to a 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 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 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;

(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.

(A) The drawings for a wastewater treatment facility 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 treatment facility at both design and peak flows.

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

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

(3) The specifications for a material alteration or expansion of an existing collection system or 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) national standards citations.

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

§217.14. Completion Notice.

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

(1) is signed, sealed, and dated by 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 Treatment Facility Operation and Maintenance Manual), has been prepared and a copy is located at the 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, based on the best professional judgment of an engineer, the change that was not submitted for approval will not result in substantial design change, as defined in §217.12(a) of this title (relating to Substantial Design Changes).

§217.15. Inspection.

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.

§217.16. Treatment Facility Operation and Maintenance Manual.

(a) An owner of a treatment facility is responsible for developing an operation and maintenance manual with the assistance of an engineer.

(b) An owner must ensure that the operation and maintenance manual includes all information specific to the 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:

(1) administrative and recordkeeping items, including:

(A) a table of contents;

(B) a copy of the wastewater permit;

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

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

(E) a sample daily activity report for documenting internal monitoring done in association with internal process control, including flow rates from various units, dissolved oxygen levels,

pH, solids concentrations, sludge settling, clarifier sludge blanket depths, sludge age or retention time, and disinfection residuals; and

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

(2) operation and maintenance items, including:

(A) expected flow patterns, size, and capacity of all units within the facility;

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

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

(D) expected solids concentrations in each unit;

(E) expected clarifier overflow rates;

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

(G) descriptions and frequencies of routine in-situ and laboratory analyses to be performed and a list of references to standard 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) a recommended spare parts inventory with source information.

(3) safety requirements, including:

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

(B) the location and method of use for all personal safety equipment in accordance with §217.324(a);

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

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

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

(F) annual safety training curriculum and schedule for all facility staff;

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

(H) chemical disposal in accordance with §217.247(q), if applicable;

(I) ultraviolet light in accordance with §217.299, if applicable; and

(J) hazardous tasks in accordance with §217.323(b), if applicable.

(c) An owner shall keep a copy of a current operation and maintenance manual at the facility site.

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

§217.17. Collection System Records.

An owner of a collection system shall maintain and make available to the executive director upon request the following:

(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;

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

(5) any approvals for variances or substantial changes.

SUBCHAPTER B: TREATMENT FACILITY DESIGN REQUIREMENTS

§§217.31 - 217.39

STATUTORY AUTHORITY

The new rules are adopted under the authority of Texas Water Code (TWC), §5.013, which provides the commission's general jurisdiction; §5.103, which provides the commission's authority to adopt any rules necessary to carry out its powers and duties under the laws of Texas; §5.105, which provides the commission's authority to, by rule, establish and approve general policy of the commission; §5.120, which provides the commission's authority to administer the law to promote conservation and protection of the quality of the environment; §26.027, which authorizes the commission to issue permits; §26.034, which provides the commission's authority to adopt rules for the approval of disposal system plans; and §26.121, which provides the commission's authority to prohibit unauthorized discharges.

The adopted new rules implement TWC, §§5.013, 5.103, 5.105, 5.120, 26.027, 26.034, and 26.121.

§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 facility, material alteration or expansion an existing facility, and the re-rating of an existing facility.

§217.32. Organic Loadings and Flows.

(a) The design of a new 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) For a facility equal to or greater than 1.0 million gallons per day (mgd), the permitted 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 in the service area.

(B) For a facility less than 1.0 mgd, the permitted flow is the maximum 30-day average flow estimated by multiplying the average annual flow by a factor of at least 1.5.

(2) Peak flow. When site-specific data is unavailable, the instantaneous two-hour peak flow must be estimated by multiplying the permitted flow by a factor of 4.0.

(A) If a facility experiences unusual periodic flow variations, a higher multiplier may be used to calculate the peak flow.

(B) In a facility with flow equalization, the facility may be designed for a lower estimated peak flow, if supporting data included in the report supports the estimate.

(C) 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.

(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 design. If actual data is not available, the design organic load must be used as the basis for design. The design organic load is determined by multiplying the projected uses by annual average flow determined from the following table and by using the appropriate influent concentration from the following table:

Figure: 30 TAC §217.32(a)(3)

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)
Municipality	Residential	75-100	200-350
Subdivision	Residential	75-100	200-350
Trailer Park (Transient)	2½ Persons per Trailer	50-60	250-300
Mobile Home Park	3 Persons per Trailer	50-75	300
School	Cafeteria & Showers Cafeteria/No Showers	20 15	300 300
Recreational Parks	Overnight User	30	200

Source	Remarks	Daily Wastewater Flow (gallons/person)	Wastewater Strength (mg/l BOD_5)
	Day User	5	100
Office Building or Factory	A facility must be designed for the largest shift	20	300
Hotel/Motel	Per Bed	50-75	300
Restaurant	Per Meal	7-10	1000*
Restaurant with bar or cocktail lounge	Per Meal	9-12	1000*
Hospital	Per Bed	200	300
Nursing Home	Per Bed	75-100	300
Alternative Collection Systems (Subchapter D)	Per Capita	75	N/A
*Based on a restaurant with a grease trap			

(b) For an owner constructing a new system to serve the same service area as an existing facility 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 if justified in the report.

§217.33. Flow Measurement.

(a) A facility must include a means of accurate effluent flow measurement.

(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 measuring devices.

(1) Primary measuring devices.

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

(B) A primary 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 measuring device must be installed upstream of a secondary measuring device to permit the manual measurement of water depth.

(2) Weirs.

(A) A channel approach section to a weir must be straight for at least 20 times the maximum expected head on a weir.

(B) The minimum height between a channel bottom and a weir crest must be the greater of twice the maximum expected head on the weir or a minimum of 1.0 foot.

(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) Upstream of a weir, there must be a secondary measuring device located a minimum distance of the greater of:

(i) three times the maximum expected head on a weir; or

(ii) the distance recommended by the equipment manufacturer.

(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 measuring devices.

(A) A secondary measuring device must measure the liquid level in the primary measuring device, and must convert this liquid level into a flow rate that is integrated to a totalized flow.

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

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

§217.34. Re-Rating, Expanding, or Materially Altering an Existing Facility.

An owner who proposes to materially alter, expand, , or re-rate an existing facility in order to meet an amended permit condition is required to use the facility's current operating data 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 is to be re-rated, expanded, or upgraded.

(B) An existing facility's data for the latest 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. If the facility is less than five years old, all 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.

(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.

(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.

(2) Organic loadings.

(A) 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 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 must document a minimum of one year, consisting of three samples per week taken during days with a representative flow . If a sampling program is for a frequency of less than three times per week or less than a three-part grab sample, an owner shall document how the proposed sampling program is representative of actual conditions at the facility.

(ii) The samples must be representative of the peak loading.

(iii) Sampling data must include a minimum of five-day carbonaceous biochemical oxygen demand or five-day biochemical oxygen demand, total suspended solids, and ammonia-nitrogen, unless justified because of specific treatment requirements.

(iv) An engineering analysis for the minimum sampling period must include:

(I) a summary of the monthly data;

(II) annual-average monthly load; and

(III) the standard deviation of the monthly data.

(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.

(ii) An owner shall use the design organic loading to determine the size of 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 within 1,000 feet of the site of a proposed facility, the owner must show the 100-year flood plain 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 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 profile adjusted to the project's vertical data determines flood elevations.

(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) One hundred-year flood plain must be shown on profile.

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

(2) If a proposed 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.

(3) When a proposed 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.

(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) 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;

(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.

(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:

(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;

(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 during any power outage.

(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).

§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.

(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 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. Facility Use of Reclaimed Water.

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

(b) A facility that is designed after the effective date of this chapter must include a meter to measure reclaimed water use at the facility.

(c) An owner must reclaim water after it has been disinfected, if disinfection is part of the treatment. 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) 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) An owner may use reclaimed water on a facility site with no further authorization from the executive director.

SUBCHAPTER C: CONVENTIONAL COLLECTION SYSTEMS

§§217.51 - 217.70

STATUTORY AUTHORITY

The new rules are adopted under the authority of Texas Water Code (TWC), §5.013, which provides the commission's general jurisdiction; §5.103, which provides the commission's authority to adopt any rules necessary to carry out its powers and duties under the laws of Texas; §5.105, which provides the commission's authority to, by rule, establish and approve general policy of the commission; §5.120, which provides the commission's authority to administer the law to promote conservation and protection of the quality of the environment; §26.027, which authorizes the commission to issue permits; §26.034, which provides the commission's authority to adopt rules for the approval of disposal system plans; and §26.121, which provides the commission's authority to prohibit unauthorized discharges.

The adopted new rules implement TWC, §§5.013, 5.103, 5.105, 5.120, 26.027, 26.034, and 26.121.

§217.51. Applicability.

This subchapter applies to the design, construction, operation, and testing 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 must design and install the system in 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 to handle the transport of the peak dry weather flow from the service area, plus infiltration and inflow.

(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 facility immediately upon completion of construction and at the end of its 50-year life.

(b) Gravity Pipe Materials.

(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, etc.) and installation (bedding, backfill, etc.).

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

(A) the characteristics of the wastewater conveyed;

(B) the character of industrial wastes;

(C) the possibility of septic conditions;

(D) the exclusion of inflow and infiltration;

(E) any external forces;

(F) any groundwater;

(G) the internal pressures; and

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

(c) Joints for Gravity Pipe.

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

(2) Materials used for gravity pipe joints must prevent 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;

(E) be heat fused; or

(F) include other types of factory-made joints.

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

(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.

(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:

(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.

(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 infiltration;

(2) prevent protruding service lines; and

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

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

(g) Corrosion potential.

(1) If a pipe or an integral structural component of a pipe will deteriorate when subjected to corrosive internal conditions or if a pipe or component does not have a 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) A pipe must have an appropriate lining if the corrosion analysis indicates that corrosion will reduce the functional life of the pipe to less than 50 years.

(h) Odor Control.

(1) An owner shall determine 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.

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

(i) Active Geologic Faults.

(1) An owner shall identify any active faults within the area of a collection system and minimize the number of collection system lines crossing faults.

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

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

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

(ii) manholes on each side of the fault so that a portable pump may be used 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 Analysis.

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

(2) An owner must include in the report the calculations that demonstrate that the hydraulic capacity of a collection system includes the peak flow of domestic sewage, peak flow of waste from industrial sites, and maximum infiltration rates.

(3) A collection system must be designed to prevent a surcharge in any pipe at the expected peak flow.

(4) The minimum diameter allowed for a gravity pipe is 6.0 inches.

(5) Connecting storm water drains to a collection system is prohibited.

(6) An owner may use the data from an existing collection system. In the absence of existing data, a design must use data from a similar 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 flows.

(B) A new collection system design must be sized for the peak flow, which is based on the estimated daily sewage 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.

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

(2) For flexible pipe, 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:

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

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

(iii) modulus of elasticity,

(iv) tensile strength,

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

(vi) Leonhardt's zeta factor;

(vii) trench width;

(viii) depth of cover;

(ix) water table elevation; and

(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 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) Pipe that meet all the requirements in this paragraph are not required to perform the structural calculations in paragraph (3) of this subsection, provided that a pipe is installed and tested in accordance with all other requirements of this subchapter:

(A) open trench design;

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

(C) buried 17 feet or less;

(D) diameter of 12 inches or less;

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

(F) no effects on a pipe due to live loads;

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

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

(5) A design analysis for rigid pipe installations must be included in the report, including a structural analysis and any details necessary to verify that the structural strength is sufficient to withstand the expected stresses. For rigid 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.

(2) Absent site-specific data, a collection system must be designed in accordance with the minimum and maximum slopes specified in this paragraph.

(A) The 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.

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	8.40
10	0.25	6.23
12	0.20	4.88
15	0.15	3.62
18	0.11	2.83
21	0.09	2.30
24	0.08	1.93
27	0.06	1.65
30	0.055	1.43
33	0.05	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 is 0.013.

(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, and an "n" value of 0.013, special provisions must 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) A gravity collection system must be laid with a uniform grade between manholes.

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

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

(4) The calculations for horizontal pipe curvature and the detail of the proposed curvature on the plans must be included in the report.

(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.

(6) The maximum allowable manhole spacing for collection systems with horizontal curvature 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 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.

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

(5) A system must allow any barrel to be 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) Sag pipe must be designed to 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) Pipe with restrained joints or monolithic pipe across a bridged section requires a manhole on each end.

(2) A bridged section must withstand the hydraulic forces 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 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 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 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 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 fracture, fault zones, caves, or solutional modification to the rock strata, an owner must halt construction until an engineer prepares a written report detailing how construction will accommodate these site conditions.

(b) Compaction.

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

(2) Compaction of an embedment envelope 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.

(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.

(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.

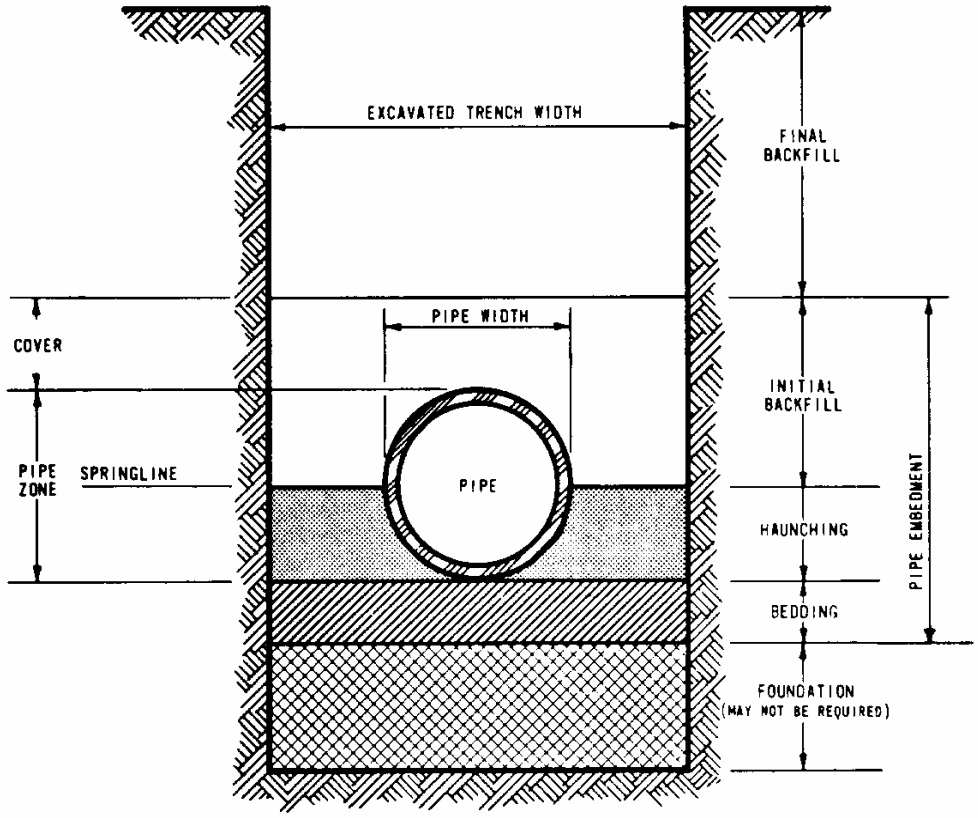
(2) The maximum and minimum trench width needed for safety and a pipe's structural integrity must be included in the report.

(3) The width of a trench must be sufficient to properly and safely place and compact haunching materials.

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

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 the intersection of all 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 material that provides adequate structural integrity.

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

(g) Manholes may be spaced no further apart than the distances specified in the following table for a wastewater collection system with straight alignment and uniform grades, unless a variance 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 because of construction constraints.

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

(j) A manhole must not be located in the flow path of a watercourse, or in an area where ponding of surface water is probable.

(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.

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

(1) Manhole Covers.

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

(B) A manhole located within a 100-year flood plain must have a means of preventing inflow.

(C) A manhole cover construction must be constructed of impervious material.

(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.

(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 pipe less than 15 inches in diameter must have a channel depth equal to at least half the largest pipe's diameter.

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

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

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

(G) An 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.

(m) The inclusion of steps in a manhole is prohibited.

(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.

(o) Venting. 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. Vents must meet the following requirements:

(1) Vent design must minimize inflow;

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

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

(p) Cleanouts. The size of a cleanout must be equal to the size of the wastewater collection system main.

§217.56. Trenchless Pipe Installation.

(a) The following trenchless technologies may be used for installation of new wastewater collection system pipe:

(1) impact moling, which is 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) pipe ramming, which is a simple technique using a pneumatic hammer to drive steel casings through the ground from one pit to another; or

(3) microtunneling, 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 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 trenchless technologies may be used for replacement of wastewater collection system pipe:

(1) 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) 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) 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.

(c) The following trenchless technologies may be used for lining of existing wastewater collection system pipe, which reduces the inside diameter of the pipe:

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

(2) epoxy spray lining, which is a method of lining pipes with a thin lining of resin (typically about one millimeter thick) 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) cure in place pipe, which is method of lining existing pipe with a flexible tube impregnated with a resin that produces a pipe after the resin cures. The resin may be set by the use of heat or ultraviolet light; or

(4) sliplining, by which continuous or discreet pipes are inserted within existing pipes.

(d) Any other trenchless method of installing, replacing, or repairing collection system pipe is nonconforming 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, executive director review may be based upon other recognized standards 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;

(4) the pipe length and diameter;

(5) 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) Pipe installed by 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).

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

(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 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, except as to testing times as required in Table C.3 in subparagraph (B)(ii) of this paragraph or Equation 3.c in subparagraph (C) of this paragraph.

(B) For sections of collection system pipe less than 36 inch average inside diameter, the following procedure 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.

(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×D×L, but not less than 1.0

D = average inside pipe diameter in inches

L = length of same pipe 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** *(feet)*	**Time for Longer Length** *(seconds/foot)*
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.

(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.

(G) A testing procedure for 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 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.

(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.

(E) If the quantity of infiltration or exfiltration exceeds the maximum quantity specified, an owner shall undertake remedial action in order to reduce the infiltration or exfiltration to an amount within the limits specified. An owner shall retest a pipe following a remediation action.

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

(1) For a collection pipe with 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 ASTMs, American Water Works Association, UNI-BELL, or American National Standards Institute, or any related appendix.

(ii) If a mandrel sizing diameter is not specified in the appropriate 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 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.

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

(iii) A barrel section length must equal at least 75% of the inside diameter of a pipe.

(iv) Each size mandrel must use a separate proving ring.

(C) Method Options.

(i) An adjustable or flexible mandrel is prohibited.

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

(iii) 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.

(2) For a gravity collection system pipe with an inside diameter 27 inches and greater, other test methods 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 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 testing.

(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 collection system must inspect the structural analysis of 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 backfilling) for leakage, separate and independent of the collection system pipes, by hydrostatic exfiltration testing, vacuum testing, or other method approved by the executive director.

(1) Hydrostatic Testing.

(A) The maximum leakage 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 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.

(A) 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.

(B) No grout must be placed in horizontal joints before testing.

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

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

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

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

(H) 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.

§217.59. Lift Station Site Requirements.

(a) Site access.

(1) A lift station design must include an access road located in a dedicated right-of-way or a permanent easement.

(2) A road surface 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, enclosure, or a lockable structure.

(3) An intruder-resistant fence must use a minimum of a 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.

(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.

§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.

(2) The location of a wet well level mechanism must ensure that the mechanism is unaffected by currents, rags, grease, or other floating materials.

(3) A level mechanism must be accessible without entering the wet well.

(4) Wet well controls with a bubbler system require dual air 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.

(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 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.

(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:

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.

(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 made of non-conductive material and rated for the load necessary for staff and equipment to descend and ascend.

(d) Lift Station Ventilation.

(1) Passive Ventilation for Wet Wells.

(A) Passive ventilation structures must include screening to prevent the entry of birds and insects to a wet well.

(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) A vent outlet must be at least 1.0 foot above a 100-year flood plain elevation.

(2) Mechanical Ventilation in Lift Stations.

(A) Dry Wells.

(i) A dry well must use mechanical ventilation.

(ii) Ventilation equipment under continuous operation must have a minimum capacity of six air exchanges per hour.

(iii) Ventilation equipment under intermittent operations must have a minimum capacity of 30 air exchanges per hour and be connected to a lift station's lighting system.

(B) Wet Wells.

(i) A wet well must use continuous mechanical ventilation.

(ii) The ventilation equipment must have a minimum capacity of 12 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.

(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 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.

(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 generated during peak operations.

(B) A pump must have a submersible motor and watertight wiring.

(C) A dry well floor must slope toward a sump sized for proper drainage.

(D) The minimum sump depth is 6.0 inches and must prevent standing water on a dry well floor under normal operation.

(E) A sump pump must operate automatically by use of a float switch or other level-detecting device.

(2) Pipes.

(A) A sump pump must use separate pipes capable of discharging more than the maximum liquid level of an associated wet well.

(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 Station Pumps.

(a) General Requirements. A raw wastewater pump, with the exception of a grinder pump, must:

(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 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 remove and replace any single pump without entering or dewatering the wet well.

(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.

(c) Lift Station Pumping Capacity. The firm pumping capacity of a lift station must handle the expected peak flow.

(d) Pump Head Calculations.

(1) An owner shall select a pump based upon analysis of the system head and pump capacity curves that determine the pumping capacities alone and with other pumps as the total dynamic-head increases due to additional flows pumped through a force main.

(2) The pipe head loss calculations, using the Hydraulic Institute Standards, pertaining to head losses through pipes, valves, and fittings, must be included in the report.

(3) The selected friction coefficient (Hazen-Williams "C" value) used in friction head loss calculations 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 firm pumping capacity of 100 gallons per minute or greater, system curves must be provided for both the normal and peak operating conditions at C values for 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 system must have a peak pump capacity equal to or less than the peak design flow, unless equalization is provided.

(2) A wastewater treatment system with a peak flow that is greater than 300,000 gallon per day must use three or more pumps, unless duplex, automatically controlled, variable capacity pumps are provided.

(f) Self-Priming Pumps.

(1) A self-priming pump must be capable of priming without reliance upon a separate priming system, an internal flap valve, or any external means for priming.

(2) A self-priming pump must use a suction pipe velocity at least 3.0 feet per second but not more than 7.0 feet per second, and must incorporate its own suction pipe.

(3) A self-priming pump must vent air back into the wet well during priming.

(g) Vacuum-Priming Pumps.

(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 use a suction pipe velocity at least 3.0 feet per second but less than 7.0 feet per second and must have its own suction pipe.

(h) Vertical Positioning of Pumps. A raw wastewater pump must have positive static suction head during normal on-off cycling, 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.

(i) Individual Grinder Pumps. A grinder pump 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 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.

(1) The discharge side of each pump followed by a full-closing isolation valve must also have a check valve.

(A) A check valve must be a swing type valve with an external lever.

(B) A valve must include 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.

(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 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.

(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;

(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.

(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.

(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 pipe or fittings rated at a working pressure of less than 150 pounds per square inch is prohibited.

(c) Pipe must be identified in the technical specifications with the appropriate specification number for both quality control and installation from the American Society For Testing And Materials, American National Standards Institute, or American Water Works Association.

(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 suitable for the material being pumped.

§217.65. Force Main Pipe Joints.

(a) An underground force main pipe joint must include either push-on rubber gaskets or mechanical joints with a pressure rating equal or greater than the force main pipe material.

(b) Exposed force main pipe joints must be flanged or flexible and adequately secured to prevent movement due to surges.

(c) American Society for Testing and Materials, American Water Works Association, or other widely accepted national reference standard for the joints must be included in the project specifications.

§217.66. Identification of Force Main Pipes.

(a) A detector tape must be laid in the same trench as a force main pipe. The detector tape must be located above and parallel to the force main.

(b) The detector tape must bear the label "**PRESSURIZED WASTEWATER**" continuously repeated in at least 1.5 inch 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 duplex pump station, the minimum velocity is 3.0 feet per second with one pump in operation.

(3) For a 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 in operation; and

(B) a minimum flushing velocity of 5.0 feet per second or greater must occur in a force main at least once daily.

(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 event of sudden pump failure.

(b) Detention Time.

(1) A force main detention time calculations must be included in the report.

(2) The force 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 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.

(1) A force main must terminate in an appropriate structure and either at a manhole on the wastewater collection system or at a wastewater treatment facility.

(2) The discharge end of a force main inside a manhole must remain steady and produce non-turbulent flow.

(3) A receiving wastewater collection system must accept the maximum pump discharge 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.

(2) A force main must be designed to abate any anticipated odor.

(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 at least 30 inches in diameter.

(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.

§217.68. Force Main Testing.

(a) The final plans and specifications must include the pressure testing procedures.

(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 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 diameter per mile of pipe per day.

§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 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.

(d) A distribution system designed to transport Type I reclaimed water, as defined by §210.33 of this title must meet the following requirements:

(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).

(2) A design must prevent pipe and bedding displacement.

(3) The design of a pipe must prevent the deposition of solids in a gravity pipe.

(e) Each appurtenance designed to handle reclaimed water must be identified.

(1) An above-ground hose bib, spigot, or other hand-operated connection is prohibited, excepted in secured areas of a facility that only trained staff has access to.

(2) An underground hose bib must be:

(A) located in locked, below-grade vaults, and clearly labeled "**NON-POTABLE WATER**"; or

(B) operated only by a special tool in non-lockable, underground service boxes clearly labeled as non-potable water;

(C) purple; and

(D) designed to prevent a connection to a standard water hose.

(3) Storage areas, hose bibs, and faucets must include signs in both English and Spanish reading "**NON-POTABLE WATER, DO NOT DRINK**" and "**El AGUA NO-POTABLE, NO BEBE**."

(f) Cross Connection Control and Separation Distances.

(1) A type 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.

(2) A physical connection between a potable water pipe and a reclaimed water pipe is prohibited.

(3) An appurtenance must prevent any possibility of reclaimed water entering a drinking water system.

(4) Where a 4.0 foot separation distance cannot be achieved, a reclaimed water pipe must meet the following requirements:

(A) If a new Type I reclaimed water pipe is installed parallel to an existing potable water pipe, the reclaimed water pipe must:

(i) 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;

(iii) is embedded in cement stabilized sand, 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;

(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) 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, one segment of a Type I reclaimed water pipe must be centered on 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) A crossing of the two pipes must be centered between the joints of the potable water pipe.

(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 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.

(E) Any portions of reclaimed water pipe within 4.0 feet of a potable water pipe must be embedded in cement stabilized sand.

(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.

(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 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.

(B) A submersible pump must use a rail-type pump support incorporating manufacturer-approved mechanisms designed to allow an operator to 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.

(C) All valve types other than rising stem gate valves must include a position indicator to show their open or closed 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 (e), and 217.68 of this title (relating to 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 be purple in color or contained in an 8.0 millimeter purple polyethylene sleeve conforming to American Water Works Association C105, Class C and in-line isolation valves for reuse pipes must open clockwise to distinguish them from potable water isolation valves.

§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.

SUBCHAPTER D: ALTERNATIVE COLLECTION SYSTEMS

§§217.91 - 217.100

STATUTORY AUTHORITY

The new rules are adopted under the authority of Texas Water Code (TWC), §5.013, which provides the commission's general jurisdiction; §5.103, which provides the commission's authority to adopt any rules necessary to carry out its powers and duties under the laws of Texas; §5.105, which provides the commission's authority to, by rule, establish and approve general policy of the commission; §5.120, which provides the commission's authority to administer the law to promote conservation and protection of the quality of the environment; §26.027, which authorizes the commission to issue permits; §26.034, which provides the commission's authority to adopt rules for the approval of disposal system plans; and §26.121, which provides the commission's authority to prohibit unauthorized discharges.

The adopted new rules implement TWC, §§5.013, 5.103, 5.105, 5.120, 26.027, 26.034, and 26.121.

§217.91. Edwards Aquifer.

An owner who plans to install an alternative wastewater collection system located over the recharge zone of the Edwards Aquifer must design and install the system in accordance with Chapter 213 of this title (relating to Edwards Aquifer) in addition to these rules.

§217.92. Component Sizing.

(a) The components of an alternative collection system must be sized based on existing flow data from a similar system and service area, if such data is available.

(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, street, or other type of drain that permit entrance of storm water into a wastewater collection system is prohibited.

(e) In the absence of existing data, the sizing of on-site components in an alternative wastewater collection system must use 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:

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.

$$Q = A \times (N + B)$$

Where:

Q = Design flow rate (gallon per minute)

A = Design coefficient, typically 0.5

N = Number of 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 population greater than 3.5, the following equation must be used:

Figure: 30 TAC §217.92(f)(1)

Equation D.3.

$$Q = A_1 \times (P + B)$$

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 the recommended operating procedures and maintenance practices for the alternative collection system; and

(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 ponding of surface water is probable.

§217.94. Management.

(a) An alternative collection system must discharge to a wastewater facility permitted by the commission.

(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.

(c) This section does not apply to grinder pumps or septic tank effluent pumps discharging directly into a conventional collection system.

§217.95. Service Agreements.

(a) An alternative collection system service agreement must be executed between a collection system owner and a property owner 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 the 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) A collection system owner shall submit 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).

(d) An alternative collection system service agreement must include the following provisions.

(1) Any existing alternative collection system component or building lateral that is to be incorporated into a new, expanded or materially altered system must be cleaned, inspected, tested, repaired, modified, or replaced, as necessary, to the satisfaction of a collection system owner before connection of the component to the collection system.

(2) A 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 collection system owner shall have an engineer inspect and approve the installation of all alternative collection system components before placing the system into service.

(4) A collection system owner shall have access at all reasonable times to inspect on-site alternative collection system components.

(5) A 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. The cost of any such repair or maintenance may be charged to the owner of the property, as determined in the service agreement.

(6) 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.

(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;

(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.

(8) Any on-site component owned by the collection system owner must have an upstream isolation valve.

(9) Any on-site component owned by the owner of the property serviced by a collection system must have a service isolation valve located on a service pipe from an on-site component to the collection system.

(10) A service isolation valve must be accessible at all times through an easement granted by the property owner to the collection system owner.

(11) A collection system owner shall have the ability to collect, transport, and dispose of any residual material.

§217.96. Small Diameter Effluent Sewers.

(a) Interceptor tank design. Septic tanks used as interceptor tanks must be designed and constructed in accordance with §285.32(b)(1) of this title (relating to Septic Tanks).

(1) An outlet of an interceptor tank must have a commercially available effluent filter designed to remove particles larger than 1/16 inch.

(2) The volume of an equivalent dwelling unit (EDU) interceptor tank must be based the criteria in Chapter 285 of this title (relating to On-site Sewage Facilities).

(3) Multiple equivalent dwelling unit (MEDU) interceptor 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 (ADF)

VSO = Volume in gallons dedicated to scum and sludge storage (1.85 ADF)

(b) Pre-treatment units.

(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 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.

(7) A pretreatment unit must be 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 its outlet elevation is below the main pipe elevation or the hydraulic grade line in a depressed section of a main pipe.

(3) A service pipe for an EDU or MEDU must be sized to meet the hydraulic requirements of the building, but must be at least 2.0 inches in diameter.

(4) The diameter of a service pipe must be no greater than the collection pipe it is connected to.

(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 pipe diameter.

(B) The minimum low velocity in a collection pipe must be at least 1.0 foot per second (fps).

(C) The maximum flow velocity in any portion of an SDES system is 8.0 fps without velocity protection and 13.0 fps with 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.

(I) Pressure flow design must use a Hazen-Williams "C" value of 120.

(J) No pipe in 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 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 with no abrupt or sharp changes.

(D) Collection pipe must have a cleanout that extends to ground level and terminates in a watertight valve box at:

(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.

§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 buried less than 30 inches 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.

(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 connects to.

(8) Material used in service pipe must 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.

(2) A single pumping unit may be used for an EDU. The report must include an analysis that justifies the selected pump(s).

(3) An 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 selected pumps.

(4) The calculations in the report must show that 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) An EDU wet well must have a reserve volume of at least 100 gallons after the activation of a high water alarm level.

(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.

(9) A pump located in a STEP chamber that is 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 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.

(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.

(A) 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 used in a STEP system must be located in a hydraulically independent chamber.

(C) A STEP system pump chamber must be hydraulically connected to an 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 or tamper-resistant;

(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.

(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 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.

(2) Velocity in a grinder pump main pipe must not be less than 2.0 feet per second or exceed 8.0 feet per second.

(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, 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.

(9) A pumping unit affected by less than full flow conditions must incorporate an anti-siphon device.

(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.

(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.

(12) Each peak in elevation requires a wastewater air release valve.

(A) A valve orifice must 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.

(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).

§217.98. Vacuum Sewer Systems.

(a) A vacuum sewer system is nonconforming technology. The executive director may review a vacuum sewer in accordance with §217.7(b)(2) of this title (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 pipe material that 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.

(5) A control mechanism that uses a pressure differential must use atmospheric air supplied by a screened breather 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 a minimum of 3.0 inches in diameter.

(8) A service pipe must have performance characteristics at least equivalent to ASTM D 2241 Class 200 PVC pipe.

(9) A service pipe joint must be made by either vacuum-rated elastomeric gasket or by solvent welding.

(10) At least 5.0 feet of service pipe must be between a vacuum valve and a main pipe.

(11) When there is a vertical profile change in a service pipe, the system must incorporate a minimum of 5.0 feet between the vacuum valve and first profile change and between the last profile change and the main pipe.

(12) A service pipe must have a minimum slope 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 made within 6.0 feet of a collection pipe vertical profile change.

(c) Collection System Design.

(1) A pipe in a vacuum sewer must 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) The minimum pipe size in a vacuum sewer must be 4.0 inches in diameter, except for a service pipe 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 length of a pipe larger than 4.0 inches in diameter must be determined by friction and lift headloss.

(4) The total available head loss from the farthest input point in a system is 18 feet; five feet to operate the vacuum valve and 13 feet available for wastewater transport.

(5) A vacuum sewer system must be laid out in a branched pattern. A pipe must have a saw-tooth profile that slopes toward a vacuum station.

(6) The design of an upgrade mainline transport pipe must reduce the risk of blocking a pipe with trapped sewage.

(7) A collection pipe depressed in order to avoid an obstruction must have 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 both sides of an area of unstable soil, and at intervals of no more than 1,500 feet.

(A) 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 provided downstream of a division valve.

(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 §217.98(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.

$$Q = \frac{V}{PDT} \times \log \frac{H_1}{H_2}$$

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 evacuate the system in less than 180 seconds.

(2) The design must include duplicate pumps, each capable of delivering 100% of required airflow and capable of 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 reservoir to prevent carry over of liquid into the pump.

(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) 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.

(5) The available net positive suction head must be greater than 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) 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.

(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 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 vacuum switch controls 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.

§217.99. Testing Requirements.

(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 §217.99(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 remedial action to reduce the infiltration or exfiltration to an amount within the specified limits.

(c) Hydrostatic Head Test for Tanks. The test consists of filling the tank to the top and holding the water for 24-hours with no leakage.

(1) The hydrostatic heat test is required before the placement of backfill around a rigid tank.

(2) The test for a tank constructed from flexible or semi-rigid material is required after placement and backfilling according to the 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.

(1) The test pressure must be a minimum of 25 pound per square inch or 1.5 times the maximum pipe design pressure, whichever is larger. The calculations for the maximum allowable leakage must 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.

(f) Vacuum Test for a Tank.

(1) The test may begin only after establishing an initial stable vacuum of 4.0 inches of mercury.

(2) The total vacuum loss during a vacuum test must not exceed 1.0 inch loss of mercury vacuum after 5 minutes.

(3) A tank constructed of flexible or semi-rigid material must not exceed the 3% change in tank dimensions in any direction.

(4) If the quantity of vacuum loss or if tank deformation equals or exceeds the maximum quantity specified, 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 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.

(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 discharges at a facility must discharge below the liquid level at the headworks.

SUBCHAPTER E: PRELIMINARY TREATMENT UNITS

§§217.121 - 217.129

STATUTORY AUTHORITY

The new rules are adopted under the authority of Texas Water Code (TWC), §5.013, which provides the commission's general jurisdiction; §5.103, which provides the commission's authority to adopt any rules necessary to carry out its powers and duties under the laws of Texas; §5.105, which provides the commission's authority to, by rule, establish and approve general policy of the commission; §5.120, which provides the commission's authority to administer the law to promote conservation and protection of the quality of the environment; §26.027, which authorizes the commission to issue permits; §26.034, which provides the commission's authority to adopt rules for the approval of disposal system plans; and §26.121, which provides the commission's authority to prohibit unauthorized discharges.

The adopted new rules implement TWC, §§5.013, 5.103, 5.105, 5.120, 26.027, 26.034, and 26.121.

§217.121. Coarse Screening Devices.

(a) A facility must use a coarse screening device, unless stated otherwise in this subchapter.

(b) A coarse screening device must include a bypass channel sized to handle the peak flow of the facility.

(c) A coarse screening device must include a means of diverting flow to the bypass channel.

(d) If the primary channel uses a mechanically cleaned coarse screening device, the bypass channel must have a coarse 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.

(f) Screen Openings.

(1) For a manually cleaned coarse screen, the bar openings must be at least 0.5 inch but not more than 1.75 inches.

(2) For a mechanically cleaned coarse screen, the bar openings must be at least 0.25 inch but not more than 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 has provisions to drain and temporarily store the screenings.

(g) Hydraulics.

(1) The velocity through 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 screening device must minimize 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 screening device and any related structure must resist the effects of a corrosive environment, including long-term exposure to hydrogen sulfide.

§217.122. Fine Screening Devices.

(a) A fine screen may be used in lieu of a coarse screening device.

(b) A fine screen is any screen with a clear opening less than 0.25 inch.

(c) 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 (BOD_5) 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 include the justification for any reduction in the size of any treatment unit 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 may occur with the largest fine screen unit out of service.

(f) A design may include a single fine screen unit if the design includes 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.

(g) A 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 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.

(i) A moving or rotating fine screen must use a continuous cleaning device, such as water jets or wiper blades.

(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).

(k) A fine screen must meet its manufacturer's recommendation with respect to velocity and head loss through the fine screen.

(l) A fine screen may use a bar rack or perforated plate.

§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.

(c) A storage area for screenings and debris must drain to the head of the facility and include runoff control.

(d) 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.

(b) A grit removal system includes those units and processes capable of removing inert, non-biodegradable particles.

(c) A grit removal system must include dual processes capable of operating at the permitted peak flow of the facility.

(d) Each grit removal unit must include:

(1) a bypass channel to accept flow when a grit removal unit is off-line; and

(2) a means of diverting flow to a bypass channel.

§217.125. Grit Chambers.

(a) Horizontal Flow Grit Chambers.

(1) Velocity through a grit chamber must range at least 0.8 feet per second but not more than 1.3 feet per second.

(2) A grit chamber channel must minimize turbulence and provide uniform velocity across the channel.

(3) The channel size must accommodate the grit removal equipment capacity and grit storage.

(b) Aerated Grit Chambers.

(1) An air diffuser and baffle arrangement design must separate the size of grit planned for removal.

(2) The aeration equipment must vary air feed rates along the length of a grit chamber from 3.0 seconds per cubic foot per meter (scfm) per linear foot but not more than 8.0 scfm per linear foot.

(3) A grit chamber must have a hydraulic detention time of at least 3.0 minutes.

(4) 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) 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:

(A) Reciprocating rake;

(B) Screw conveyor; or

(C) Air lift pump.

(d) Cyclonic Degritters.

(1) A cyclonic degritter must prevent 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 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.

(2) Minimum initial inlet velocity at the peak flow must be at least 2.0 feet per second.

(3) A vortex system must include rotating paddles in the center of a grit chamber and must rotate at a maximum 21 revolutions per minute.

(4) An outlet channel must maintain a constant elevation.

(5) Grit removal from a grit storage chamber must be by pumps specifically designed to handle grit.

§217.126. Grit Handling.

(a) 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.

(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 may be used 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 any pre-aeration system design.

§217.128. Flow Equalization Basins.

(a) A facility must use a flow equalization basin if:

(1) A facility's total daily influent flow volume occurs during a period of time less than or equal to ten hours of a day for any day of any week;

(2) A facility experiences periods of time when it receives an influent flow of less than 10% of its design capacity for a period of time equal to or greater than 48 hours in any one week; or

(3) At any time that flow equalization is necessary to minimize random or cyclic peaking of organic or hydraulic loadings.

(b) A flow equalization basin must have an upstream screening 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) 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 a basin must be controlled by a flow-regulating device capable of maintaining a flow rate that allows downstream process units to operate 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 processing units.

§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.

(2) A primary clarifier must discharge scum to a sludge digester or 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 may use hydraulic differential skimming, only if the scum pickup is capable of removing scum from the entire operating surface of the clarifier.

(6) A scum pump must be specifically designed for this purpose.

(c) Effluent weirs.

(1) An effluent weir must prevent turbulence or localized high vertical flow velocity in the primary clarifier.

(2) A weir must be located to prevent short circuiting flow through a primary clarifier.

(3) A weir must be adjustable for leveling.

(4) Weir loading, for a 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 for a facility with a design flow in excess of 1.0 mgd must not exceed 30,000 gpd peak flow per linear foot of weir length.

(d) Basin sizing.

(1) The surface area of a facility's clarifier(s) determines the proper overflow rates.

(2) The actual clarifier size is based on the larger of the two surface area calculations: peak flow rate or design flow surface loading rate.

(3) The design criteria for primary a clarifier in subparagraphs (A) and (B) of this paragraph are based upon a minimum side water depth of 10.0 feet.

(A) Maximum surface loading:

(i) must not exceed 1,800 gpd per square foot at peak flow;

(ii) must not exceed 1,000 gpd per square foot at design flow; and

(iii) does not include recirculation flow.

(B) Detention Time.

(i) Detention time at peak flow must be no less than 54 minutes (0.9 hour).

(ii) Detention time at design flow must at least 108 minutes (1.8 hours).

(iii) Overflow rate and side water depth (SWD) may be adjusted from a minimum of 10 feet 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 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.

(III) For a flat bottom tank, a sludge blanket of 3.0 feet must be allowed for development of maximum return sludge concentration.

(e) SWD. The minimum SWD for primary clarifiers is 10.0 feet.

(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.

(1) A primary clarifier must have the capability of draining completely to an appropriate point in the facility.

(2) A portable dewatering pump is acceptable for complete dewatering.

(h) Accessibility. A primary clarifier must be accessible to facilitate routine operation and maintenance.

(i) Five-day biochemical oxygen demand (BOD_5) Removal. A design 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 and transfer it for subsequent processing.

(2) A gravity sludge transfer pipe must be at least 8.0 inches in diameter.

SUBCHAPTER F: ACTIVATED SLUDGE SYSTEMS

§§217.151 - 217.164

STATUTORY AUTHORITY.

The new rules are adopted under the authority of Texas Water Code (TWC), §5.013, which provides the commission's general jurisdiction; §5.103, which provides the commission's authority to adopt any rules necessary to carry out its powers and duties under the laws of Texas; §5.105, which provides the commission's authority to, by rule, establish and approve general policy of the commission; §5.120, which provides the commission's authority to administer the law to promote conservation and protection of the quality of the environment; §26.027, which authorizes the commission to issue permits; §26.034, which provides the commission's authority to adopt rules for the approval of disposal system plans; and §26.121, which provides the commission's authority to prohibit unauthorized discharges.

The adopted new rules implement TWC, §§5.013, 5.103, 5.105, 5.120, 26.027, 26.034, and 26.121.

§217.151. Requirements for an Aeration Basin.

(a) Unless designed for advanced nutrient removal, an aeration basin must be designed maintain a minimum dissolved oxygen concentration of 2.0 milligrams per liter (mg/l) throughout the 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 the volume in aerated influent wastewater channels and aerated mixed liquor transfer channels to meet aeration basin volume requirements, provided the 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.

(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 prevent the settling of solids in the channel.

(b) Scum removal.

(1) A clarifier must include scum baffles and a means for the collection and disposal of scum.

(2) Scum collected from a clarifier in a facility using an activated sludge process and an aerated lagoon may be discharged to an aeration basin or digester, or may use another disposal method that complies with Chapter 312 of this title (relating to Sludge Use, Disposal, and Transportation).

(3) Scum from a clarifier in a facility not using an activated sludge process and an aerated lagoon must be discharged to a sludge digester or may use another disposal method that complies with Chapter 312 of this title.

(4) Discharge of scum to an open drying area is prohibited.

(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 scum pump must be specifically designed to pump scum.

(c) Effluent weirs.

(1) An effluent weir must prevent turbulence or a localized high vertical flow velocity in a clarifier.

(2) A weir must be located a minimum of 6.0 inches from an outer wall or baffle and must prevent the short-circuiting of flow through a clarifier.

(3) A weir must be adjustable to allow leveling of the weir and to provide for minor changes to the water surface elevation in a clarifier.

(4) For a facility with a design flow of less than 1.0 million gallons per day (mgd), the weir loading must not exceed 20,000 gpd at the peak flow per linear foot of weir length.

(5) For a facility with a design flow equal to or greater than 1.0 mgd, the 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 weirs around the entire perimeter of the clarifier.

(d) Sludge Pipes.

(1) Sludge transfer from a clarifier to a subsequent processing unit must not negatively affect treatment efficiency.

(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.

(4) Each sludge pipe must have a means to remove any blockage.

(e) Sludge Collection Equipment. A clarifier 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.

(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) The SWD 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 with a hydraulic sludge removal mechanism.

(2) A clarifier with a mechanical sludge collector and a surface area:

(A) equal to or greater than 300 square feet (sf) must have a minimum SWD of 10.0 feet.

(B) less than 300 sf must have a minimum SWD of 8.0 feet.

(3) A clarifier with a hopper bottom must determine the SWD using the following equation:

Figure: 30 TAC §217.152(g)(3)

Equation F.1.

$$SWD = 160Q + 4$$

Where:

Q = annual average flow in million gallons per day, as determined in §217.51(a) of this title (relating to Applicability)

SWD = side water depth required (feet)

(4) An SWD computed using Equation F.1 in paragraph (3) of this subsection excludes the hopper portion of a clarifier. The upper third of the hopper portion of a hopper bottom clarifier may be counted as part of the 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 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 with a maximum flow equal to or greater than 10,000 gpd.

(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 weir must prevent short circuiting.

(j) Return Sludge Pumping Capacity.

(1) The capacity of a return sludge-pumping unit must be calculated based on the area of an activated sludge clarifier(s), including the stilling well area.

(2) The return sludge pumping capacity is the clarifier underflow rate in gallons per day per square foot (gpd/sf).

(3) A return sludge pumping system must be capable of pumping least 200 gpd/sf but not more than 400 gpd/sf.

(4) The pumping capacity 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 basin and a clarifier must resist the effects of a corrosive wastewater environment.

(b) Freeboard.

(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 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, unless the aeration equipment is removable without taking the aeration basin out of service.

(2) Internal and interconnecting pipes must be capable of hydraulically passing the peak flow without overflow and with either the largest clarifier or the largest aeration basin out of service.

(3) Each aeration basin and clarifier must have gates or valves to allow it to be hydraulically isolated.

(4) Each aeration basin and clarifier must have a dedicated means for 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 based on values that have been used historically as standard engineering practice.

(b) Aeration Basin Sizing.

(1) A aeration reactor must be sized using the organic load calculated in §217.32 of this title (relating to Organic Loading and Flows).

(2) Based on this organic load, the aeration basin volume must ensure that the organic loading on the aeration basin does not exceed the rates in the following table:

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 When Reactor 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 over 20 days)	10	15	3, 2, or 1	15

(3) When identifying the reactor temperature for the process design in Table F.1 in paragraph (2) of this subsection, the average of the lowest consecutive seven-day mean reactor temperature from a similar wastewater treatment facility located within 50 miles of the proposed site must be used.

(c) Clarifier Sizing.

(1) The following table establishes the maximum surface loading rates and the minimum detention times used to determine the size of an activated sludge clarifier:

Figure: 30 TAC §217.154(c)(1)

Table F.2. - Maximum Clarifier 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 (BOD_5 lbs/day)* (from Table F.1)	**Process - Treatment Level**	**Maximum 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 overflow rate criteria.

(A) When calculating overflow rates for a proposed clarifier, sludge recycle flow must not be used in the calculation of the maximum overflow rate, in compliance with Table F.2 in paragraph (1) of this subsection.

(B) When calculating the 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_2R) of 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_2R calculated by Equation F.2 located in paragraph (3) of this subsection or use the recommended values presented in Table F.3 in paragraph (3) of this subsection.

(3) The O_2R values in Table F.3 in the following figure use concentrations of 200 mg/l five-day biochemical oxygen demand (BOD_5) and 45 mg/l ammonia-nitrogen (NH_3-N) in Equation F.2 in the following figure:

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 either paragraph (1) or (2) of this subsection.

(1) Design Airflow Requirements - Default Values. A diffused air system may use the following table to determine the airflow for sizing:

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	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 air system may base calculations of the airflow requirements for the diffused air equipment in accordance with subparagraphs (A) - (D) of this paragraph.

(A) Determine Clean Water Oxygen Transfer Efficiency.

(i) A diffused air system may have a clean water oxygen transfer efficiency greater than 4% only if the full scale diffuser performance data from a certified testing laboratory or sealed by an independent licensed professional 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 air system with a clean water transfer efficiency greater than 18% for a coarse bubble system 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 air 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 and by multiplying the clean water transfer efficiency by 0.45 for a fine bubble diffuser.

(ii) The executive director may require additional testing and data to justify actual WOTE for a 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 air system must correct the RAF 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 Airflowrate (standard cubic feet per minute (SCFM))

PPD BOD_5 = Influent Organic Load in Pounds per Day

0.23 = lb 0_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.

(D) Corrections to RAF based on varying diffuser submergence depths. 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

(3) Mixing Requirements for Diffused Air. The air requirements for mixing must be calculated using:

(A) *Design of Municipal Wastewater Treatment Plants*, 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 scfm/1000 cf for a coarse bubble diffuser and greater than or equal to 0.12 scfm /square foot (sf) for a fine bubble diffuser.

(4) Blowers and Air Compressors.

(A) A blower and a compressor must have sufficient capacity to provide the required aeration rate for biological treatment and the air requirements of any supplemental unit.

(B) The report must include blower or compressor calculations that show the 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 air system must have multiple compressors arranged to provide an adjustable air supply to meet the variable organic load on the facility.

(D) The compressors must be capable of handling the maximum design air requirements with the largest single unit out of service.

(E) A blower unit and a compressor unit must restart automatically after a power outage, or a telemetry system or an auto-dialer with battery backup must notify an operator of any outage.

(F) A design must specify blowers or 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).

(G) A design must specify the capacity of 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).

(5) Diffuser Systems - Additional Requirements.

(A) Diffuser Submergence.

(i) 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** *(feet)*
<0.01	8.0
0.01 to 0.10	9.0
>0.10	10.0

(ii) 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.

(B) Grit Removal. A facility that uses diffusers and has wastewater with high concentrations of grit must include a grit removal unit upstream of an aeration process or must include multiple trains that may be taken out of service to allow for grit removal.

(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) An air header must be able to withstand temperatures up to 250 degrees 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.

(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 oxygen transfer efficiency rate for the mechanical equipment.

(ii) Clean water oxygen transfer rate must not exceed 2.0 pounds of oxygen per horsepower-hour, unless justified by full scale performance data conducted by a certified testing laboratory or sealed by an independent, licensed professional engineer 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*.

(iii) A proposed clean water 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 data to justify actual wastewater transfer efficiency.

(ii) 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.

(A) A mechanical aeration device must provide sufficient mixing to prevent deposition of mixed liquor suspended solids (MLSS) 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 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 reliability.

(i) Each 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.

(iii) A mechanical aeration device must automatically restart after a power 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) 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 operator 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 and be equipped with a splash prevention device.

(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 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.

(3) A two-basin 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 SBR with fixed decant equipment and decant volumes that do not accommodate the design 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). Maximum space loadings must be below 35 pounds of five-day biochemical oxygen demand ($CBOD_5$) 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 at least 3,000 milligrams per liter (mg/l) but not more than 5,000 mg/l.

(8) The minimum depth MLSS during a react phase is 9.0 feet.

(9) The minimum side water depth of 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 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.

(5) A decanter must prevent solids from entering the decanter during a react cycle by one the following methods:

(A) Recycle treated effluent to wash out solids trapped in a decanter;

(B) Mechanically close a decanter when it is not in use; or

(C) Fill a decanter with air except during a decant period.

(6) The design of a decanter and related pipes and valves must 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.

(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 flowrate 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.

(5) An SBR tank must 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 overflow to another aeration tank(s) or a storage tank.

(12) At a facility that is not staffed 24-hours each day, a manually operated SBR tank must include a high-level alarm that notifies 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 basins.

(14) All equipment must be accessible for inspection, maintenance, and operation.

(15) An SBR may use fine screens pursuant to §217.122 of this title (relating to Fine 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 tank out of service.

(d) Aeration and Mixing Equipment.

(1) In addition to the requirements of §217.155 of this title 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 basin.

(4) A design must specify the blower discharge pressure at the maximum water depth.

(5) 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.

(1) The motor control center must include programmable logic controllers (PLC) with able to operate with limited operator adjustment and be programmed to meet the required effluent limitations for the design loadings.

(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.

(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 at least:

(A) Pumps - hand/off/automatic;

(B) Valves - open/closed/automatic;

(C) Blowers or aerators - hand/off/automatic; and

(D) Selector switch for tank(s) - in operation/standby.

(7) The control panel visual displays must include:

(A) Mimic diagram of the process that shows the status and position of any pumps, valves, blowers or aerators, and mixers;

(B) Process cycle and time remaining;

(C) Instantaneous and totalized flow to the facility and of the final discharge;

(D) Tank level gauges or levels;

(E) Sludge pumping rate and duration; and

(F) Airflow rate and totalizer.

(8) The required alarm condition indicators for an annunciator panel must include:

(A) High and low water levels in each tank;

(B) Failure of all automatically operated valves;

(C) Decanter failure;

(D) Blowers, if used - low pressure, high temperature, and failure;

(E) Mechanical aerator, if used - high temperature and failure;

(F) Pump - high pressure and failure; and

(G) Mixers, if used - failure.

§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) Performance Standards.

(1) MBR performance standards for conventional pollutants and nutrients are shown in the following table:

Figure: 30 TAC §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) An owner may be required to submit a pilot study report or data from a similar facility if a proposed facility is designed to achieve higher quality effluent than the performance standards listed in the table in paragraph (1) of this subsection.

(c) 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 screen with either perforated plate or wire mesh with an opening size of 0.5 - 2.0 millimeter (mm) for hollow fiber systems and tubular systems and 2.0 - 3.0 mm for flat plate systems.

(ii) Bypass of a fine screen must be prevented with either a duplicate fine screen, overflow to a wet well, or an alternative that has been approved by the executive director.

(iii) A fine screen must be designed to prevent overflow at the peak flow.

(iv) Coarse screens followed by fine screens may be used in larger facilities to minimize the complications of fine screening.

(B) The economic feasibility of primary clarification must be evaluated for facilities designed for an average daily flow of 5.0 million gallons per day (mgd) or more. The evaluation must be included in the report.

(C) Oil and grease removal is required if the 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, influent concentrations of oil and grease equal to or more than 100 milligram per liter (mg/l) must have oil and grease removal.

(D) The necessity of grit removal must be evaluated for a facility that has a collection system with excessive inflow and infiltration. 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.

(B) The design sludge retention time (SRT) for an MBR must be at least 10 days but no more than 25 days.

(C) The design operational range of mixed liquor suspended solids 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) A system designed for an SRT or MLSS outside theses ranges requires a pilot study in compliance with paragraph (8) of this subsection, or data from a similar facility that demonstrates that the design parameters are sustainable and can achieve the expected performance.

(3) Aeration.

(A) An aeration system in a bioreactor must be capable of maintaining dissolved oxygen levels as listed in subparagraph (C) of this paragraph.

(B) A bioreactor aeration system must compensate for a low oxygen transfer efficiency due to the higher MLSS concentrations with a justified alpha value of 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;

(ii) Aerobic: at least 1.5 mg/l but not more than 3.0 mg/l; and

(iii) Membranes: at least 2.0 mg/l but not more than 8.0 mg/l.

(D) A design must include oxygen monitoring and an alarm to notify an operator of potential or actual oxygen depravation.

(4) Recycle Rates. Facilities without advanced treatment must be designed with recycle rates sufficient to sustain the design mixed liquor concentrations; typically from 200% to 400% of the facility's influent flow.

(5) Nutrient removal.

(A) A system designed for enhanced nutrient removal must include an isolated tank or baffled zone for anoxic treatment, anaerobic treatment, or both.

(B) Calculations for sizing the reactor volumes must be based on one of these models for nutrient removal:

(i) Bardenpho;

(ii) modified Ludzak-Etinger;

(iii) University of Capetown; or

(iv) an alternative approved by the executive director.

(C) A facility designed for nitrogen or biological nutrient removal must contain a deoxygenation basin, a larger anoxic basin, or another method 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 basins; typically totaling 600% or more of the influent flow.

(6) Use of Membranes.

(A) Use of a membrane system other than a hollow fiber system, tubular system, or a flat plate system must be considered innovative treatment technology and is subject to §217.7(b)(2) of this title.

(B) 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).

(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 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

(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 that substantiate the proposed duration, frequency, and recovery time from peak flow.

(C) A system with a peak flow rate that is greater than 2.5 times the average daily flow must use equalization volume, off-line storage, or reserve membrane capacity to accommodate the higher peak flow.

(D) Hollow fiber transmembrane pressure (TMP).

(i) The operational pressure range must be at least 2.0 pounds per square inch (psi) but not more than 10.0 psi.

(ii) The maximum pressure must not exceed 12.0 psi.

(E) Flat plate TMP.

(i) The operational pressure range must be at least 0.3 psi but not more than 3.0 psi.

(ii) The maximum pressure must not exceed 4.5 psi.

(F) Tubular, Out of Basin TMP.

(i) The operational pressure range must be at least 0.5 psi but not more than 5.0 psi.

(ii) The maximum pressure must not exceed 10.0 psi.

(8) Supporting Data. 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 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 actual operational conditions including flow variations and influent wastewater characteristics.

(C) The treatment and pretreatment processes in a pilot study or similar facility must be equivalent to the proposed facility.

(D) The results of the pilot study must include the following recommendations:

(i) average, peak day, and peak two-hour design net flux rates;

(ii) average and maximum TMP;

(iii) cleaning and backwash intervals;

(iv) expected percent 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's wastewater permit.

(9) Redundancy.

(A) A facility must be able to operate at normal operating parameters and conditions for daily average flow with one MBR unit or train out of service.

(B) Acceptable methods of providing redundancy are additional treatment trains, additional treatment units, or storage. Calculations must be included in the report to demonstrate adequate redundancy.

(10) Other components.

(A) Mixers.

(i) Unaerated (deoxygenation, pre/post anoxic, and anaerobic) zones must have submersible mixers or an alternative mixer that has been approved by the executive director.

(ii) Coarse bubble air diffusers may be used for mixing in a pre-anoxic tank.

(B) Scum and Foam Handling.

(i) Scum and foam must not interfere with treatment or overflow 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 must be provided for periodic cleaning and maintenance.

(11) Disinfection.

(A) An owner may request and the executive director may grant decreased ultraviolet light or chlorine dosing requirements for MBR effluent.

(B) 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:

(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 with mixed liquor jet feed;

(C) Back-flushing;

(D) Relaxation, which is short periods of air scouring without filtration; or

(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. If turbidity is used for indirect integrity monitoring, 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 inspection, testing, and maintenance procedures and frequencies must be included in the facility's operation and maintenance manual.

(C) An owner must provide a 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 included in a operation and maintenance manual for the facility.

(3) Control instrumentation.

(A) A facility must have the ability to run 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, including concentrations and disposal methods, must be identified in the report.

(f) Training.

(1) Key staff must be trained to operate the particular MBR at a facility. They must be familiar with the sequencing and set points of all operations and actions typically controlled by automated systems 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 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.

§217.158. Solids Management.

(a) Solids Recycling and Monitoring.

(1) A return sludge system must operate satisfactorily 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. A design must be adequate 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 allow for cleaning without removal from a basin.

(3) 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.

(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) A sludge piping system must be sized for a minimum velocity of 3.0 feet per second at the maximum waste or return rate to prevent solids from settling 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.

(1) A facility design must include the necessary equipment for a 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 operating manual must provide the formulas for determining the SRT.

(3) The SRT required for nitrification applies to the aerobic portion of the facility.

(b) Aeration System Control. Aeration control must include the total air supplied and the distribution of air to the aeration tanks.

(1) In order to conserve energy, a facility design may include the ability to adjust the airflow in proportion to the oxygen demand of the facility.

(2) If this 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.

§217.160. Operability and Maintenance Requirements.

(a) All equipment must operate at the temperature extremes of the facility location and may require enclosures to allow operation of the equipment at all times.

(b) All equipment must be accessible for inspection, maintenance, and operation.

(c) A building that houses equipment must be designed with sufficient clearance and working room to remove and reinstall equipment. The building must be 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 must conduct fault monitoring and reporting on high wet well, power interruption, disinfection failure, blower failure, and return sludge pumping failure.

(d) For a facility not staffed 24 hours a 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 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.

§217.163. Advanced Nutrient Removal.

(a) A facility designed to provide advanced nutrient removal must specify the process units needed to achieve the permit's effluent limits.

(b) Biological nutrient removal, membrane filtration, sand filtration, or a combination of these processes may be used for advanced nutrient removal without applying for the 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:

(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 requirements in Subchapter K of this chapter (relating to Chemical Disinfection).

(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.

(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.

(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.

(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.

(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 design.

(c) Aeration Basin Sizing.

(1) For a facility that does not require nitrification, the minimum SRT is as follows:

(A) For a facility with an effluent $CBOD_5$ monthly average limitation of 20 milligrams per liter (mg/l), the minimum SRT is three days;

(B) For an extended aeration facility with an effluent $CBOD_5$ monthly average limitation of 20 mg/l, the minimum SRT is 22 days;

(C) For a facility with an effluent $CBOD_5$ monthly average limitation less than 20 mg/l, the minimum SRT is 4.5 days; and

(D) For an extended aeration facility with an effluent $CBOD_5$ monthly average limitation of less than 20 mg/l, the minimum SRT is 25 days.

(2) For a facility that requires nitrification, the minimum SRT is based on the winter reactor temperature as set forth in §217.154(a) 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 $CBOD_5$ monthly average loading limitation for a single-step facility is 50 pounds (lb) $CBOD_5$ per 1,000 cubic feet (cf) and for the first step of 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 utilizing a reinforced concrete tank. A facility must be designed for an MLSS concentration of at least 2,000mg/l but less than 5,000 mg/l. The net solids production, (Y), in the following table includes both coefficients for yield and endogenous respiration:

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.

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:

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.

$$V_a = \frac{1000CBODL}{\max allowable lbCBOD/kcf}$$

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.

(2) Biological solids may occupy different volumes for the same mass of solids as indicated by the SVI.

(3) For purposes of determining 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 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 overflow rate.

(6) A clarifier must be sized to prevent overloading in the thickening process at the design flow.

(7) The facility's operation and maintenance manual must state the design maximum mixed liquor floc volume.

(8) Dimensions for clarifiers not designed for solids storage (i.e., not overloaded in thickening at the peak flow).

(e) Determine Overflow Rate and Area. The values in 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 an aeration basin. The design must be based the underflow rate. The design must include calculations for maximum 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 = overflow rate (gpd/sf) from Figure 1: 30 TAC §217.164(e)(2)(I), Table F.9

(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 §217.164(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 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} = 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

$$A_c = \frac{Q_p}{OR_{T10}}$$

Where:

$A_{c,}$ = clarifier area (sf), based on 2-hr peak flow

Q_p = peak flow, mgd

OR_{T10} = 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} = 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

(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 Requirements for Clarifiers);

(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 = 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 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:

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

Figure: 30 TAC §217.164(e)(2)(G)(i)

Equation F.17.

$$OR_{T10} = 5053.8(1 - fv/100)^{3.83} \text{ gpd/sf}$$

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 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 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:

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

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					
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

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					
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 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
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

SUBCHAPTER G: FIXED FILM AND FILTRATION UNITS

§§217.181 - 217.193

STATUTORY AUTHORITY

The new rules are adopted under the authority of Texas Water Code (TWC), §5.013, which provides the commission's general jurisdiction; §5.103, which provides the commission's authority to adopt any rules necessary to carry out its powers and duties under the laws of Texas; §5.105, which provides the commission's authority to, by rule, establish and approve general policy of the commission; §5.120, which provides the commission's authority to administer the law to promote conservation and protection of the quality of the environment; §26.027, which authorizes the commission to issue permits; §26.034, which provides the commission's authority to adopt rules for the approval of disposal system plans; and §26.121, which provides the commission's authority to prohibit unauthorized discharges.

The adopted new rules implement TWC, §§5.013, 5.103, 5.105, 5.120, 26.027, 26.034, and 26.121.

§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 the basis for the selection of the design hydraulic and organic loadings:

(1) strength of the influent wastewater;

(2) effectiveness of pretreatment;

(3) type of filter media; and

(4) treatment efficiency required.

(b) A trickling filter 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 required settled effluent BOD_5 and total suspended solids (TSS);

(3) a combined BOD_5 and nitrifying filter, which provides the required settled effluent BOD_5, ammonia-nitrogen (NH_4-N), and TSS; or

(4) a tertiary nitrifying filter, which provides the required settled effluent NH_4-N, if the influent to a trickling filter is a clarified secondary effluent.

(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
†BOD_5 Removal (%)	80-85	0-70	40-80	65-85	40-85
*Does not include recirculation					

† Includes subsequent settling

(d) Pretreatment.

(1) A trickling filter must have upstream preliminary treatment units that:

(A) remove grit, debris, suspended solids, oil, and grease;

(B) 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 media using crushed rock, slag, or similar material containing more than 5% by weight of pieces with their longest dimension three times greater than the least dimension is prohibited.

(B) Rock 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 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 media must be at least 4.0 feet deep at the shallowest point.

(B) Dumping rock media directly on a filter is prohibited. Rock media must be placed by hand to a depth of 12 inches above the underdrains. The remainder 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 filter media.

(f) Synthetic (Manufactured or Prefabricated) Media Materials.

(1) Any synthetic media material must be used in accordance with all manufacturer's recommendations.

(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).

(A) Suitability. The suitability of synthetic media material must be evaluated based on 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) A structural design must support the synthetic media, water flowing through or trapped in voids, and the maximum anticipated thickness of the wetted biofilm.

(ii) The synthetic media must support the weight of 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 Media. Modular synthetic media must be installed with the edges matched as nearly as possible to provide consistent hydraulic conditions within the trickling filter.

(g) Filter Dosing.

(1) Suitable flow characteristics must be used for the application of wastewater to a filter by siphon, pump, or gravity discharge from preceding treatment unit.

(2) A 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 must be adjusted for the dosing intensity as a compensatory measure under low-flow conditions. The following table provides design ranges of dosing intensity for normal usage periods and for flushing periods:

Figure: 30 TAC §217.182(g)(3)

Table G.2 - Trickling Filter Dosing Intensity Ranges (SK)

BOD_5 loading *kilogram (kg)/m^3/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)

Equation G.1.

$$SK = \frac{(q + r) \times (1000mm/m)}{(a) \times (n) \times (60)}$$

Where:

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

(h) Distribution Equipment.

(1) A design 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 upgrade of an existing trickling filter must include 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 media that will not be fully wetted must not be considered part of the required effective treatment area.

(6) The center column of a rotary filter distributor must have adequately sized overflow ports to prevent water from reaching the bearings in the center column.

(7) A filter distributor must include cleanout gates on the ends of the arms and an end spray nozzle to wet the edge of the media.

(8) The 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. If an existing 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 filter media and the distributing nozzles is 6.0 inches.

(11) Rotary distributors must capable of operating at speeds as low as one revolution per 30 minutes.

(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) A design must include 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) A design must include the minimum recirculation in the evaluation of the efficiency of a filter, if it is part of a proposed specified continuous recirculation rate.

(C) Minimum flow to the filters must equal to or greater than 1.0 mgd per acre of filter aerial surface and must keep the distribution nozzles properly operating.

(D) The minimum flow rate for a design using hydraulically driven distributors must keep rotary distributors turning at the minimum design rotational velocity.

(E) For a facility designed with a 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) A design must provide 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:

(A) 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 design flow if calculations to justify the higher rate are included in the report.

(5) Configuration.

(A) In a facility with influent that has constant organic loadings, a system must use direct recirculation of unsettled trickling filter effluent.

(B) A design must ensure that the distributor nozzles can handle the recirculated sloughed biofilm.

(C) In a 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 filters in terms of million gallons per acre of filter area per day for the initial year and the design year.

(2) The average hydraulic surface loadings of a filter with crushed rock, slag, or similar media must not:

(A) exceed 40 mgd per acre based on design flow, except in roughing applications;

(B) be less than 1.0 mgd per acre; and

(C) be within the ranges specified by the manufacturer.

(k) Underdrain System Design.

(1) A trickling filter must include an underdrain with semicircular inverts that cover the entire floor.

(2) An underdrain must be 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 filter's surface area.

(5) A modular synthetic media design must be supported above a filter floor by beams and grating with support and clearances in accordance with the media manufacturer's recommendations.

(l) Underdrain Slopes.

(1) An underdrain and 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 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 on slope of at least 1% and not more than 5%, based on filter size and hydraulic loading.

(m) Passive Ventilation.

(1) The effluent channel and effluent 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.

(4) A ventilation system may include an extension of an underdrain through a filter sidewall, a ventilation opening through a sidewall, and an effluent discharge conduit designed as a partially full flow pipe or an open channel.

(5) A vent opening through a trickling filter walls must include hydraulic closure to allow flooding of a 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 plan area.

(8) The minimum required ventilating area for a synthetic media underdrain is the area recommended by the manufacturer.

(9) The ventilating area must be the greater of 1.0 sf per 175 sf of synthetic media area or 2.6 sf per 1,000 cf of media volume.

(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, 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.

(2) A design must specify the minimum airflow for forced ventilation and optimized process performance, and the report must include any calculation associated with this determination.

(3) 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

(C) a reversible fan or other mechanism to reverse the airflow when a wide temperature difference between the ambient air and wastewater create strong updrafts.

(4) A ventilation fan and the associated controls must withstand flooding of a filter without sustaining damage.

(5) The following equation and the values in Table G.3 determine the minimum airflow rate:

Figure: 30 TAC §217.182(n)(5)

$$MAFR = \frac{(R_A) \times (L) \times (P_F)}{1440 \text{min}/day}$$

Equation G.2.

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)

(o) Maintenance.

(1) Cleaning and Sloughing.

(A) A flow distribution device, an underdrain, a channel, and a pipe must allow maintenance, flushing, and drainage.

(B) A trickling 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 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.

(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 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 minimize areas where sludge may accumulate. 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 design must minimize corrosion and use corrosion-resistant materials for all equipment and 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 a filter and the recirculation flow.

(q) Odor Control. A trickling filter system must use ventilation 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 with a history of odor complaints to install a cover over a new, expanded or materially altered trickling filter.

(B) A cover must allow access to the entire top of the 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 high influent organic loading must have forced ventilation in a down-flow mode to minimize odor. Odorous off-gases may be:

(A) recycled through a trickling filter;

(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 with a trickling filter must allow for the required effluent total suspended solids removal at the maximum influent flow and the maximum recirculation with all pumps in operation.

(s) Report Requirements.

(1) The report must specify the 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 treatment efficiency, kinetic coefficients, and other design parameters.

(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. Minimum design airflow rate must provide the 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 while providing a design hydraulic dosing intensity that lessens the effects of temperature on removal efficiency.

(c) pH. The report must verify that the design recirculation rates are appropriate for dealing with the effects 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.

(1) Design Justification. The report must include process design calculations and selection criteria of kinetic coefficients for a tertiary nitrifying filter and must be justified by operating data from any existing trickling filter of similar construction and operation.

(2) Media biotowers. A tertiary nitrifying 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 nitrifying filter must use either:

(A) tower ≤20 feet; or

(B) a series of towers less than 20 feet operating in series if the design includes provisions to readily switch the operating sequence of the filters.

(h) Combined BOD_5 and Nitrification Filters. A trickling filter intended to perform nitrification and treating influent having a BOD_5 to TKN ratio of ≥ 1.0 or soluble BOD_5 of ≥ 12 mg/l is a combined BOD_5/nitrification filter.

(1) Design Justification. The report must justify the projected treatment efficiency and other design parameters 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 ≤ 15 mg/l. The design must not take credit for nitrification in sections of the filter having soluble BOD_5 of ≥ 20 mg/l.

(3) Recirculation. A combined 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 one of the following:

(1) Activated Biological Filter (ABF) System. An ABF 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 may include a sludge re-aeration basin.

(3) Roughing Filter/Activated Sludge (RF/AS) System. A 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. A 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 system must be designed in an integrated process that includes the effluent quality from the first stage in determining the design basis of the second stage.

(2) A design 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 treatment process design in which activated sludge is recycled to first-stage trickling filters, the design must not include the reduction of oxygen demand to the second-stage aeration basin because of sludge recirculation to the trickling filters.

(4) A design 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:

(1) Pretreatment. Pretreatment of a dual system must conform to requirements for a first-stage process.

(2) Snail Control. A dual system must include a low-velocity channel between the first stage and second stage treatment units for control of snails.

(3) Return sludge.

(A) A dual system that includes recirculation of activated sludge or sloughing to trickling filters must prevent recirculation of pieces larger than will pass through the distributor nozzles or the filter media voids.

(B) The trickling filters in a dual system that recirculates sludge to the trickling filters must be high-rate, vertical flow, and fully corrugated media.

(C) Sludge must be incorporated into 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 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;

(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 processes must 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 system must maintain a total combined mean cell residence time in the attached and suspended growth systems of at 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 dual treatment 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.

§217.185. Rotating Biological Contactors.

(a) Pretreatment.

(1) Pretreatment to remove grit, debris, and excess oil and grease must precede an rotating biological contractor (RBC) unit.

(2) A design may require primary clarifiers, fine screens, or grit removal chambers to control high levels of grease, oil, grit, or other debris in the influent waste stream.

(3) 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 provide appropriate levels of ventilation.

(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 for the first stage.

(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) provision for step feed and supplemental aeration.

(e) Tank Configuration. A design must ensure that 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.

(f) Control of Unwanted Growth in the Initial Stages. Chlorine may be added upstream of an RBC system to control the growth of *beggiatoa*.

(g) Maintenance Provisions.

(1) An RBC system designed for 1.0 million gallons per day (mgd) or greater must have two or more process trains consisting of three or more stages in series in each process train.

(2) Each process train must be capable of being removed from service when maintenance or cleaning is required.

(h) Bearing Maintenance. An RBC system's bearings must be easily accessible for inspection and lubrication.

(i) Organic Loading Design Requirements.

(1) A design must be based on the organic loading for an RBC system on total five-day biochemical oxygen demand (BOD_5) in the waste.

(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) A design must require the RBC media area 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 facilities required to meet secondary treatment; or

(B) 2.0 lbs of BOD_5 per day per 1,000 sf for a facility required to meet advanced secondary treatment.

(j) Hydraulic Loading Design Requirements. An RBC system must include flow equalization when the peak-to-design flow ratio is higher than 2.5 to 1.0 to prevent loss of fixed growth from the media.

(k) Stages.

(1) An RBC system designed for a BOD_5 removal unit must have at least three stages in series, unless the report justifies a lesser number using operational data from either a full-scale operating 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 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.

(A) A mechanical drive must have a motor and speed control unit capable of maintaining the required revolutions per minute.

(B) A fully assembled spare for each size mechanical drive unit must be on-site.

(2) Air Drive.

(A) Each RBC unit 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) each RBC unit;

(ii) double the airflow rate to any one 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 unit must:

(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 during the maximum organic loading rate.

(2) The executive director may require supplemental aeration.

§217.186. Nitrifying Rotating Biological Contactors.

(a) A rotating biological 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/day/1,000 square feet of media.

(b) A nitrifying RBC must be designed to allow chemical addition if the influent pH is below 7.0.

(c) The report must justify the nitrification rate of a system.

(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 contactors (RBC) unit may be used in conjunction with other systems.

(b) An RBC system may be used as a "roughing" unit in series with an activated sludge system as described in §217.183 of this title (relating to Nitrifying Trickling Filters--Additional Requirements).

(c) The report must include supporting data, calculations, process descriptions, and vendor information to describe how a proposed 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.

(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 for rotation of the unit and one to provide dissolved oxygen for the biological activity.

(2) The submerged bearings must be sealed to prevent intrusion of the wastewater.

(c) If 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 systems.

(b) An SBC system may be used as a roughing unit 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 fixed and suspended growth process.

(d) If a dual system employs an SBC unit, the report must include supporting data, calculations, process descriptions, and vendor information to describe how the proposed 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 with tertiary effluent limitations must use filtration as a unit of operation to supplement suspended solids removal.

(2) Specific Water Quality Requirements. At facility with secondary or advanced secondary effluent limitations may use filtration as a unit of operation to supplement suspended biological

floc removal and intermittent filter operation if filters are not necessary to meet permitted effluent limitations.

(b) Redundancy.

(1) A facility using filtration to provide tertiary treatment for a permit requirement must have a minimum of two filter units.

(2) A design must specify the required filter surface area based on peak flow through the filters with the largest filter unit out of service.

(3) If a filter is being provided to polish wastewater for situations where permit compliance does not depend on the use of a filter, such as some cases of reclaimed water usage, one filter is allowed.

(c) Source of Backwash Water. A filtration system must use filtered effluent as the source of backwash water.

(d) Disposition of Backwash Water. A filtration system must return backwash water containing material cleaned from a filter to the head of the 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 a filter is backwashed to the headworks of the facility.

(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.

§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 filtration unit must not exceed twice the design application rate.

(1) Single Media.

(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. The design filtration rate for a dual media (anthracite and sand) filter must not exceed 4.0 gpm/sf of media surface.

(3) Mixed Media. 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 filter underdrain system must include a graded gravel layer with a minimum depth of 15 inches, or other filter media support material unless a filter media other than gravel is justified in the report.

(2) Uniformity coefficient of media used in a filter must be 1.7 or less.

(3) 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.

(4) Media depths for the various 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	1.0-4.0	16 total
	Anthracite	*1.0-2.0*	*10*
	Sand	*0.5-1.0*	*6*
Mixed Media	Anthracite, Sand & Other	1.0-4.0	16 total
	Anthracite	*1.0-2.0*	*10*
	Sand	*0.6-0.8*	*4*
	Garnet or Similar Material	*0.3-0.6*	*2*

(c) Backwash Systems.

(1) Flowrate and Media Expansion.

(A) A backwash system must allow a media expansion of at least 20%.

(B) A single media filter must provide a minimum backwash flowrate of 6.0 gpm/sf of media area.

(C) A dual and mixed media 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 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.

(C) A design 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.

(D) An enclosed backwash tank must be vented.

(3) Pumps.

(A) Pumps for backwashing filter units must deliver the required rate with the largest pump out of service.

(B) A backup pump must be available on-site.

(C) A valve arrangement for isolating a 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.

(A) A single media filter system must include an air scour system or combination air and water scour system in addition to an up-flow backwash water system.

(B) A dual or mixed media filter system must include either a surface air or water scour system.

(C) Air scour system flowrates must be at least 3.0 standard cubic feet per minute per square foot of media surface area but not more than 5.0 scfm/sf of media surface area.

(D) Water scour system flowrates 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 headloss.

(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 trough must have a minimum freeboard of 3.0 inches during the maximum backwash flowrate.

(f) Controls.

(1) The filter operation controls may be manual or automatic.

(2) Control indicators must be visible to a facility operator while adjusting the controls.

(3) An automatically controlled system must include a manual override system.

(4) Each filter unit must have a head loss indicator.

§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 unit must not exceed twice the design application rate

(2) The report must include manufacturer's recommended filtration rates with test data.

(3) Single Media. A single media 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 filter must have a maximum design filtration rate of 4.0 gallons per minute per square foot of media surface.

(b) Media Design. Media sizes and depths must correspond to the values in the following figure, unless the report justifies different media sizes 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	0.55-0.65	16
	Anthracite	*1.0-2.0*	*10*
	Sand	*0.5-1.0*	*6*

(c) Backwash System.

(1) A backwash system must provide a minimum 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 expand the media a minimum of 20% unless the report includes the manufacturer's recommended backwash rates with test data.

(3) The surge control and pumping system requirements must be the same as those detailed in §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.

(e) Floating Material Control. A filter system must provide for automatic and regular removal of any floating material from the surface of a filter and return the floating material to the head of the facility for further processing.

§217.193. Alternative Designs for Effluent Polishing.

The executive director shall review 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).

SUBCHAPTER H: NATURAL TREATMENT FACILITIES

§§217.201 - 217.213

STATUTORY AUTHORITY

The new rules are adopted under the authority of Texas Water Code (TWC), §5.013, which provides the commission's general jurisdiction; §5.103, which provides the commission's authority to adopt any rules necessary to carry out its powers and duties under the laws of Texas; §5.105, which provides the commission's authority to, by rule, establish and approve general policy of the commission; §5.120, which provides the commission's authority to administer the law to promote conservation and protection of the quality of the environment; §26.027, which authorizes the commission to issue permits; §26.034, which provides the commission's authority to adopt rules for the approval of disposal system plans; and §26.121, which provides the commission's authority to prohibit unauthorized discharges.

The adopted new rules implement TWC, §§5.013, 5.103, 5.105, 5.120, 26.027, 26.034, and 26.121.

§217.201. Applicability.

This subchapter establishes the minimum design requirements for Imhoff tanks, constructed wetlands, facultative lagoons, aerated and partially aerated lagoons, stabilization lagoons, treated effluent storage lagoons, evaporative lagoon systems, and overland flow processes.

§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.

(c) A treated effluent storage lagoon downstream of the permit sampling location is not considered a treatment unit for the purposes of this chapter.

(d) A secondary treatment unit must be preceded by a primary unit.

§217.203. Design Criteria for Natural Treatment Facilities.

(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 ensure even 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) If 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 exempted in paragraphs (4) and (5) of this subsection, a constructed wetland, facultative lagoon, earthen aerated lagoon, partially-aerated lagoon, stabilization lagoon, and treated effluent storage lagoon must be constructed with a liner material with a minimum coefficient of permeability of $1x10^{-7}$ centimeters per second (cm/sec) with a thickness of 2.0 feet for water depths less than or equal to 8.0 feet and a thickness of 3.0 feet at water depths greater than 8.0 feet.

(2) A liner must extend from the lowest lagoon elevation or lowest constructed wetland elevation up to an elevation of 2.0 feet above normal water elevation in a lagoon or constructed wetland.

(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).

(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. The report must include the results of any test required in this subsection.

(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 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 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

(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 $1x10^{-7}$ 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.

(D) Each of the permeability tests must verify that the coefficient of permeability is equal to or less than $1x10^{-7}$ 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.

(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 a minimum of 10.0 feet.

(2) The report must justify all inner and outer embankment slope steeper than 1.0 foot vertical to 4.0 feet horizontal from the top of 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 planting grass, paving, riprapping, or other method approved by the executive director.

(5) All embankments must have a minimum cover of 6.0 inches of topsoil if vegetated.

(f) Disinfection. Chemical or ultraviolet disinfection is not required if a detention time of at least 21 days is provided in the entire, free-water surface, natural treatment unit, in accordance with §309.3(g) of this title (relating to Disinfection).

(g) Sampling Point Significance.

(1) Sizing or design of any treatment unit upstream of the permitted sampling point must not be based on any 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) Storm Water Drainage. A natural treatment system must be constructed to prevent storm water from draining into the system.

§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 at least 8.0 inches wide provided between the walls to allow solids to be dispersed into a digestion compartment.

(4) The maximum depth between the normal water level and the plane of a slot is 9.0 feet.

(5) The minimum freeboard above the normal water level is 18 inches.

(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 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 a tank must include scum baffles with a height that meet the water levels at all flows from minimum flow to peak flow.

(d) Gas Vents.

(1) An Imhoff tank must include gas vents with a total area not less than 20% of the total tank surface area.

(2) The width of at least one vent opening must allow maintenance access into a digestion compartment.

(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.

(f) Imhoff Tank Dimensions. The total depth of an Imhoff tank must not be less than 15 feet from the water surface at design flow to the bottom of a digestion compartment, not including the first 18 inches of tank depth below the plane of a slot for design digestion volume.

(g) Sludge Removal.

(1) An Imhoff tank must have a sludge withdrawal pipe in a digestion compartment.

(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.

(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.

(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 must cover at least 25% of the area of a lagoon bottom.

(3) The remainder of a facultative lagoon must have a minimum depth of 8 feet.

(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 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 water surface and not disturb the anaerobic zone.

(3) A facultative lagoon must allow for recirculation from at least 50% to not more than 100% of the design flow.

(4) A facultative lagoon design must prevent siphoning of lagoon contents through a submerged inlet.

(e) Removal efficiency. The design of a facultative lagoon may be based on no more than 50% efficient removal of the influent BOD_5.

§217.206. Aerated Lagoons.

(a) The requirements of this section apply to both completely mixed lagoons and partially mixed 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) 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.

(d) The aeration equipment must have an alarm that will provide sufficient notification to ensure timely repair to prevent a permit violation. If a facility is not staffed 24 hours per day, the alarm system must be connected to a telemetry system with battery backup.

(e) The BOD_5 removal in each lagoon must be calculated using the following equation:

Figure: 30 TAC §217.206(e)

Equation H.1.

$$E = \frac{1}{1 + K(\frac{V}{Q})}$$

Where:

E = % BOD_5 removal in aerated lagoon

K = first order removal rate constant, day^{-1}

V = aeration basin volume, million gallons

Q = 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 a partially mixed lagoon is 0.28 day^{-1} at 20 degrees Celsius.

(2) The value of K may be adjusted for the minimum monthly water temperature using the following equation:

Figure: 30 TAC §217.206(e)(2)

Equation H.2.

$$K_T = K_{20} \times 1.06^{T-20°C}$$

Where:

K_T = the lowest average water temperature during any 30-day period.

K_{20} = K value at 20°C

T = lowest average water temperature (°C) expected during any 30-day period

(3) The value of K may be determined for high-strength or industrial wastewater by either a laboratory study or evaluation of an existing facility treating similar wastewater.

(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).

(3) If multiple partially mixed aerated lagoons are used in series, the power input may be reduced as the influent BOD_5 to each lagoon decreases.

(g) Aerated Lagoon Design Requirements. An aerated lagoon system must be designed 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).

(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.

(1) A stabilization lagoon must be located so that the local prevailing winds will be toward a less populated area.

(2) If uncontaminated water is available, a stabilization lagoon must be pre-filled 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 reduce potential odor.

(c) Minimum Number of Wastewater Stabilization Lagoons. A minimum of two stabilization lagoons 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) Lagoon Design.

(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 allow for raising and lowering water level 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.

(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.

(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's design flow.

(2) The inlet and outlet structures must be sized to transport the volume of water found in the top 6.0 inches of a lagoon during normal operating depths per day at the available head.

(3) A pipe and recirculation system must allow a stabilization lagoon system to comply with the facility's permitted effluent limitation with any one lagoon of service.

(f) Maximum Surface Organic Loading Rate for Stabilization Lagoons.

(1) The maximum surface organic loading rate on the stabilization lagoon series is 35 pounds (lbs) of five-day biochemical oxygen demand (BOD_5) per acre per day.

(2) The maximum surface organic loading rate on the first lagoon in a stabilization lagoon series is 75 lbs of BOD_5 per acre per day.

(3) The surface organic loading rate applied to 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 lagoon surface to control the discharge of algae.

(3) A multipurpose control structure may be used to facilitate a normal operational function such as drawdown, flow distribution, flow depth, measurement, sampling, pump for recirculation and chemical addition; and to minimize the number of construction sites in a lagoon.

(4) A pipe embankment penetration must have a seep water-stop collar.

(5) A stabilization lagoon must have a drainpipe to allow emptying for maintenance and may use a pump as part of a drainage system. If not permanently installed, a temporary pipe suction station must be provided.

§217.208. Evaporative Lagoons.

(a) Design.

(1) If evaporative lagoons are used, a facility must have a minimum of two lagoons.

(2) The primary evaporative lagoon must provide at least 60% of the total surface area of an evaporative lagoon system.

(3) The number and size of evaporative lagoons must provide adequate evaporation for design flow during periods of low evaporation.

(b) Odor Management. An evaporative lagoon must be located so that the local prevailing winds will be toward a less populated area.

(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.

(d) 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 dependant on its location within the lagoon system.

(A) The maximum operating depth for a primary lagoon is 5.0 feet, but the area around an inlet must be designed 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 lagoon is 8.0 feet.

(3) Evaporation and Organic Loading.

(A) An evaporation 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 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.

(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.

(e) 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) 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 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, at least 8.0 inches thick, and resistant to the corrosive effects of a wastewater environment.

(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 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 a free water surface system or subsurface flow system.

(b) Natural Wetlands. The use of natural wetlands for wastewater treatment is prohibited.

(c) Design.

(1) A constructed wetland must be preceded by primary treatment and may be preceded by secondary treatment.

(2) A primary treatment system 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 minimize anaerobic conditions and stress on vegetative communities in any subsequent wetland treatment unit.

(4) A treatment facility that 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 be met with any one wetland cell 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 may have the following flora:

(1) Emergent plants including:

(A) Scirpus spp. (bulrush);

(B) Sagittaria spp. (arrowhead);

(C) Phragmites spp. (reeds);

(D) Juncus spp. (rushes);

(E) Elecharis spp. (spikerush);

(F) Cyperus spp. (sedges);

(G) Typha spp. (cattails);

(H) Caladium spp. (elephant ear); or

(I) various aquatic grass species (e.g., wild rice).

(2) Floating plants 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 plant species.

(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 in the design.

(4) Plans for harvesting aquatic plants from 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; Renewal; Amendment; Reporting and Recordkeeping; and Prohibited Acts, respectively).

(e) Maintenance activity must not result in a deterioration of water quality.

(1) All herbicides, insecticides, and fertilizers are prohibited in a constructed wetland.

(2) Floating Material Removal.

(A) A constructed wetland must allow the removal of an algal mat or other floating material prior to the effluent entering the wetlands.

(B) A removal mechanism may be a screen, a submerged adjustable inlet, a baffle, or another suitable method. The removal mechanism must be justified in the report.

(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 operation and maintenance manual for a facility that has a constructed wetland must include detailed description and schedule for maintaining the constructed wetlands.

(f) A wetlands system 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 wetland system must comply with the requirements of §217.203(c) of this title (relating to Design Criteria for Natural Treatment Facilities).

(2) A minimum 6.0 inch layer of productive topsoil must be placed above a liner to encourage root penetration.

(h) Berms.

(1) A berm of a constructed wetland must 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;

(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 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 subject to §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, an advanced secondary treatment unit, or for polishing wastewater effluent, but not for primary treatment.

§217.210. Constructed Wetlands--Free Water System (FWS) Design.

(a) A Free Water System (FWS) wetland must be based on a maximum water depth 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.

(c) Multiple Cells. An FWS wetland must include multiple cells that may be operated independently, allowing an individual cell to be removed from service while maintaining system operations.

(d) System Size. An FWS wetland must be sized to meet permit effluent limits with any single cell removed from service.

(e) Bottom slope.

(1) A FWS wetland cell must have adequate bottom slope or other means such as strategically placed deep-water zones to facilitate drainage for maintenance.

(2) A design must require that a bottom slope maintain an appropriate range of wetland water depths 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 be oriented to avoid prevailing winds perpendicular to the process flow direction or use elevated berms or vegetative windbreaks.

(h) Inlets and Outlets.

(1) The inlets and outlets of an FWS wetland cell must assure uniform distribution of influent flow and uniform collection of effluent flow across the entire cell cross section.

(2) Inlet and outlet devices must minimize erosion of wetland substrate from locally high velocity effluent flow.

(3) Each inlet and outlet device must be adjustable to allow variations in operational water level.

(4) Submergence. An inlet must be submerged under normal operational conditions.

(5) Inspection and Cleaning. A design must allow inspection and cleaning of inlet and outlet devices.

(i) Organic Loading and Treatment Efficiency.

(1) Constructed wetland process design may be based on organic loading design for typical municipal wastewater primary or secondary effluent, whichever is the influent for the constructed wetland.

(2) A design must be based on the organic removal treatment efficiency for FWS wetlands on the areal 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.

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° C for BOD_5)

a is required wetland area, hectacre (ha) (1,000 m/yr @ 20° 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:

(A) using mosquito fish (Gambusia) and other natural predators,

(B) maintaining aerobic conditions, or

(C) using other biological controls.

(2) A design must minimize the potential 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 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 an SFS wetland.

(c) Seasonal draw down of the water level must be performed to encourage deeper root penetration into the wetted media.

(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 cell must meet permit effluent limitations with any single cell removed from service.

(3) Hydraulic profile.

(A) An SFS wetland must maintain minimum 6.0 inches of dry media cover at design flow, 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.

(B) An SFS wetland hydraulic profile must be based on the following figure, unless the report justifies an alternate design method, includes the source of the method, and all supporting calculations and documentation.

Figure 1: 30 TAC §217.211(e)(3)(B)

Equation H.4. Darcy's Law.

$$Q = K_s \times A \times S$$

Where:

Q = Design flow (gallons/day)

K_S = 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

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.

(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 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. A constructed wetland must have effective flow distribution and collection to efficiently treat wastewater. An SFS wetland must include the following minimum flow distribution standards:

(1) Flow distribution.

(A) The inlet and outlet system of an SFS wetland cell must assure uniform distribution of influent flow and uniform collection of effluent flow across an entire cell.

(B) The inlet and outlet devices must not cause locally high velocities to avoid the 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 an SFS wetland must be below the media surface.

(3) Maintenance. The design of an inlet and outlet device must allow inspection and cleaning.

(4) Staged influent feed. If a high influent BOD_5 load is anticipated, the design must allow for staged influent fee to improve process control.

(g) SFS Organic Loading and Treatment Efficiency.

(1) A constructed wetland process may be based on organic loading design for typical municipal wastewater primary or secondary effluent.

(2) A design 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 and all supporting calculations.

Figure: 30 TAC §217.211(g)(2)

Equation H.5.

$$C_0 = C^* + (C_i - C^*)\exp^{-\frac{Ka}{0.0365Q}}$$

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° C for BOD_5)

a = is required wetland area, ha (3,000 m/yr @ 20° C for TSS)

(active treatment area, not including dike, buffers, etc.)

Q = design flow in m^3/d

(h) Temperature. 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 mosquito breeding opportunities.

(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) Media must be resistant to acidic conditions.

(5) Synthetic media is nonconforming or innovative technology and is subject to §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 wetland's hydraulic conductivity.

(7) The media must be placed in an SFS wetland by light equipment to avoid introduction of clay or other undesirable materials, to avoid compaction, and to avoid creating ruts in the subgrade.

(8) If an SFS wetland has gravel media larger than 1.5 inch diameter, the design must specify a top layer of small gravel to encourage healthy plant rooting. The 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.

An overland flow process is a nonconforming technology and subject to the requirements of §217.7(b)(2) of this title (relating to Types of Plans and Specifications Approvals).

§217.213. Integrated Facultative Lagoons.

(a) Nonconforming technology. An integrated facultative lagoon is nonconforming technology and is subject to review in accordance with §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 0.40 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 sludge storage for a minimum of 20-years ; and

(B) a two-day hydraulic retention time above the sludge storage area.

(5) The maximum up-flow velocity in the pit is 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 equivalent to the size of a pit.

(7) An inlet must be located in the pit portion of a lagoon.

(8) An outlet must be able to maintain the water level within 1.0 foot of a constant level.

(9) A design must locate an integrated facultative lagoon in a central location with regard to the surrounding secondary lagoons and meet the buffer zone requirements specified in §309.13 of this title (relating to Unsuitable Site Characteristics).

(10) Depth.

(A) The depth of an inlet pit must not be less than 15 feet deep from the water surface elevation during normal operating conditions to the 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.

(D) The minimum distance from the water surface elevation during normal operating conditions to the top of the berm around a pit is 5.0 feet.

(11) Organic Loading. The maximum organic loading into a pit is 300 pounds of ultimate five-day biochemical oxygen demand (BOD_5) per acre of total lagoon area per day.

(12) Odor Control.

(A) An inlet to a pit must be 3.0 feet above the bottom of a lagoon and the flow must be directed downward.

(B) A design must allow 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 not siphon lagoon contents through a submerged inlet.

(13) Removal Efficiency.

(A) A design may be based on the removal efficiency of the pit of an integrated facultative lagoon no more than 60% of the influent BOD_5.

(B) A design may be based on subsequent removal efficiency of BOD_5 in the outer portion of the integrated facultative lagoon no more than 50% of the remaining BOD_5, which is 20% of the original BOD_5.

(14) Detention Time. An integrated facultative lagoon must provide a minimum of 21 days hydraulic retention time.

SUBCHAPTER J: SLUDGE TREATMENT UNITS

§§217.241 - 217.252

STATUTORY AUTHORITY

The new rules are adopted under the authority of Texas Water Code (TWC), §5.013, which provides the commission's general jurisdiction; §5.103, which provides the commission's authority to adopt any rules necessary to carry out its powers and duties under the laws of Texas; §5.105, which provides the commission's authority to, by rule, establish and approve general policy of the commission; §5.120, which provides the commission's authority to administer the law to promote conservation and protection of the quality of the environment; §26.027, which authorizes the commission to issue permits; §26.034, which provides the commission's authority to adopt rules for the approval of disposal system plans; §26.121, which provides the commission's authority to prohibit unauthorized discharges; and Texas Health and Safety Code (THSC), §361.022, which provides the state's public policy concerning municipal solid waste and sludge.

The adopted new rules implement TWC, §§5.013, 5.103, 5.105, 5.120, 26.027, 26.034, 26.121 and THSC, §361.022.

§217.241. General Requirements.

(a) For purposes of this section, the sludge 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 that disposes of sludge under Chapter 312 of this title (relating to Sludge Use, Disposal, and Transportation) must stabilize the sludge.

(d) A 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.

(a) Supernatant, filtrate, or centrate resulting from sludge processing must be returned to the headworks or at 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 practical.

(c) A sludge processing unit must 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 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.

(d) The slope of a gravity discharge pipe must not be less than 3.0%.

(e) The minimum diameter for 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

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 digester or gravity thickener	6.0 inches

(f) The available head on a discharge using gravity withdrawal pipe must be at least 4.0 feet.

(g) A gravity pipe used for withdrawal from the primary sludge clarifier pump must allow for 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) 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.

§217.244. Sludge Pumps.

(a) A sludge transfer pump size must be based on the quantity and character of the anticipated solids load.

(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.

(d) A centrifugal sludge pump must have a positive suction head, unless the pump includes a priming device.

(e) A positive displacement pump or other type of pump 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.

(g) A positive suction head of 24 inches or more is required for all sludge pumps.

§217.245. Exclusion of Grit and Grease from Sludge Treatment Units.

(a) A facility design must minimize the amount grit, debris, oil, and grease entering a sludge treatment unit.

(b) A sludge 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 treatment unit must remove screenings, 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 might be a health hazard or a threaten air quality.

(b) An enclosed area that may be accessed by staff must have automatic mechanical ventilation.

(1) A continuous ventilation system must provide at least six complete air exchanges per hour.

(2) An intermittent ventilation system must provide at least 30 complete air exchanges per hour.

(c) A sludge processing unit must be designed to prevent nuisance odors.

§217.247. Chemical Pretreatment of Sludge.

(a) A chemical used to treat sludge must be compatible with the operation of the treatment unit and must 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 with characteristics such as organic levels, metal concentrations, and hydraulics that are within 25% of the proposed design.

(c) Each chemical must be stored safely.

(d) A liquid chemical storage tank must include:

(1) a liquid level indicator; and

(2) an overflow receiving basin or drain capable 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 or conditions may occur must have electrical outlets, lights, and motors that meet National Electric Code, including explosion prevention requirements.

(g) Transport, transfer, storage, and use of any volatile chemical must prevent discharge to the atmosphere.

(h) A 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.

(j) The procedures for measuring the quantity of each chemical used to prepare each feed solution must be included in the facility's operation and maintenance manual.

(k) The design of a storage tank, pipe, or other equipment must be compatible with the chemical it is designed to handle.

(l) Intermixing of chemicals prior to preparing a feed solution is prohibited.

(m) Concentrated liquid acid must not be stored in an open vessel, but must be pumped in undiluted form from the original container to a point of treatment, a covered day tank, or 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 a positive actuating device.

(p) A facility must be designed with one or more of the following control methods to ensure that a transfer of a dry chemical will minimize dust:

(1) Vacuum pneumatic equipment of a closed conveyor system;

(2) A facility for emptying shipping containers in a special enclosure; or

(3) An exhaust fan and dust filter that put a hopper or bin under negative pressure sufficient to eliminate chemical particles in the air.

(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) 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 chemical feed equipment must provide access for servicing, repair, and observation of operations.

(2) Redundancy. A feed system must have at least two feeders and must be able to supply the amount of chemicals needed for process reliability throughout the range of feed. 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 feed system must be able to deliver a proportional amount of chemical feed based on the rate of flow.

(B) A 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 water 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 feed system component must be resistant to the chemical it is designed to apply.

(E) A dry chemical 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 feed equipment must have protective curbing to contain a chemical spill.

(5) Control Systems.

(A) All feed systems must have an automatic control system that is capable of manual control.

(B) A feed system must have manual starting equipment.

(C) A 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) Feed System Protection. A 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.

(B) A feed system must protect its water supply from contamination.

(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 design may include a booster pump to maintain water pressure.

(9) Solution Tanks.

(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 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;

(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 overflow pipe must:

(i) be turned downward;

(ii) have an unobstructed discharge;

(iii) be clearly visible;

(iv) drain to a containment area; and

(v) must not contaminate the wastewater or receiving stream.

(10) Chemical Application.

(A) A chemical application system 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 thickener(s) is used, 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.

(2) Flexibility.

(A) A sludge thickening system must have a bypass.

(B) A facility with a design flow greater than 1.0 million gallons per day (mgd) must have:

(i) at least dual sludge thickening units;

(ii) an alternate means of thickening; or

(iii) an alternate disposal method.

(b) Specific Requirements for a Mechanical Gravity Thickener.

(1) Equipment Features.

(A) A mechanical gravity thickener must have:

(i) a low-speed stirring mechanism for continuous mixing and flocculation within the zone of sludge concentration;

(ii) sludge storage, if sufficient storage is unavailable in other external tankage; and

(iii) a means of controlling the rate of sludge withdrawal.

(B) A mechanical 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) A mechanical thickener design must be justified in the report.

(B) The executive director may require data from a pilot study or similar sludge thickening unit operating under similar conditions.

(C) The thickener overflow rate must be at least 400 gallons per day per square foot (gpd/sf) but no more than 800 gpd/sf.

(D) The minimum side water depth for a mechanical thickener is 10 feet.

(E) A circular 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 thickener design must minimize the potential for short-circuiting.

(c) Dissolved Air Flotation (DAF) Thickener.

(1) Equipment Features.

(A) A DAF basin must have a bottom scraper that 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. 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) A DAF basin design must be justified in the report.

(B) The executive director may require data from a pilot study or similar DAF operating under similar conditions.

(C) The hydraulic loading rate must not exceed 2.0 gallons per minute (gpm) per square foot (sf).

(D) The solids loading rate must be at least 1.0 pound but not more than 4.0 pounds per hour per 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.

(d) Centrifugal Thickener.

(1) A centrifugal thickener design must be justified in the report.

(2) The executive director may require data from a pilot study or 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 §217.242 of this title (relating to Control of Sludge and Supernatant Volumes).

(e) Specific Requirements for Gravity Belt Thickeners.

(1) Equipment Features.

(A) Gravity belt thickeners must include a wash water system (60 pounds per square inch minimum) capable of providing 60 gpm per meter of belt width belt. Booster pumps may be employed to achieve design conditions.

(B) Gravity belt thickeners must include a polymer feed system that meets the requirements of §217.247 of this title.

(C) A filtrate drainage system must be sized to remove the full hydraulic capacity of a gravity belt thickener without accumulation or ponding.

(2) Design Basis. Gravity belt thickener sizing must be based upon the following criteria, unless otherwise justified in the report:

(A) maximum solids loading of 1,250 pounds per meter of belt width; or

(B) maximum hydraulic loading 250 gpm per meter of belt width.

(3) Gravity belt thickener filtrate is subject to the requirement in §217.242 of this title.

§217.249. Sludge Stabilization.

(a) Design Requirements. The design requirements for the stabilization processes in this section are based on the assumption that the process is the sole stabilization process employed at the facility.

(b) Variance. An owner must request a variance in accordance with §217.4 of this title (relating to Variances), if a design employs a series of two or more stabilization processes or methods.

(c) Anaerobic Digestion.

(1) A facility with a design flow exceeding 0.4 million gallons per day must have at least two anaerobic digesters.

(2) Each digester may be used as a first stage or primary reactor for treating primary and secondary sludge flows.

(3) Each digester must have a means for transferring a portion of its contents to another digester.

(4) A facility that has been granted a variance to operate without multiple digesters must have an emergency storage basin so the digester 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 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.

(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 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:

(1) multiple sludge inlets located to minimize short-circuiting and at least one inlet located in the center of a 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 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;

(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 able maintain a minimum daily average sludge digestion temperature of 35 degrees Celsius (95 degrees Fahrenheit) and maintain the temperature within a 4 degrees Celsius (+/-) range.

(4) The minimum detention time for sludge undergoing digestion for stabilization is 15 days in the primary digester 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), 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), 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 tank over 60 feet in diameter must have multiple mixing devices.

(D) The minimum gas flow supplied for complete mixing must be 15 cubic feet per minute (cfm) per 1,000 cf 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 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 of volatile solids per 1,000 cf 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.

(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 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.

(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 float controlled condensate trap is 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.

(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 pipe 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.

(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 digesters 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) A system must have a gas meter to measure total gas production.

(2) A meter must have a bypass.

(o) Manometer.

(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 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) pressure to waste burners.

(q) Digestion Temperature Control.

(1) Passive Temperature Control.

(A) A digester must be constructed above the shallowest ground water table.

(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.

(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.

(B) A digester system must be designed to use an alternate source of fuel and 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.

(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 system must have a positive, unvalved, vented overflow.

(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.

(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 facility for treatment or chemically treated before being returned to the facility for treatment. Any other method of treating supernatant liquor must be approved by the executive director.

(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 a batch or a continuous process.

(i) A batch process may have the mixing and settling processes in the same tank.

(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 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.

(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.

(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 the average of the lowest consecutive seven-day low temperature at a similar wastewater treatment facility located within 50 miles of a proposed site must be used.

(3) Mass Balance Requirements. Mass balance calculations must be included in report. The mass balance calculations must take into account design sludge age, wastestream concentration, operational hours, operational volume in 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 and 40 Code of Federal Regulations Part 503.

(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:

Figure: 30 TAC §217.249(t)(4)(B)

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 reactors operating in series.

(6) Field Data.

(A) Any increase in flow or organic loading or change in process requires new testing and verification of time and temperature operating parameters.

(B) An expansion of an existing facility may be designed and operated according to previously established time and temperature operating parameters.

(C) The executive director may re-rate a facility under Subchapter B of this chapter (relating to 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) supporting data is submitted in the report to increase the solids concentration to 3.0%; or

(iii) 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.

(C) A diffuser must be designed to permit its removal without dewatering a tank for inspection, maintenance, and replacement.

(D) The volatile solids loading rate must be designed to be at least 100 lb but not more than 200 lb of volatile solids per 1,000 cf per day, unless otherwise justified in the report.

(E) The dissolved oxygen concentration maintained in the liquid must be at least 0.5 mg/l.

(F) The energy input for mixing must be at least 0.5 horsepower per 1,000 cf for mechanical aerators.

(G) The energy input for mixing must be at least 20 standard cf per minute per 1,000 cf per 1,000 cf of aeration tank if diffused air mixing is used.

(H) A unit must be designed for effective separation and withdrawal, or decanting of the supernatant.

(u) Heat Stabilization.

(1) The design of a heat treatment system must be based on the anticipated sludge flow, characteristics, and 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, fuel pump, air compressor, 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.

(6) The report must include a design for adequate storage for process feed and downtime.

(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 (psig) but not more than 400 lbs/psig; or

(B) provide for pasteurization at temperatures of 30 degrees Celsius (85 degrees Fahrenheit) or more and gage 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.

(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 heat treatment.

(2) A recycle stream must not impact effluent quality or the 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 pilot test program or from a comparable 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 standby conveyance and mixer, backup heat source, and dual blowers.

(C) A design must include:

(i) the expected downtime for maintenance and repair based on data from a comparable 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(u)(1) of this title (relating to Chemical Pretreatment of Sludge).

(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(u)(1) of this title.

(B) Hydrated lime must be fed as 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 maximum feed rate.

(B) A batch process must maintain a pH greater than 12 su in a mixing tank during the blending period.

(C) A continuous flow process must maintain a pH greater than 12 su 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.

(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 of tank volume.

(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.

(ii) The impellers must minimize debris fouling in the sludge.

(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.

(A) The drainage from beds and centrate or filtrate from dewatering units must be returned to the head of the 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 threatens water quality or compliance with the associated wastewater permit.

(3) Redundancy.

(A) A mechanical dewatering system must have at least two 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 able to dewater the average daily sludge flow with the largest 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 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.

(6) Maintenance. Each dewatering system unit must have a bypass to allow for maintenance, repair, and replacement.

(d) Sludge Conditioning.

(1) 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.

(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 may be smaller than the design volume required for daily dosage if the equipment is not in continuous operation.

(8) 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.

(10) The report must justify any storage volume reduction and any other method used to ensure a continuous supply of chemicals through an operating day or batch.

(e) Sludge Drying Beds.

(1) The sludge drying beds size must be based on data from a similar facility in the same geographical area with the same influent sludge characteristics.

(2) If such data is unavailable, or if the executive director determines that the data is not appropriate for a proposed 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 beds.

(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 annual average relative humidity of less than 50%, as determined by National Weather Service data.

Figure: 30 TAC §217.250(e)(2)(A)(ii)

Table J.3. - Surface Area Requirements for Sludge Drying Beds

Stabilization Process	**Pounds 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 greater than 45 inches average annual rainfall or annual average relative humidity of 50% or greater, as determined by National Weather Service data.

(iv) A design must:

(I) provide a method of effectively dewatering sludge;

(II) provide a means for accelerated dewatering;

(III) size the sludge drying beds to store accumulated sludge during periods of extended high humidity and rainfall; and

(IV) provide an alternative dewatering method to effectively dewater the sludge during periods of extended high humidity and rainfall.

(v) The report must provide justification for use of innovative or non-conforming sludge drying beds in high rainfall, high relative humidity areas of the state.

(B) Gravel Media Beds. A gravel media bed must be laid in two or more layers. The gravel around the underdrains must be properly graded 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 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 mm above the top of an underdrain.

(D) Underdrains.

(i) The underdrains must be at least 4.0 inches in diameter and sloped not less than 1.0% to drain.

(ii) The underdrains must be spaced not more than 20 feet apart.

(E) Decanting. A sludge drying bed may have a method of decanting supernatant installed on the perimeter of the bed.

(F) Walls.

(i) The interior walls of a sludge drying bed must be watertight and extend 12 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 to 24 inches above the bed surface or ground elevation, whichever is higher.

(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 beds must terminate at least 12 inches above the surface of the media and be arranged so that the pipe drains to a sump to be pumped to the headworks.

(ii) A sludge discharge point must have a concrete splash plate.

(I) Drying Bed Bottom.

(i) The bottom of a sludge drying bed must consist of a minimum of one foot layer of clayey subsoil having a permeability of less than 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.

(3) Innovative or Non-Conforming Sludge Drying Beds. The executive director will review any vacuum assisted 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)

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 dual trains are provided, the following equipment must be provided in duplicate to allow equipment alternation: feed pump, vacuum pump and filtrate pump. Spare filter fabric must be provided except when metal coils are used.

(C) Filter Equipment. 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.

(D) Pumps.

(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 design must be based on performance data from a similar 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.

(C) A design must include adequate sludge storage.

(D) Unless 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) Each feed pump must have variable speed.

(F) Each centrifuge must have a separate feed system.

(G) Each centrifuge must be equipped for variable scroll speed and pool depth.

(H) Each centrifugation system must have a crane or monorail for equipment removal or maintenance.

(I) Each centrifuge system must have access for adequate and efficient wash down of the interior of the machine.

(6) Plate and Frame Presses.

(A) Sizing.

(i) A design must be based on performance data developed from 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) 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.

(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) a duplicate feed pump;

(ii) at least one extra plate for every ten required for startup, but not less than two;

(iii) one complete filter fabric set;

(iv) one closure drive system;

(v) air compressor; and

(vi) one washwater booster pump.

(C) Operational Requirements.

(i) The filter feed pumps must be capable of a combination of initial high flow, low pressure filling, followed by sustained periods of operating at 100 pounds per square inch (psi) to 225 psi.

(ii) A design may specify an integral pressure vessel to produce this initial high volume flow.

(iii) A plate and frame system may use operating pressures less than 225 psi if the report includes actual performance data using similar sludge justifying such a use.

(iv) A design may include provisions for cake breaking to protect or enhance down line processes when necessary.

(D) Maintenance.

(i) A plate and frame system must have a crane or monorail capable of removing the plates.

(ii) A plate and frame 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 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.

(B) Duplicate Equipment and Spare Parts. Unless multiple units are provided, a belt press system must have the following spare equipment:

(i) a duplicate feed pump;

(ii) washwater booster pumps;

(iii) one complete set of belts;

(iv) one set of bearings for each type of press bearing;

(v) duplicate tensioning;

(vi) tracking sensors;

(vii) one set of wash nozzles;

(viii) one doctor blade; and

(ix) duplicate conditioning or flocculation drive equipment.

(C) Conditioning. The report must include the polymer selection methodology, account for sludge variability, and document the anticipated sludge loading to the press.

(D) Sludge Feed.

(i) The sludge feed must be relatively constant to eliminate difficulties in polymer addition and 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.

(i) A belt must have variable speed.

(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 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.

(i) A belt press system must use high-pressure wash water for each belt.

(ii) 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 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 press and under the thickener when gravity belt thickening is employed.

(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 material subject to corrosion must be weatherproof or located outside of the press area.

(iv) A doctor blade clearance must be adjustable.

§217.251. Sludge Storage.

(a) This section applies to the storage of residuals after processing but before final disposal or removal from the facility site.

(b) A site may store residuals in liquid, dewatered, or dry form if the solids have been stabilized in a treatment process.

(c) General Storage Requirements.

(1) The design of a storage facility must minimize odor conditions and vector attraction.

(2) A storage facility must provide storage of waste sludge separate from a biological treatment process.

(3) The design of a 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 demonstrates a method 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.

(B) A 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 cf of volume.

(E) An earthen 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 may be stored in a covered basin.

(e) Storage of Dewatered Solids.

(1) A storage facility must store the dewatered solids in a container or in a stockpile that prevents re-wetting by precipitation.

(2) A storage container may store dewatered solids with a solids content of less than 35% for no more than seven 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.

(2) An open stockpile must have a system for collecting storm water runoff and returning it to the head of the 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 bin or covered facility.

(2) A enclosed storage structure must be mechanically ventilated with at least 20 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).

(b) Quantities of Sludge.

(1) An estimate of the quantity of solids generated by the treatment process from a similar full-scale facility or pilot study 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 use or disposal option must be based on the characteristics of the sludge.

(d) Sludge Constituents.

(1) Metals and their concentration in sludge must be determined using 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)).

(2) A sludge processing system must be designed to reduce pathogens in sludge to levels 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 Chapter 312 of this title with regards vector attraction.

(e) Emergency Provisions for Sludge Disposal. A design must include a secondary method of sludge disposal in the event of conditions that prevent the use of a facility's primary use or disposal method. A secondary method must be included in the report.

(f) Weather Factors. Weather factors such as rainfall, wind conditions, and humidity must be included in the determination of the use or disposal of sludge.

SUBCHAPTER K: CHEMICAL DISINFECTION

§§217.271 - 217.283

STATUTORY AUTHORITY

The new rules are adopted under the authority of Texas Water Code (TWC), §5.013, which provides the commission's general jurisdiction; §5.103, which provides the commission's authority to adopt any rules necessary to carry out its powers and duties under the laws of Texas; §5.105, which provides the commission's authority to, by rule, establish and approve general policy of the commission; §5.120, which provides the commission's authority to administer the law to promote conservation and protection of the quality of the environment; §26.027, which authorizes the commission to issue permits; §26.034, which provides the commission's authority to adopt rules for the approval of disposal system plans; and §26.121, which provides the commission's authority to prohibit unauthorized discharges.

The adopted new rules implement TWC, §§5.013, 5.103, 5.105, 5.120, 26.027, 26.034, and 26.121.

§217.271. Chlorine (Cl_2) Disinfection and Sulfur Dioxide (SO_2) Dechlorination System Redundancy Requirements.

(a) Each Cl_2 disinfection and SO_2 and dechlorination system must include at least two banks of chemical storage cylinders.

(b) A bank of cylinders must include a device that automatically switches from an empty bank of cylinders to a full bank of cylinders in a manner that ensures continuous disinfection.

(c) A facility must have sufficient space to store a bank of empty cylinders.

(d) A chemical delivery system must be designed so that the pound per day requirements in §217.272 of this title (relating to Capacity and Sizing of Chlorine (Cl_2) Disinfection and Sulfur Dioxide (SO_2) Dechlorination) are met with the largest chlorinator, sulfonator, or evaporator out of service.

(e) A chemical delivery system must include a backup pump for any injector water supply system requiring a booster pump.

(f) A chemical delivery system must include an emergency power source capable of maintaining operation of the chlorination and dechlorination of the minimum flow necessary to keep the facility from being inundated by influent during an extended power outage.

§217.272. Capacity and Sizing of 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:

Figure: 30 TAC §217.272(a)

Equation K.1.

$$PPD = Q \times D \times 8.34$$

Where:

PPD = Pounds (lbs) per day of Cl2 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 figure establishes the minimum acceptable design Cl_2 dosage for disinfection:

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 include at least one unit of SO_2 gas to dechlorinate at least one unit of Cl_2 gas.

§217.273. Cylinder Requirements for Chlorine (Cl_2) Disinfection and Sulfur Dioxide (SO_2) Dechlorination Systems.

(a) Cylinder Withdrawal Rates.

(1) Gas Withdrawal. The gas withdrawal rate per cylinder must be based on the Equation K.2. located in the following figure and the variables from Table K.2. located in the following 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, °F

T_{th} = Threshold temperature, °F

F = Withdrawal factor, lb/°F/day

W_g = Maximum gas withdrawal rate per cylinder, lb/day

Table K.2 - Threshold Temperatures and Withdrawal Rates for Cl_2 And SO_2 - *

Gas and Cylinder Size	Withdrawal Factor, (F) lb/°F/day	Threshold Temperature, (T_{th}) for Cylinder Mounted Vacuum Regulator, °F	Threshold Temperature, (T_{th}) for Manifold Systems at 10-15 psig pressure, °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			

(A) If the cylinders are not stored in a temperature-controlled enclosure, the report must include the ambient temperature based on the lowest 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.

(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:

(A) 9,600 pounds (lbs)/day of Cl_2; and

(B) 7,200 lbs/day of Sulfur Dioxide (SO_2).

(b) Cylinders per Bank. The number of cylinders per cylinder bank must be based on the equation in the following figure:

Figure: 30 TAC §217.273(b)

Equation K.3.

$$Cyl = \frac{PPD}{W_{gl}}$$

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

$W_{g,l}$ = 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 Chlorine (Cl_2) Disinfection and Sulfur Dioxide (SO_2) Dechlorination Systems.

A new, expanded or materially altered Chlorine (Cl_2) and Sulfur Dioxide (SO_2) system must include automatic dosage control that adjusts the dosage of Cl_2 or SO_2 relative to the flow of an effluent stream.

§217.275. Requirements for Chlorine (Cl_2) Disinfection and Sulfur Dioxide (SO_2) Dechlorination Systems Using 150 pound (lb) Cylinders.

(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 the cylinders, chlorinators, and/or sulfonators.

(2) An unconnected cylinder may be stored outdoors, but the cylinder must reach at least 65 degrees Fahrenheit before being connected to a system.

(b) Heating Blankets.

(1) Heating blankets on Cl_2 gas cylinders are prohibited.

(2) An SO_2 cylinder may have a heating blanket only in a temperature-controlled room to increase the temperature inside a cylinder above the ambient room temperature.

(A) The report must include a calculation determining the setting for a heating blanket to maintain a 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.

(C) A cylinder with a heating blanket that is connected to a disinfection system must have a downstream pressure-reducing valve.

(D) An SO_2 system must be capable of deactivating a heating blanket if high pressure is detected downstream.

(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 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 indoors and 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, a storage structure must:

(A) protect a cylinder from direct sunlight; and

(B) allow safe removal and replacement of a cylinder.

(3) A one-ton cylinder stored outdoors may have heated pipes to prevent gas from liquefying 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 Cl_2 gas cylinder is prohibited.

(2) A one-ton SO_2 cylinder may have a heating blanket to increase the operating temperature of an SO_2 system. A design must specify the temperature a heating blanket may be set to maintain an adequate temperature inside a cylinder, based on the lowest seven-day average of the local daily low temperatures over the last ten years.

(3) The ambient temperature must be used to calculate a cylinder withdrawal rate in §217.273(a) of this title.

(4) A heating blanket must include a mechanism to prevent heating a cylinder to more than 100 degrees F.

(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.

(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:

(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 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 assumed in

§217.273(a)(2) of this title (relating to Cylinder Requirements for 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 §217.276(d) of this title (relating to Requirements for Chlorine (Cl_2) Disinfection and Sulfur Dioxide (SO_2) Dechlorination Systems Using Gas Withdrawal from One-Ton Cylinders).

§217.278. Housing Requirements for Chlorine (Cl_2) Disinfection and Sulfur Dioxide (SO_2) Dechlorination Systems.

(a) Floor Drains. A floor drain from a Cl_2 or SO_2 feed or storage room must not drain to any pipe system connected to any other room of the facility.

(b) Doors and Windows.

(1) Each door must:

(A) open to the outside of the building; and

(B) include panic hardware.

(2) Each room must have at least one clear, gas-tight window in an exterior door.

(3) A room may have additional 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 forced mechanical ventilation with at least 1.0 air exchange every 3.0 minutes.

(2) Exhaust equipment must have:

(A) external controls; and

(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.

(4) An exhaust system may use 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 SO_2 or Cl_2 gas feed systems must exhaust to a point that is:

(A) not frequented by facility staff;

(B) not near a fresh air intake; and

(C) clearly marked.

(d) Gas Detectors and Protection.

(1) An area containing Cl_2 or SO_2 under pressure must have a gas detector and alarm system.

(2) An area used for handling pressurized gases must have respiratory and protective equipment that meets the requirements of the National Institute for Occupational Safety and Health.

(A) The respiratory equipment must be immediately accessible and included in the 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 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.

§217.279. Equipment and Material Requirements for 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.

(1) One-ton 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 Chlorine (Cl_2) and Sulfur Dioxide (SO_2) system must have a scale for determining the amount of chemical used daily and the amount of chemical remaining in a container.

(d) Pressure Pipe Systems for Gas Transport.

(1) Gas transport pressure pipe and fittings must be at least equivalent to Schedule 80 black seamless steel pipe and 2,000 pound forged steel fittings.

(2) The use of polyvinyl chloride (PVC) in a pressure pipe system is prohibited.

(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 a length of supply pipes greater than 20 feet;

(B) 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 at the gas discharge side of an evaporator must have a rupture disk and a high-pressure alarm that warns facility staff of disk rupture.

(6) A gas pipe entering a chlorinator or sulfonator must have a heated leg drop sediment trap.

(7) An SO_2 system must have at least the equivalent of 316 stainless steel seat and stem.

(8) A 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 staff of disk rupture, and an expansion chamber.

(f) Vacuum pipes.

(1) Vacuum pipes and fittings downstream of a vacuum regulator must be the equivalent 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 of 10 feet per second through any Cl_2 or SO_2 system diffuser, 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 Bisulfate ($NaHSO_3$) system must include at least two chemical solution pumps and must ensure that the capacity requirements 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) 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 Cl_2 required.

(B) Cl_2 Determination. The pounds of available Cl_2 per gallon of NaClO solution must be determined using values and appropriate references supplied by 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:

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) $NaHSO_3$.

(A) Figure: 30 TAC §217.280(b)(1)(C), Equation K.4. of this subsection must be the basis to determine the pounds per day of chemical required.

(B) The minimum amount of $NaHSO_3$ needed to dechlorinate one pound of Cl_2 is 1.465 pounds. The pounds per day of Cl_2 that must be dechlorinated, as determined in subparagraph (A) of this paragraph, multiplied by 1.465 pounds of $NaHSO_3$ per pound of Cl_2, determines the pounds of $NaHSO_3$ needed.

(C) The gallons per hour (R) of $NaHSO_3$ 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 NaClO or $NaHSO_3$ feed rate to correspond to the flow of the effluent stream.

(d) Chemical Handling.

(1) Storage Tank Sizing.

(A) A bulk storage facility for NaClO with a solution strength greater than or equal to 10% must not be sized to store more than a 15-day supply, unless a residual analyzer or oxidation-reduction potential (ORP) monitor provides automatic feed control to compensate for solution degradation.

(B) For 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.

(C) A facility with a design flow equal to or greater than 1.0 million gallons per day must have at least two chemical storage tanks.

(2) Temperature considerations.

(A) If a NaClO tank is not stored indoors, the tank must be opaque or otherwise block sunlight penetration.

(B) An outdoor $NaHSO_3$ storage facility and pipes must be insulated and heat traced in a location where the ambient temperature is below 40 degrees 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.

(e) Equipment and Materials.

(1) Equipment and materials used for storage, pumping, and transport of NaClO must be used according to the manufacturer's recommendations and suitable for use in a corrosive chemical environment.

(2) Equipment and materials used for storage, pumping, and transport of $NaHSO_3$ must be used according to the manufacturer's recommendations and suitable for use in an acidic chemical environment.

(f) Safety.

(1) Ventilation. A chemical storage area must be sufficiently ventilated to prevent buildup of fumes.

(2) Liquid-depth indicators. A storage tank must have an external liquid-depth indicator.

(3) Spill containment.

(A) A chemical storage area 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, unless the pipe system prevents a combined release.

(C) A tank must be placed on an equipment pad that is:

(i) elevated above the secondary containment maximum liquid level; or

(ii) provided with positive drainage from below the tank.

(D) A containment system for NaClO must be separate from a containment system for $NaSO_3$.

(4) Emergency and Protective Equipment. A chemical storage area must have at least one emergency eyewash station and adequate personal protective equipment for all facility staff working in the area.

§217.281. Application of Chlorination and Dechlorination Chemicals.

(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_2 contact chamber.

(2) Mixing Zones. A mixing zone within a Cl_2 contact basin of an existing facility must not be considered as part of the volume needed for disinfection.

(3) Cl_2 and Sodium Hypochlorite (NaClO). A disinfection system must apply the 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}.

(4) Sulfur Dioxide (SO_2) and Sodium Bisulfite ($NaHSO_3$):

(A) The mixing for an SO_2 and $NaHSO_3$ system must ensure compliance with all relevant permit requirements.

(B) A disinfection system must provide a mean velocity gradient (G value) of at least 250 per second^{-1}.

(b) Disinfection Contact Basins.

(1) A Cl_2 contact basin must provide a minimum Cl_2 contact time of 20 minutes at the peak flow.

(2) The design of a Cl_2 contact chamber must prevent short-circuiting and that the wastewater is retained in a contact basin for at least 20 minutes.

(3) The report must include supporting data from a contact basin design model, performance data of a similar design, or a field tracer study.

(c) Dechlorination Contact Time.

(1) A disinfection system must have sufficient mixing and contact time between the disinfected wastewater and a dechlorinating agent to ensure continuous compliance with the permitted Cl_2 limits.

(2) A design 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.

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).

§217.283. Post-Disinfection Requirements.

(a) A design must include a sufficient number of sampling points to allow an operator to monitor the system. Sampling points must be identified in the report.

(b) Dissolved Oxygen (DO) Requirements.

(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.

SUBCHAPTER L: ULTRAVIOLET LIGHT DISINFECTION

§§217.291 - 217.300

STATUTORY AUTHORITY

The new rules adopted under the authority of Texas Water Code (TWC), §5.013, which provides the commission's general jurisdiction; §5.103, which provides the commission's authority to adopt any rules necessary to carry out its powers and duties under the laws of Texas; §5.105, which provides the commission's authority to, by rule, establish and approve general policy of the commission; §5.120, which provides the commission's authority to administer the law to promote conservation and protection of the quality of the environment; §26.027, which authorizes the commission to issue permits; §26.034, which provides the commission's authority to adopt rules for the approval of disposal system plans; and §26.121, which provides the commission's authority to prohibit unauthorized discharges.

The adopted new rules implement TWC, §§5.013, 5.103, 5.105, 5.120, 26.027, 26.034, and 26.121.

§217.291. Ultraviolet Light Disinfection System Definitions.

(a) Module--A grouping of ultraviolet 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.

§217.292. Ultraviolet Light Disinfection Systems Effluent Limitations.

Ultraviolet light disinfection systems must be designed to comply with at least the effluent limits relating to the bacterial limit in the facility's wastewater permit.

§217.293. Ultraviolet Light Disinfection Systems Redundancy Requirements.

(a) An ultraviolet (UV) disinfection system must include 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 spare equipment, including but not limited to, lamps, ballasts, banks, and modules, to replace equipment during emergency repairs and scheduled maintenance.

§217.294. Ultraviolet Light Disinfection Systems Monitoring and Alarms.

(a) An ultraviolet (UV) system shall continuously monitor and display locally at the system control panel the following:

(1) the flow rate in each disinfection channel;

(2) the relative intensity of a lamp in one bank of a disinfection channel;

(3) the operational status and condition of each bank;

(4) the on/off status of each lamp in the system;

(5) the number of operating hours of each bank in the system; and

(6) the total number of hours of operation for each bank in the system.

(b) Flow pacing shall be accomplished by turning the appropriate number of banks on or off in proportion to effluent flow. Set points used to energize the banks shall be operator adjustable.

(c) A UV system must include an alarm system.

(1) A facility that is not supervised 24-hours per day must have telemetry with battery backup as part of the alarm system. A telemetry system must notify a facility operator in the event of a UV alarm.

(2) A UV system must include the following minimum alarm conditions:

(A) A minor alarm must activate if:

(i) the relative UV intensity of the system is less than 45%; or

(ii) there is a lamp outage.

(B) A major alarm must activate if:

(i) the relative UV intensity of the system is less than 25% (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 .

§217.295. Ultraviolet Light Disinfection Dosage and System Sizing.

(a) A system must be sized based upon the results of an independent bioassay. 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) 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 4 lamps per reactor.

(b) If a variable output lamp is used, detailed documentation from the lamp manufacturer must be provided to document 254nm 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;

(2) National Water Research Institute's *Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse* (May 2003); or

(3) NSF International, The Public Health and Safety Company, 40CFR35.6450 *Environmental Technology Verification Protocol* (October 2002).

(b) The following minimum standards are required for proper validation:

(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 10^5 to 10^7 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) Runs must be in at least triplicate, each from a separate dilution of the stock suspension.

(6) A minimum of two controls (unexposed) must be sampled with each dose run.

(7) The diameter of the collimating tube must at least equal the diameter of the Petri dish. Any difference 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 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.

(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 (relating to Variances) in this chapter.

(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'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 reactor must include a level control that ensures that the UV lamps remain submerged at a near-constant depth, regardless of flow.

(e) The upstream and downstream portions of a UV reactor channel between UV banks must be covered to shut out all natural light.

§217.298. Ultraviolet Light Disinfection System Cleaning and Maintenance.

(a) A design must include provisions for draining each ultraviolet (UV) disinfection channel and routine cleaning of the UV lamps and modules.

(b) A UV system must include the following spare parts, as a percentage of the total system equaling at least:

(1) 5% of the lamps;

(2) 2% of the ballasts; and

(3) 5% of the quartz sleeves.

(c) The 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.

Anyone in a reactor area must wear appropriate personal protection, including at least an ultraviolet (UV) UV-rated face shield and safety glasses or goggles.

§217.300. Post-Disinfection Requirements.

(a) 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) Requirement.

(1) A UV 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 meet the minimum DO level.

SUBCHAPTER M: SAFETY

§§217.321 - 217.333

STATUTORY AUTHORITY

The new rules are adopted under the authority of Texas Water Code (TWC), §5.013, which provides the commission's general jurisdiction; §5.103, which provides the commission's authority to adopt any rules necessary to carry out its powers and duties under the laws of Texas; §5.105, which provides the commission's authority to, by rule, establish and approve general policy of the commission; §5.120, which provides the commission's authority to administer the law to promote conservation and protection of the quality of the environment; §26.027, which authorizes the commission to issue permits; §26.034, which provides the commission's authority to adopt rules for the approval of disposal system plans; and §26.121, which provides the commission's authority to prohibit unauthorized discharges.

The adopted new rules implement TWC, §§5.013, 5.103, 5.105, 5.120, 26.027, 26.034, and 26.121.

§217.321. Safety Design.

(a) The safety aspects of a 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 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 treatment facility equipment and processes.

(c) A facility design must incorporate processes that use the least hazardous and toxic chemicals and the 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 in a land application area.

(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 facility being materially altered or expanded must conduct a safety audit of the facility 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.

(2) A safety audit must identify the locations and jobs associated with injuries or incidents and any subsequent corrective action taken or planned.

(3) 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 facility may conduct a security audit.

(2) The security audit may be based on the *Asset Based Vulnerability Checklist for Wastewater Utilities* by the Association of Metropolitan Sewerage Agencies or an equivalent security audit protocol.

§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, 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;

(4) personal protective equipment and clothing;

(5) warning signs and guards; and

(6) first-aid supplies.

(c) The tools at a 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.

(a) An owner must make available appropriate protective equipment for breathing, eyes, face, head, and extremities for operating staff who will handle any chemical known to pose a potential health risk and must train the facility staff in the use of the equipment.

(b) A facility that uses any chemical must be designed to provide eye washing and showering systems in all appropriate locations.

(c) All protective equipment and chemical neutralizers must be stored near but outside a chemical storage area.

§217.325. Railings, Ladders, Walkways, and Stairways.

(a) An opening in a railing must have a removable chain.

(b) A open valve box, pit, tank, or basin that extends less than 4.0 feet above ground must have a railing capable of preventing a person from falling into it.

(c) A steep or vertical ladder is acceptable only for infrequent access to equipment.

(d) A ladder must have flat safety tread rungs and extensions at least 1.0 foot out of a vault.

(e) A walkway above an open tank must have a raised edge designed to prevent a person from slipping off the walkway.

(f) Walkways, steps, landings, and ladder rungs must have a non-slip finish.

(g) An overhead pipe must have at least a 7.0-foot clearance, unless the pipe is padded to prevent head injury and has a warning sign.

§217.326. Electrical and Fire Code Compliance.

(a) The electrical elements of a facility or system design must conform to local electrical codes or to the National Fire Protection Association (NFPA) 70 – National Electrical Codeif the facility is located in an area that does not have a local electrical code.

(b) The facility or system design must conform to local fire codes or to the National Fire Protection Association (NFPA) 70 if the facility is located in an area that does not have a local fire code.

§217.327. Non-Potable Water.

Each hydrant and outlet for non-potable water must be clearly marked as "**NON-POTABLE WATER**" or "**UNSAFE WATER**."

§217.328. Facility Access Control.

(a) A facility must be completely fenced and have a lockable gate at each access point.

(b) A facility containing an open tank must have hazard signs stating "**DANGER - OPEN TANKS - NO TRESPASSING**" within visible sighting of each other and 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

(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.

(d) A facility 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 facility must have color-coded pipes.

(b) A new facility must have tracer tape for each non-metallic underground pipe.

(c) An existing facility must color-code and install tracer tape for each pipe associated with a material alteration or expansion .

(d) A non-potable water pipe must be painted purple and be stenciled "**NON-POTABLE WATER**" or "**UNSAFE WATER**."

(e) A facility design must use the following color-coding for 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;

(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

(19) Effluent after clarification – dark green.

§217.330. Public Drinking Water Supply Connections.

(a) Connection between a public drinking water supply system and a wastewater treatment facility 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 annually.

(c) RPBA test results and maintenance records must be retained onsite for at least three years.

§217.331. Freeze Protection.

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 staff must be designed to comply with 29 Code of Federal Regulations §1910.95.

(b) Removable noise attenuation 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.

(b) A ventilating manhole must be equipped with a connection for a portable ventilator.

(c) A confined space entry must be conducted according to the requirements of 29 Code of Federal Regulations §1910.146.