

Subchapter C: CONVENTIONAL COLLECTION SYSTEMS

§§217.51 – 217.71

Statutory Authority

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

Note: The **1st paragraph** of a Statutory Authority should state what the rules are proposed "under the authority of," and the **2nd paragraph** should list (no titles) any bills, statutes (state or federal) the rules implement.]

RULE OF THUMB: for existing rules/sections, language must have been downloaded from 30 Texas Administrative Code as this is the *official* version of the rules.

- **NEW language:** to designate language that is *new* to 30 TAC, you **must** underline new language that does *not* currently exist in TAC, including punctuation
- **Delete existing language:** to designate existing language in 30 TAC that is *obsolete, no longer required/needed*, [you **must** place that language between brackets] in order to show deletion of that language from 30 TAC
- new language before [old language]

§217.51. Applicability.

This subchapter applies to the design, construction, operation, maintenance, and testing of conventional gravity 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 collection system located over the Edwards Aquifer recharge zone, as defined in §213.3 of this title (relating to Definitions), must design and install the collection system in accordance with Chapter 213 of this title (relating to Edwards Aquifer), in addition to this subchapter. The completed sewage collection system (SCS) design and Water Pollution Abatement Plan (WPAP) must be submitted to the Edwards Aquifer Protection Program (EAPP) for review and approval.

§217.53. Pipe Design.

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

(1) A collection system must be designed to transport the peak flow from the service area, plus infiltration and inflow. The design must minimize inflow and infiltration. Flow calculations must be included in the engineering report.

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

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

(4) Pipes must be designed to meet a velocity of at least 2 feet per second at a maximum flow of three-quarters ($\frac{3}{4}$) full capacity

(b) Gravity Pipe Materials

(1) An owner must identify in the engineering 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, pipe stiffness, dimensional ratio, etc.) and installation (bedding, backfill, etc.).

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

(A) the characteristics of the wastewater conveyed;

(B) the possibility of septic conditions;

(C) the ability to minimize inflow and infiltration;

(D) any external forces;

(E) any groundwater conditions;

(F) the internal pressures; and

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

(c) Joints for Gravity Pipes.

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

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

(A) include rubber gaskets;

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

(C) include a restraining rib with a compression joint;

(D) [(C)] high density polyethylene compression joints;

(E) [(D)] include a restraining rib;

(E) [(E)] be welded; or

(G) [(F)] be heat fused.

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

(d) Separation Distances.

(1) Separation distances need to be set according to the language in the requirements of either 30 TAC 217 or 30 TAC 290.44, and follow the more stringent requirements.

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

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

(4) [(3)] Wherever possible, collection system pipes and manholes must be located at least nine feet from all water supply pipes. If a collection system pipe or manhole cannot be located at least nine feet away from a water supply pipe, the owner must justify in the engineering report why it is not possible to provide at least nine

feet of separation. Table C.1. in Figure: 30 TAC §217.53(d)(3) provides a reference to paragraphs in this subsection that apply if a collection system pipe or manhole cannot be located at least nine feet away from a water supply pipe.

Figure: 30 TAC §217.53(d)(3)

Case	Protection Requirement
Parallel pipes within nine feet, where the collection system pipe is above the water supply pipe	Encased in a casing pipe according to paragraph (4) of this subsection
Crossing pipes within nine feet, where the collection system pipe is above the water supply pipe	Encased in a casing pipe according to paragraph (5)(A) of this subsection -or- Constructed using 150 per square inch (psi) pressure class pipe according to paragraph (5)(B) of this subsection -and- <u>Both pipes should be centered on the crossing for combined new line construction</u>
Parallel pipes within nine feet, where the collection system pipe is below the water supply pipe	Constructed using 150 psi pressure class pipe according to paragraph (6)(A) of this subsection -or- Encased in a casing pipe according to paragraph (6)(B) of this subsection
Crossing pipes within nine feet, where the collection system pipe is below the water supply pipe	Constructed using 150 psi pressure class pipe according to paragraph (7)(A) of this subsection -or- Encased in cement-stabilized sand according to paragraph (7)(B) of this subsection -or- Encased in a casing pipe according to paragraph (7)(C) of this subsection -and-

	<u>Both pipes should be centered on the crossing for combined new line construction</u>
Manhole within nine feet of a water supply pipe	No measurable leakage according to paragraph (8)(A) of this subsection -or- Encased in cement-stabilized sand according to paragraph (8)(B) of this subsection

(4) If a collection system pipe is located above a water supply pipe and runs parallel to the water supply pipe, each portion of the collection system pipe within nine feet of the water supply pipe must be encased. The casing pipe must be constructed of at least 150 per square inch (psi) pressure class pipe that:

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

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

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

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

(5) If a collection system pipe crosses above a water supply pipe, each portion of the collection system pipe within nine feet of the water supply pipe must either be encased in a casing pipe according to subparagraph (A) of this paragraph, or must be constructed using at least 150 psi pressure class pipe according to subparagraph (B) of this paragraph.

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

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

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

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

(B) A collection system pipe that crosses above a water supply pipe must be constructed of at least 150 psi pressure class, corrosion-resistant, non-brittle pipe and must use manufacturer-approved adapters. Gasketed joints, compression joints, and other non-bonded joints must be designed to seal at atmospheric pressure.

(6) If a collection system pipe is located below a water supply pipe and runs parallel to the water supply pipe, each portion of the collection system pipe within nine feet of the water supply pipe must either be constructed using at least 150 psi pressure class pipe according to subparagraph (A) of this paragraph, or must be encased in a casing pipe according to subparagraph (B) of this paragraph.

(A) A collection system pipe that runs parallel to and below a water supply pipe must be constructed of at least 150 psi pressure class, corrosion-resistant, non-brittle pipe that:

(i) is located at least two vertical feet below the water supply pipe;

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

(iii) includes joints that are designed to seal at atmospheric pressure.

(B) A casing pipe for a collection system pipe that runs parallel below a water supply pipe must be constructed of at least 150 psi pressure class pipe that:

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

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

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

(7) If a collection system pipe crosses below a water supply pipe, each portion of the collection system pipe within nine feet of the water supply pipe must either be constructed using at least 150 psi pressure class pipe according to subparagraph (A) of this paragraph, or must be encased in cement-stabilized sand according to subparagraph (B) of this paragraph, or must be encased in a casing pipe according to subparagraph (C) of this paragraph.

(A) A collection system that crosses below a water supply pipe and is constructed of at least 150 psi pressure class, corrosion-resistant, non-brittle pipe must:

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

(ii) be centered on the crossing (for combined new water and sewer construction);

(iii) be at least 18 feet long; and

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

(B) A collection system pipe that crosses below a water supply pipe and is constructed of any material other than at least 150 psi pressure class, corrosion-resistant, non-brittle pipe must:

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

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

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

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

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

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

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

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

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

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

(8) For new construction all pipe crossing should have the crossing at center length of both lines

(9) [(8)] If a nine-foot separation distance between a manhole and a water supply pipe cannot be achieved, the manhole must either:

(A) have no measurable leakage during a leakage test conducted according to the requirements in §217.58 of this title (relating to Testing Requirements for Manholes); or

(B) have all portions of the manhole within nine feet of a water supply pipe encased in at least one foot of cement stabilized sand that meets the requirements of paragraph (7)(D)(i) and (ii) of this subsection.

(e) Building Laterals and Taps. Building laterals and taps must:

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

(2) prevent service lines from protruding into the collection system pipe;

and

(3) protect the mechanical and structural integrity of a 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 the pipe as required by subsection (k) of this section.

(g) Corrosion Potential of Collection System Pipes.

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

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

(h) Odor Control. An owner shall implement odor control measures necessary to prevent a collection system from becoming a nuisance.

(i) Active Geologic Faults.

(1) An owner shall identify all active faults within the boundaries of the collection system project and minimize the number of collection system lines crossing faults.

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

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

(i) joints that provide maximum flexibility; and

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

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

(j) Capacity Requirements.

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

(2) An owner must include calculations in the engineering report that demonstrate the hydraulic capacity of a collection system, accounting for the peak flow of domestic wastewater, peak flow of wastewater from industrial sites, and maximum expected infiltration rates; based on pipes flowing at $\frac{3}{4}$ full.

(3) An owner must ensure that the collection system has capacity to prevent a surcharge.

(4) An owner must ensure that a gravity pipe is at least 6.0 inches in diameter.

(5) Any connection between a stormwater collection system and a wastewater collection system is prohibited.

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

- (A) location;
- (B) inflow and infiltration characteristics;
- (C) peak flows;
- (D) pipe materials;
- (E) customer base; and
- (F) any other characteristics required by the executive director.

(7) New collection systems.

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

(B) A new collection system design must be sized for the peak flow, which is based on the estimated daily wastewater flow contribution as shown in Table B.1. in Figure: 30 TAC §217.32(a)(3) of this title (relating to Organic Loadings and Flows for New Wastewater Treatment Facilities) and assuming that pipes are flowing at $\frac{3}{4}$ full.

(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 used in a collection system, which is pipe that will deflect at least 2% without structural distress, the engineering 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;

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

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

(I) modulus of elasticity;

(J) tensile strength;

(K) pipe stiffness, or ring stiffness constant converted to pipe stiffness;

(L) Leonhardt's zeta factor;

(M) trench width;

(N) depth of cover;

(O) water table elevation; and

(P) unit weight of soil.

(3) For trench installations, the design must specify a minimum stiffness requirement to ensure ease of handling, transportation, and construction. Pipe stiffness must be related to the ring stiffness constant by Equation C.1. in Figure: 30 TAC §217.53(k)(3)

Figure: 30 TAC §217.53(k)(3)

Equation C.1.

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

Where:

PS = Pipe stiffness in pounds per square inch (psi)

C = Conversion factor, (0.80)

RCS = Ring stiffness constant

D = Mean pipe diameter in inches

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

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

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

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

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

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

(F) there are no effects on the pipe due to live loads from vehicles driving over the pipe;

(G) the unit weight of soil used for backfill is 120 pounds per cubic foot or less; and

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

(5) A design analysis for rigid pipe installations must be included in the engineering report. The design analysis must include a structural analysis and all details necessary to verify that the structural strength is sufficient to withstand the expected stresses. For rigid pipes, the minimum strength for each class of pipe material and the appropriate standard must be included.

(l) Minimum and Maximum Slopes.

(1) All collection systems must contain slopes sufficient to allow a velocity not less than 2.0 feet per second when flowing at full capacity; For design assume $\frac{3}{4}$ full.

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

(A) The slopes 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)

Size of Pipe (inches)	Minimum Slope (%)	Maximum Slope (%)
6	0.50	12.35
8	0.335	8.40
10	0.25	6.23
12	0.20	4.88
15	0.15	3.62
18	0.115	2.83
21	0.095	2.30

24	0.08	1.93
27	0.07	1.65
30	0.06	1.43
33	0.055	1.26
36	0.045	1.12
39	0.04	1.01
>39	*	*

* For pipes larger than 39 inches in diameter, the slope is determined by Manning's formula to maintain a velocity greater than 2.0 feet per second and less than 10.0 feet per second when flowing full.

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

(ii) The "n" value must take into consideration the slime, grit, result of hydraulic cleaning (jetting) 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 Equation C.2. in Figure: 30 TAC §217.53(l)(2)(B), using the "n" value of 0.013 for new pipe recommended by the manufacturer, the collection system must be designed to protect against pipe and bedding displacement.

Figure: 30 TAC §217.53(1)(2)(B)

Equation C.2. Manning's Formula.

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

Where:

V = velocity (ft/sec)

n = Manning's roughness coefficient (0.013)

R_h = hydraulic radius (ft)

S = slope (ft/ft)

(m) Alignment.

(1) Alignment Requirements. A gravity collection system must be laid with a uniform grade and straight alignment between manholes, if possible. All deviations from uniform grade and straight alignment must be justified in the engineering report.

(2) Prohibited Deviations.

(A) Deviation from uniform grade (e.g., grade breaks or vertical curves) without manholes is prohibited if the open cut construction method is used, except as provided in subparagraph (B) of this paragraph.

(B) For segmented pipe, a horizontal curve must not be accomplished by bending the pipe unless the pipe joints are welded or heat-fused. Horizontal curves must be accomplished using additional manholes or joint offset. Horizontal curves for non-segmented, welded, or heat-fused pipes must follow the manufacturer's recommendations.

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

- (i) five degrees of deflection;
- (ii) 80% of the manufacturer's recommended maximum joint offset; or
- (iii) 80% of the appropriate ASTM, AWWA, ANSI, or other nationally established standard for joint offset.

(3) Calculations and Plan Drawings. The calculations for horizontal curvature must be included in the engineering report. Details of the proposed curvature must be displayed on the plan drawings.

(4) Manhole Spacing. 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) An inverted siphon [sag pipe] must include:

(A) two or more barrels;

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

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

(D) [(2)] A manhole with [must include] adequate clearance for rodding and cleaning.

(E) [(3)] Inverted Siphons [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.

(F) [(4)] The arrangement of an inverted siphon's inlet and outlet details must divert the normal flow to one barrel.

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

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

(I) [(7)] An inverted siphon must be designed to [A sag pipe must] prevent nuisance odors.

(J) [(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).

(2) A sag pipe must include:

(A) two or more barrels;

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

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

(D) A manhole with adequate clearance for rodding and cleaning.

(E) A 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.

(F) The arrangement of a sag pipe inlet and outlet details must divert the normal flow to one barrel.

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

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

(I) A sag pipe must be designed to prevent nuisance odors.

(J) Sag pipes must be pressure tested according to the requirement of §217.57 of this title (relating to Testing Requirements for Installation of Gravity Collection System Pipes).

(o) Bridged Sections.

(1) Piping 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, including buoyancy, applied by the occurrence of a 100-year flood event.

(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.

(p) Design of Collection systems for subdivisions with Graywater systems or tiny houses must accommodate for the lack of liquids (push water) and heavier solids loading

- (A) Must design to prevent nuisance odors
- (B) Design with all sewer lines on one side of the houses
- (C) Must be designed with adequate slope to allow solids to move in the absence of normal water flow (push water)

§217.54. Criteria for Laying Pipe.

(a) Pipe Embedment.

(1) A rigid pipe must be laid with bedding, haunching, and initial backfill that will meet the appropriate standards and will support the anticipated load. The bedding classes that are allowed are A, B, or C, as described in American Society for Testing and Materials (ASTM) C 12, American National Standards 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 bedding, haunching, and initial backfill that will meet the appropriate standards and will support the anticipated load. The bedding classes that are allowed are IA, IB, II, or III, as described in ASTM D-2321 or ANSI K65.171.

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

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

(5) If a fracture, fault zone, cave, or solutional modification to the rock strata that would prevent pipe bedding is encountered during construction, an owner must halt construction until an engineer prepares a written report, which must be submitted with the final engineering report, detailing how construction will accommodate these site conditions.

(b) Compaction.

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

(2) Compaction of the pipe embedment must provide the modulus of soil reaction for the bedding material necessary to ensure a 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) Embedment Thickness.

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

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

(d) Trench Width.

(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.

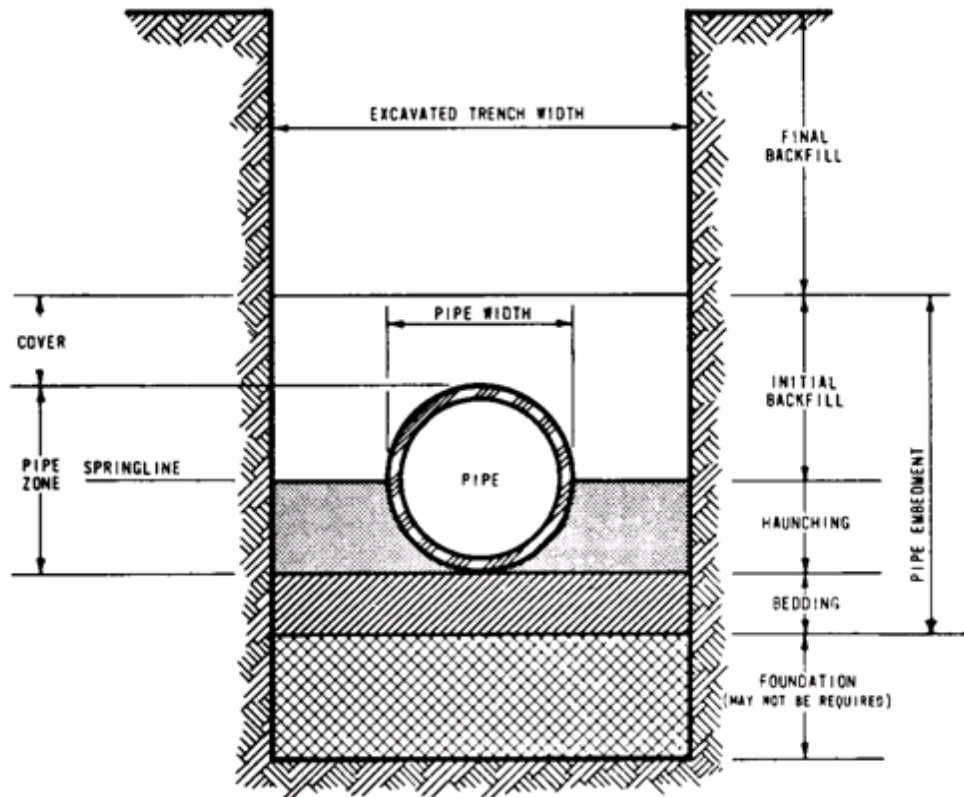
(2) The maximum and minimum trench width needed for safety and a pipe's structural integrity must be included in the engineering report.

(3) The width of a trench must allow proper and safe placement and compaction of haunching materials in accordance with the standards in subsection (a) of this section.

(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 collection system at:

(1) all points of change in alignment, grade, or nominal pipe diameter;

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

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

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

(c) A cleanout with watertight plugs may be installed in lieu of a manhole at the end of a 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, polymer concrete, or other material designed to withstand the anticipated live and static loads.

(f) The use of bricks to adjust a manhole cover to grade or construct a manhole is prohibited. Adjustment rings used to adjust a manhole cover to grade must be

constructed of concrete, high density polyethylene, or other material that is designed to withstand the anticipated live and static loads.

(g) Manholes may not be spaced farther apart than the distances specified in the following table for a wastewater collection system with straight alignment and uniform grades. The executive director may approve different distances, in writing,

(1) if the owner has equipment that can clean longer distances, and [.]

(2) if a correctly sized active ventilation system is used to vent

(A) sewer gases; and

(B) odors

Figure: 30 TAC §217.55(g)

Pipe Diameter (inches)	Maximum Manhole Spacing (feet)
6-15	500
18-30	800
36-48	1,000
54 or larger	2,000

(h) Tunnels are exempt from manhole spacing requirements.

(i) A manhole must not be located in a stream bed or other area that prevents access to the manhole.

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

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

(1) Manhole Covers.

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

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

(C) A manhole cover must be constructed of impervious material with no holes that could allow inflow.

(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- equaling 20,000 pounds

(E) The engineering report must specify and the owner must follow an appropriate national reference standard for manhole gaskets.

(F) Manhole covers must be constructed of cast iron, steel, non-metallic composite material, fiberglass, or other material approved in writing by the executive director.

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

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

(E) In a manhole with pipes of different sizes, the tops of all the pipes must be at the same elevation and flow channels in the invert must be sloped evenly from pipe to pipe to prevent backpressure.

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

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

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

(I) Steps are prohibited in a manhole.

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

(n) Venting.

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

(2) Vents must be designed to minimize inflow and must be located above a 100-year flood event elevation.

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

(4) Any other venting configuration must be approved in writing by the Executive Director and must consist of an active ventilation system.

(o) Cleanouts. A cleanout diameter must be at least equal to the diameter of the pipe to which it is attached.

§217.56. Trenchless Pipe Installation.

(a) Trenchless technologies that may be used for installation of new collection system pipe include impact moling, pipe ramming, microtunneling, conventional tunneling, bore and jack, and horizontal directional drilling.

(b) Trenchless technologies that may be used for replacement of collection system pipe include pipe bursting, pipe splitting, and pipe jacking.

(c) Trenchless technologies that may be used for lining existing collection system pipes include epoxy spray lining, cured-in-place pipe, and sliplining. These technologies reduce the inside diameter of a pipe.

(d) All other trenchless methods of installing, replacing, or repairing collection system pipe are non-conforming technologies subject to the requirements of §217.7(b) of this title (relating to Types of Plans and Specifications Approvals).

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

(f) The engineering 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) the pipe slope;

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

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

(8) the pipe standard.

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

§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.

The test must conform to the following requirements:

(1) Low Pressure Air Test.

(A) A low pressure air test must follow the procedures described in American Society for Testing and Materials (ASTM) C 828, ASTM C 924, or ASTM F 1417 or other procedure approved in writing by the executive director. The testing times listed in Table C.4. in Figure: 30 TAC §217.57(a)(1)(C) or Equation C.3 in Figure: 30 TAC §217.57(a)(1)(B)(ii) must be used, regardless of the testing procedure.

(B) For sections of collection system pipe with an average inside diameter less than 36 inches, the following procedure applies, 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) gauge. If groundwater is present, then a pipe must be pressurized to 3.5 psi gauge 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 pipe line, 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.4. - Minimum Testing Times for Low-Pressure Air Test

Pipe Diameter <i>(inches)</i>	Minimum Time	Maximum Length for Minimum Time	Time for Longer Length

	<i>(seconds)</i>	<i>(feet)</i>	<i>(seconds/foot)</i>
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	1,020	133	7.693
21	1,190	114	10.471
24	1,360	100	13.676
27	1,530	88	17.309
30	1,700	80	21.369
33	1,870	72	25.856

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

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

(F) 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 a pipe with an inside diameter greater than 33 inches must be approved in writing by the executive director.

(2) Infiltration/Exfiltration Test.

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

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

(C) If the quantity of infiltration or exfiltration exceeds the maximum quantity specified, an owner shall take remedial action in order to reduce the infiltration or exfiltration to an amount within the limits specified by Equation C.3. in Figure: 30 TAC §217.57(a)(1)(B)(ii) before putting the system into service. An owner

shall retest a pipe following a remedial action according to the requirements of this chapter.

(3) Vacuum Test

(b) If a gravity collection system pipe is composed of flexible pipe, deflection testing is also required.

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

(A) Mandrel Sizing.

(i) A rigid mandrel must have an outside diameter not less than 95% of the base inside diameter or average inside diameter of a pipe, as specified in the appropriate standard by the ASTM, American Water Works Association, UNI-BELL, or American National Standards Institute.

(ii) If the mandrel diameter is not specified in the standard used in clause (i) of this subparagraph, the mandrel must have an outside diameter equal to 95% of the inside diameter of a pipe. In this case, the inside diameter of the pipe, for the purpose of determining the outside diameter of the mandrel, must equal

the average outside diameter minus two minimum wall thicknesses for outside diameter controlled pipe and the average inside diameter for inside diameter controlled pipe.

(iii) All mandrel dimensions must meet the standard used in clause (i) of this subparagraph.

(B) Mandrel Design.

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

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

(iii) A mandrel must have nine or more runners or legs.

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

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

(C) Method Options.

(i) Television inspection as a substitute for deflection testing is prohibited for pipe less than or equal to 27 inches in diameter

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

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

(D) Trenchless Testing. The executive director may exempt pipe sections installed by trenchless technologies from mandrel testing in writing on a case-by-case basis.

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

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

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

(5) Collection system pipe deflection must not exceed 5%.

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

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

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

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

§217.58. Testing Requirements for Manholes.

(a) All manholes must pass a leakage test.

(b) An owner shall test each manhole, after assembly and before backfilling, for leakage using hydrostatic exfiltration testing, vacuum testing, or any other method approved in writing by the executive director. A manhole must be tested separately and independently from the collection system pipes.

(1) Hydrostatic Testing.

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

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

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

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

owner must apply grout to the exterior of the excavated manhole before retesting the manhole.

(A) Texas Test.

(i) To perform a vacuum test, an owner shall plug all lift holes and exterior joints with a non-shrink grout and plug all pipes entering a manhole, and the testing must be completed prior to backfill

(ii) Grout may not be placed in horizontal joints immediately prior to, and grout must be dry before testing.

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

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

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

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

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

(viii) A manhole passes the test if after 2.0 minutes and with all valves closed, the vacuum is at least 9.0 inches of mercury.

(B) American Society for Testing and Materials (ASTM) Test. The owner may require manhole testing that meets the requirements of ASTM C1244-11.

§217.59. Lift Station Site Requirements.

(a) Site access.

(1) A lift station must be located in a right-of-way or a permanent easement.

(2) A lift station site must be accessible by truck during all weather conditions, including a 25-year, 24-hour rainfall event.

(3) A road surface used to access a lift station must have a minimum width of 12 feet.

(b) Security.

(1) The design of a lift station, including all mechanical and electrical equipment, must restrict access by an unauthorized person.

(2) A lift station must include an intruder-resistant fence, or must be completely enclosed by an intruder-resistant enclosure approved in writing by the executive director.

(A) An intruder-resistant fence or intruder-resistant enclosure must be locked at each access point.

(B) An intruder-resistant fence must be at least 6.0 feet tall, and the bottom of the fence must be close enough to surface grade to prevent human access.

(C) An intruder-resistant fence must be constructed of wood, concrete, masonry, or metal. Other materials may be used, but only if approved in writing by the executive director.

(D) The top of an intruder-resistant fence must have at least three strands of barbed wire or [. A fence that is at least 8.0 feet tall does not require barbed wire. The top of an intruder-resistant fence may have [outwardly directed] iron bars spaced on four-inch centers facing away from the lift station, [instead of barbed wire] or other intruder-resistant device approved, in writing, by the Executive Director.

(3) Above-ground valves located inside or outside of an intruder-resistant fence must be chained and locked to prevent unauthorized operation. A valve does not need to be chained if the valve is located below ground or in a secure valve vault [if the valve is fully enclosed in an intruder-resistant enclosure designed to prevent unauthorized operation].

(4) Valves located above ground should be placed over a concrete pad with secondary containment and a drain which will return flow to the wet well

(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. An owner shall implement odor control measures necessary to prevent a lift station from becoming a nuisance.

§217.60. Lift Station, Wet Well, and Dry Well Designs.

(a) Pump Controls.

(1) A lift station pump must operate automatically, based on the water level in a wet well. Pump controls must be designed to prevent surcharges in the collection system and must be designed to prevent adverse effects on the operation of the wastewater treatment facility.

(2) The location of a wet well water level mechanism must ensure that the mechanism is unaffected by currents, rags, grease, or other floating materials.

(3) A wet well water level mechanism must be accessible without entering the wet well.

(4) Wet wells with a bubbler system require dual air supplies and dual controls.

(5) Motor control centers must be mounted high enough above grade, but in no case less than 4.0 inches above grade, to prevent water intrusion and corrosion from standing water in the enclosure. Motor control centers must also be protected from the entrance of corrosive gases from wet wells or piping.

(6) Electrical equipment and electrical connections in a wet well or a dry well must meet National Fire Protection Association 70 National Electrical Code® explosion prevention requirements, unless continuous ventilation is provided.

(7) Electronic wet well level control systems must also use a float switch or similar manual backup.

(8) Wet well control settings must be designed to discourage septic conditions in a lift station.

(9) Wet well control settings must be designed to prevent overloading of downstream pipes and treatment units.

(b) Wet Wells.

(1) A wet well must be enclosed by watertight and gas tight walls.

(2) A penetration through a wall of a wet well must be gas tight.

(3) A wet well must not contain equipment requiring regular or routine inspection or maintenance, unless inspection and maintenance can be done without a person 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 inside [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. Valve vaults shall be ventilated according to subsection (d) of this section.

(7) A pump must run continuously until the off-level float or other control equipment triggers the pump off condition during the pump cycle time, which begins when the pump is activated by the pump controls. Pump cycle time, based on peak flow, must equal or exceed those in the following table:

Figure: 30 TAC §217.60(b)(7)

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.4.

$$V = \frac{T \times Q}{4 \times 7.48}$$

Where:

V = Active volume (cubic feet)

Q = Pump capacity (gallons per minute)

T = Cycle time (minutes)

7.48 = Conversion factor (gallons/cubic foot)

(c) Dry well access.

(1) An underground dry well must be accessible for maintenance and shall be ventilated according to subsection (d) of this section.

(2) A stairway in a dry well must use non-slip steps and conform to Occupational Safety and Health Administration regulations with respect to rise and run.

(3) A ladder in a dry well must be made of non-conductive material and be rated for the load necessary for staff and equipment to descend and ascend.

(d) Lift Station Ventilation.

(1) Passive Ventilation for Wet Wells.

(A) Passive ventilation structures must include screening to prevent the entry of birds and insects to a wet well. The screening must be made of corrosion-resistant material.

(B) All mechanical and electrical equipment in a wet well with passive ventilation must be constructed in compliance with explosion requirements in the National Fire Protection Association 70 National Electrical Code®.

(C) A passive ventilation system must be sized to vent at a rate equal to the maximum pumping rate of a lift station, but not to exceed 600 feet per minute through a vent pipe.

(D) The minimum acceptable diameter for an air vent is 4.0 inches.

(E) All vent outlets 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 complete air exchanges per hour.

(iii) Ventilation equipment under intermittent operations must provide a minimum capacity of 30 complete air exchanges per hour and be connected to the lift station's lighting system.

(B) Wet Wells.

(i) Mechanical ventilation systems for wet wells must operate continuously.

(ii) The ventilation equipment must provide at least 12 complete air exchanges per hour and be constructed of corrosion-resistant material.

(iii) An owner shall implement odor control measures necessary to prevent a wet well from becoming a nuisance. An owner shall consider the source of potential odor, turbulence, residence time, and other factors that contribute odor at a lift station when selecting odor control measures.

(iv) All mechanical and electrical equipment in a wet well with mechanical ventilation must be constructed in compliance with explosion requirements in National Fire Protection Association 70 National Electrical Code®.

(e) Wet Well Slopes.

(1) A wet well floor must have a smooth finish and minimum slope of 10% to a pump intake.

(2) A wet well design must prevent deposition of solids, grease, and debris under normal operating conditions.

(3) A lift station with greater than 5.0 million gallons per day firm pumping capacity must have anti-vortex baffling.

(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 or Valve Pad Drains. A floor drain from a valve vault or contained valve pad 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 necessary to prevent accumulation of water from condensation and incidental leaks during peak pumping operations.

(B) A sump pump must have a submersible motor and watertight wiring.

(C) A dry well floor must slope toward the sump. A sump must include sump pumps sized to prevent accumulation of water from condensation and incidental leaks.

(D) The minimum sump depth is 6.0 inches. The sump must prevent standing water from accumulating on a dry well floor under normal operation.

(E) A sump pump must operate automatically by use of a float switch or another level-detecting device.

(2) Pipes.

(A) A sump pump must use independent piping that is capable of discharging more than the maximum liquid level of an associated wet well at a rate that will prevent overflow of the 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 for a submersible or non-submersible pump must prevent movement and vibration during operation.

(3) A submersible pump must use a rail-type pump support system with manufacturer-approved mechanisms designed to allow personnel to readily remove and replace any single pump without entering or dewatering the wet well.

(4) Submersible pump rails and lifting chains must be constructed of a material that performs to at least the standard of Series 300 stainless steel.

(5) All lift station pumps and associated appurtenances must be designed to prevent the discharge of wastewater from the lift station and at all points in the upstream collection system.

(c) Lift Station Pumping Capacity. A lift station must have at least two pumps.

The firm pumping capacity of a lift station must handle the peak flow.

(d) Pump Head Calculations.

(1) An owner must select a pump based upon analysis of the system head and pump capacity curves. The owner must determine the pumping capacities and pressure head requirements of a single pump operating alone, and with other pumps.

(2) The engineering report must include pipe head loss calculations, using the American National Standards Institute's Hydraulic Institute Standards pertaining to head losses through pipes, valves, and fittings.

(3) The engineering report must include the friction coefficient (Hazen-Williams "C" value) used in friction head loss calculations. The selected friction coefficient must be based on the pipe material.

(4) For a lift station with more than two pumps, a force main in excess of one-half mile, or a lift station with a firm pumping capacity of 100 gallons per minute or greater, the engineering report must include system curves for both the normal and peak operating conditions at friction coefficient values (C values) for the force main pipe.

(e) Flow Control.

(1) A lift station or a transfer pumping station located at or discharging directly to a wastewater treatment facility must have a peak pump capacity equal to or less than the peak flow, unless equalization is provided.

(2) Each lift station or transfer pumping station located at or discharging directly to a wastewater treatment facility with a peak flow that is greater than 300,000 gallons per day must use three or more pumps, unless duplex, automatically controlled, variable capacity pumps are used.

(3) Each lift station or transfer pumping station located at or discharging directly to a wastewater treatment facility with a peak flow that is less than or equal to 300,000 gallons per day must use at least two pumps.

(f) Self-Priming Pumps.

(1) A self-priming pump must be capable of priming without relying on a separate priming system, an internal flap valve, or any other external method for priming.

(2) A self-priming pump must use a suction pipe that produces flow with velocity of at least 3.0 feet per second but not more than 7.0 feet per second. A self-priming pump must have 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 produce a suction pipe velocity between 3.0 and 7.0 feet per second. A vacuum priming pump must have its own suction pipe.

(h) Vertical Positioning of Pumps. A raw wastewater pump must maintain positive static suction head during normal on-off cycling. A submersible pump with "no suction" pipes, a vacuum-primed pump, or a self-priming unit capable of satisfactory operation under any negative suction head anticipated for the lift station is not required to have positive static suction head during normal on-off cycling.

(i) Individual Grinder Pumps. A grinder pump, used solely in conjunction with a low-pressure alternative collection system, is not subject to the requirements of this subchapter if:

(1) the grinder pump is [not] part of an alternative collection system as defined by this chapter; and

(2) the grinder pump only serves a single connection to a wastewater collection system.

(j) Pump for Low-Flow Lift Station. A pump used for a lift station with a peak flow of less than 120 gallons per minute must be submersible and include a grinder.

§217.62. Lift Station Pipes.

(a) Horizontal Pump Suctions.

(1) Each lift station pump must have a separate suction pipe that uses an eccentric reducer.

(2) Pipes in a wet well must have a turndown-type flared intake.

(b) Valves.

(1) The discharge side of each lift station pump must be followed by a full-closing isolation valve and must also have a check valve.

(A) A check valve must be a swing type valve with an external lever or external position indicator to show its open and closed positions.

(B) An isolation valve must include an external 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 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 lift station must include a sign with the name of the wastewater treatment facility and 24-hour emergency contact information. The sign must be posted at the lift station so that it is visible and legible, with block lettering that is at least 1.5 inches tall.

(b) A lift station must be designed to prevent the discharge of wastewater from the lift station and at all points in the upstream collection system during electrical power failures.

(c) A lift station must include an audiovisual alarm system. The audiovisual alarm system must transmit alarm conditions through use of an auto-dialer system, Supervisory Control and Data Acquisition (SCADA) system, or telemetering system connected to a continuously monitored location. At a minimum, the alarm system must automatically activate to give warnings for power outages, pump failures, and high-water levels. Audiovisual alarms are not required if the SCADA system alerts the

operator about communication loss, in addition to the alarm conditions. All SCADA systems must be monitored 100% of the time (24/7/365).

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

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

(1) be in writing;

(2) be on the utility's letterhead and bear a signature of an electric utility employee who has knowledge of data about power outages;

(3) identify the location of the lift station;

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

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

(f) The executive director may consider documentation of commercial power system upgrades and their effects on the reliability of commercial power.

Documentation of upgrades and their effects on power reliability must be submitted in writing on the electric utility's letterhead and must bear the signature of an electric utility employee who has knowledge of the system upgrades.

(g) Systems for preventing the discharge of wastewater must operate for a duration at least equal to the longest power outage on record for the past 60 months, or at least 20 minutes, whichever is longer. The design must be based on peak flows, inflow, and infiltration. If the longest power outage on record for the past 60 consecutive months is greater than 48 hours and generators will be used to provide backup power, then the owner must have a contract in place that guarantees fuel supply during an emergency. The owner must also have sufficient storage capacity at the wastewater treatment facility for the fuel for the duration of the emergency.

(h) For calculation purposes, the owner must assume that the lift station wet well is full to the pump activation level when the power outage period begins.

(i) Systems for preventing discharge of wastewater may include any combination of alternate power sources, on-site generators, portable generators, gravity relief sewers, bypass pumps, collection system storage, spill containment structures, and

other systems approved in writing by the executive director. For purposes of this section, a gravity relief sewer is the part of a collection system built to manage the flow of wastewater that exceeds the capacity of the existing collection system by passively transporting the flow to a different part of the collection system or to another wastewater treatment facility.

(1) The system or combination of systems must accommodate the firm pumping capacity of the lift station.

(2) Collection system storage must not be used as a sole system for preventing unauthorized discharge of wastewater.

(3) A spill containment structure must not be used as a sole system for preventing unauthorized discharge of wastewater.

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

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

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

(5) If portable generators and pumps are used to guarantee service, the engineering report must include:

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

(B) the amount of time that will be needed to transport each generator or pump from the storage location to the furthest lift station that will be served by the generator or pump;

(C) how many lift stations each backup generator or pump serves; and

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

(j) Systems for preventing discharge of wastewater at a lift station must be permanent features of the lift station or must be deployable during any electrical power outage. Deployable systems must be operational before any unauthorized discharge occurs. The owner must describe how a temporary power system will be

deployed and operated in the engineering report, and must address deployment during all types of weather events that might reasonably cause power outage at the lift station.

(k) Spill containment structures must be able to be cleaned and must have an intruder-resistant fence that meets the requirements in §217.59(b) of this title (relating to Lift Station Site Requirements). The engineering report must include a detailed management plan for cleaning and maintaining each spill containment structure.

(l) A lift station must be fully accessible during a 25-year, 24-hour rainfall event.

(m) Lift station pump controls must prevent over-pumping and surcharge upon resumption of normal power after a power outage.

§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 pipes or fittings rated at a working pressure of less than 150 pounds per square inch is prohibited.

(c) Force main pipe materials must be identified in the 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 non-corrosive.

§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 to or greater than that of the force main pipe material.

(b) Exposed force main pipe joints must be flanged or flexible and adequately secured to prevent movement due to wastewater surges

(c) A force main joint can be comprised of a rubber gasket used in conjunction with a restraining rib

(d) [(c)] American Society for Testing and Materials, American Water Works Association, or other widely accepted national reference standards for the joints must be included in the project specifications.

§217.66. Identification of Force Main Pipes.

(a) A detectable underground warning tape must be laid in the same trench as a force main pipe. The detectable underground warning tape must be located above and parallel to the force main.

(b) The detectable underground warning tape must bear the label "PRESSURIZED WASTEWATER" continuously repeated in at least 1.5 inch tall letters.

§217.67. Force Main Design.

(a) Velocities.

(1) A force main must be a minimum of 4.0 inches in diameter, unless it is used in conjunction with a grinder pump station. The executive director may approve pipes with a diameter less than 4.0 inches where grinder pumps are used, on a case-by-case basis in writing.

(2) For a lift station with two pumps, the minimum velocity is 3.0 feet per second with one pump in operation.

(3) For a lift station with three or more pumps:

(A) the minimum velocity in a force main is 2.0 feet per second with only the smallest pump operating at full speed; and

(B) a minimum flushing velocity of 5.0 feet per second or greater must occur in a force main at least twice daily.

(4) A force main less than 4.0 inches in diameter not connected to a grinder pump is prohibited

(5) [(4)] The engineering report must certify that a pipeline with a velocity greater than 6.0 feet per second can withstand high and low negative surge pressures in the event of sudden pump failure.

(b) Detention Time.

(1) Force main detention time calculations must be included in the engineering report.

(2) 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 effective surge control measures to manage pressure due to water hammer that may exceed the working strength of a force main pipe.

(d) Connection to Gravity Main.

(1) A force main must terminate at a collection system manhole or at a manhole or preliminary treatment unit at a wastewater treatment facility.

(2) The discharge end of a force main inside a manhole must be restrained to prevent movement and must produce non-turbulent flow.

(3) A collection system receiving wastewater from a force main must be designed to accept the maximum pump discharge from the force main without surcharging.

(e) Pipe Separation. A separation distance between a force main and any water supply 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 such that the flowline of the force main entering the manhole matches the flowline of the gravity pipe leaving the manhole.

(2) A force main must be designed to abate anticipated odor. An owner shall implement odor control measures necessary to prevent a collection system from becoming a nuisance.

(g) Air Release Valves in Force Mains.

(1) Any high point along the vertical force main alignment must include an air release valve or a combination of air release and air vacuum valves.

(2) An air release valve must have an isolation valve between the air release valve and the force main.

(3) An air release valve must be inside of a vault that is at least 48 inches in diameter and has a vented access opening of at least 30 inches in diameter.

(4) An air release valve must be made of corrosion-resistant material.

(h) Valves. A force main must have valves spaced at no more than 2,000 foot intervals to facilitate initial testing and subsequent maintenance and repairs.

(i) Fatigue Life. The engineering report must include calculations that show the strength of the force main pipe at the end of the 50-year design life. The calculations must consider the fluctuations between a pressurized and depressurized operating state.

(j) Alignment Changes.

(1) Bending a segmented pipe is prohibited, unless the pipe joints are welded or heat-fused.

(2) Force main alignment changes must be accomplished using manufactured bend fittings.

(3) Force main pipe joints must include mechanical joint restraints or thrust blocks at all bends unless pipe vibration calculations justify the absence of a joint restraint or thrust block.

§217.68. Force Main Testing.

(a) The final plans and specifications must include the pressure testing procedures.

(b) A pressure test must use 50 pounds per square inch above the normal operating pressure of a force main.

(c) A temporary valve for pressure testing may be installed near the discharge point of a force main and must be removed after a test is successfully completed.

(d) A pump isolation valve may be used as an opposite termination point.

(e) A test must involve filling a force main with water.

(f) A pipe must hold the designated test pressure for a minimum of 4.0 hours.

(g) The leakage rate must not exceed 10.0 gallons per inch of diameter per mile of pipe per day. The following equation must be used to calculate the acceptable leakage rate in gallons per hour per 1,000 feet of pipe.

Figure: 30 TAC §217.68(g)

Equation C.5.

$$L = \frac{SD\sqrt{P}}{155,400}$$

Where:

L = Acceptable leakage rate (gallons/hour/1,000 feet of pipe, based on a leakage rate of 10.0 gallons per inch of diameter per mile of pipe per day)

S = Length of pipe (feet)

D = Nominal diameter of pipe (inches)

P = Average test pressure (pounds/square inch)

§217.69. Maintenance, Inspection, and Rehabilitation of the Collection System.

(a) A Capacity, Management, Operation and Maintenance (CMOM) program should be implemented to assist in maintaining a collection system. The owner of a collection system shall develop a maintenance and inspection program for its collection system with the assistance of an engineer and licensed operators. The owner is responsible for ensuring that the maintenance and inspection program includes all the information pertaining to inspection, maintenance, and rehabilitation of the collection system necessary to ensure efficient, safe, and environmentally compliant operation. The owner is also responsible for ensuring that all records pertaining to maintenance, inspection, and rehabilitation activities are maintained by the licensed collection system operators. The inspection program must include, at a minimum:

- (1) a schedule for inspections, cleaning, and maintenance;
- (2) methods for inspecting, cleaning, and maintaining each unit within the collection system;
- (3) methods for estimating the current condition and life expectancy of each unit; and
- (4) a requirement to estimate the structural integrity of each collection system unit.

(5) the date the asset was placed into service

(b) The plans and specifications for a rehabilitation project must include, at a minimum:

(1) a surface preparation plan that includes:

(A) a cleaning plan to remove all contaminants;

(B) references for the cleaning method;

(C) dewatering or bypassing provisions; and

(D) field preparation and application logs;

(2) a plan for managing volatile chemicals and dust in confined spaces;

(3) a requirement to follow the manufacturer's installation procedures and specifications;

(4) a requirement to re-inspect the rehabilitation project, including the underlayment and coating, between six months and 11 months after installation; and

(5) a requirement to re-inspect the rehabilitation project, including the underlayment and coating, 18 months after installation.

(c) The owner must maintain records of all activities related to collection system inspection, maintenance, cleaning, and rehabilitation. The records must be made available to the executive director upon request according to the requirements of §217.18 of this title (relating to Provisions that Apply to All Sections in this Chapter).

§217.70. Reclaimed Water Facilities.

A reclaimed water distribution system must provide reclaimed water of the type and quality as listed in 30 TAC Chapter 210 to all respective users of the water.

(a) In accordance with §217.6 of this title (relating to Submittal Requirements and Review Process), the design of a distribution system that will convey reclaimed water to a user must be submitted, reviewed, and approved in writing by the executive director before the distribution system may be used.

(b) A municipality may be the review authority in accordance with §217.8 of this title (relating to Municipality Reviews), and may approve a reclaimed water distribution system.

(c) A distribution system designed to transport Type II reclaimed water, as defined by §210.33(2) of this title (relating to Quality Standards for Using Reclaimed Water), must comply with this subchapter, as applicable to the project.

(d) A distribution system designed to transport Type I reclaimed water, as defined by §210.33(1) of this title must meet the requirements of subsections (e) - (j) of this section.

(e) 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). Type I reclaimed water pipe design must prevent pipe and bedding displacement.

(f) Each appurtenance designed to handle reclaimed water must be identified in the plans and the engineering report.

(1) An above-ground hose bib, spigot, or other hand-operated connection is prohibited, except in a lockable, secured area that is only accessible to authorized personnel.

(2) An underground hose bib must:

(A) be located in a locked, below-grade vault, or be operated only by a special tool in a non-lockable, underground service box;

(B) be clearly labeled "NON-POTABLE WATER, DO NOT DRINK" and "NO BEBA EL AGUA;"

(C) be purple; and

(D) be designed to prevent a connection to a standard water hose.

(3) Reclaimed water storage areas, hose bibs, and spigots must include signs in both English and Spanish reading "NON-POTABLE WATER, DO NOT DRINK" and "NO BEBA EL AGUA."

(g) 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) Backflow prevention must be provided for all potable water connections to prevent any possibility of reclaimed water entering a drinking water system according to the requirements of §217.330 of this title (relating to Drinking Water Supply Connections).

(4) Where a 4.0-foot separation distance cannot be achieved, a reclaimed water pipe must meet the requirements of subparagraph (A) of this paragraph if the reclaimed water pipe runs parallel to the potable water pipe or subparagraph (B) of this paragraph if the reclaimed water pipe crosses the potable water pipe.

(A) If a new Type I reclaimed water pipe is installed parallel to an existing potable water pipe, the reclaimed water pipe must:

(i) be located below the potable water pipe and maintain a horizontal separation distance of no less than 3.0-feet;

(ii) have a minimum pipe stiffness of 115 pounds per square inch (psi) with compatible joints, or a pressure rating of 150 psi for both pipe and joints; and

(iii) be embedded in cement stabilized sand that meets the requirements of subparagraph (D) of this paragraph.

(B) If a new Type I reclaimed water pipe crosses a potable water pipe, the design of the reclaimed water pipe must:

(i) include one full segment of reclaimed water pipe that is centered on the potable water pipe such that the joints of the reclaimed water pipe are equidistant from the center point of the potable water pipe;

(ii) cross the potable water pipe at a point that is equidistant between the joints of the potable water pipe; and

(iii) have a separation of at least six inches between the outsides of the pipes.

(C) A Type I reclaimed water pipe must have either a pressure rating of 150 psi for both pipe and joints or a pipe stiffness of at least 115 psi with compatible joints for a minimum distance of 4.0 feet in each direction, as measured perpendicularly from any point on the potable water pipe to the Type I reclaimed water pipe.

(D) All portions of reclaimed water pipe within 4.0 feet of a potable water pipe must be embedded in cement stabilized sand that:

(i) has a minimum content of 10% cement, based on loose dry weight volume;

(ii) is installed a minimum of 6.0 inches above and one quarter of the pipe diameter on either side and below a reclaimed water pipe.

(h) Site Selection of Type I Reclaimed Water Pump Stations. A design must comply with §217.59(a) - (c) of this title.

(i) 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 protected from a 100-year flood event and be protected from potential flooding from a wet well.

(B) Motor control centers must be mounted at least 4.0 inches above grade to prevent water intrusion and corrosion from standing water in the enclosure.

(2) Pumps.

(A) A pump support must prevent movement or vibration during operation.

(B) A submersible pump must use a rail-type pump support incorporating manufacturer-approved mechanisms designed to allow an operator to readily remove and replace any single pump without first entering or dewatering the wet well.

(C) Submersible pump rails and lifting chains must be made of a material that is equivalent to Series 300 stainless steel at minimum.

(3) Pump Station Valves.

(A) The discharge side of each pump must include a check valve followed by a full-closing isolation valve.

(B) Check valves must be swing type with an external lever or external position indicator to show the open and closed positions.

(C) All valve types other than rising stem gate valves must include a position indicator to show the open and closed positions.

(j) Force Main Pipe for Type I Reclaimed Water. A force main pipe for Type I reclaimed water must comply with §§217.54, 217.64, 217.65, 217.67(a) - (c) and (e), and 217.68 of this title (relating to Criteria for Laying Pipe; Materials for Force Main Pipes; Force Main Pipe Joints; Force Main Design; and Force Main Testing) and the following:

(1) A valve casing for an underground isolation valve must include "REUSE" or "NPW" cast into its lid.

(2) A force main pipe must either be purple in color or be contained in an 8.0 mils thick purple polyethylene sleeve conforming to American Water Works Association C105, Class C. In-line isolation valves for reuse pipes must open clockwise to distinguish them from potable water isolation valves.

§217.71. 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.

§217.72 Reclaimed Water Pressure Planes

- (a) A reclaimed water distribution system may consist of one or more pressure planes to provide reclaimed water to users. The minimum required pressure at all points within the distribution network is 35 psi at flowrates of at least 1.5 gpm per connection can be achieved and maintained through the use of elevated storage tanks, service pumps taking suction from ground storage tanks, and booster pumps taking suction directly from distribution
- (b) The minimum required capacity of the storage tanks and pumps will depend on the number of connections a pressure plane services and the maximum/peak daily demand
- (c) When a reclaimed water system is intended to provide water for fire fighting capability is must also be designed to maintain a minimum pressure of 20 psi under combined fire fighting and standard reclaimed water use

§217.73 Reclaimed Water Distribution System Design

- (a) Minimum reclaimed waterline sizes depend on the number of reclaimed water service connections
- (b) The minimum pressure of 35 psi must be maintained at all points the distribution system at flowrates of at least 1.5 gpm per connection
- (c) Air release devices must be installed in the distribution system at all points where topography or other factors may create air locks in the lines. Air release devices shall be installed in such a manner as to preclude the possibility of submergence entrance of contaminants.

§217.74 Looping and Dead-End Flushing

- (a) Reclaimed water distribution systems shall be designed to maintain effective circulation of the reclaimed water with minimum dead ends.
- (b) All dead-ends mains shall be provided with acceptable flush valves and discharge piping
 - (1) All dead ends less than two inches in diameter will not require flush valves if the end at a customer service
 - (2) Where dead ends are necessary as a stage in the system growth they shall be located and arranged to ultimately connect the ends to provide circulation

- (c) Dead-end mains must be flushed at monthly intervals
- (d) Dead-end lines and other mains shall be flushed as needed when reclaimed water quality complaints are received from customers
- (e) All flushing of reclaimed water lines must be done so that the flush water enters sanitary sewer lines

§217. 75 Additional Disinfection of Reclaimed Water Systems

- (a) All reclaimed water provided for end use must be of the type and quality as indicated in 30 TA Chapter 210 requirements
 - (1) Testing of the reclaimed water quality should be performed throughout the entire reclaimed water distribution
 - (2) To ensure reclaimed water quality addition disinfection must be used as needed
 - A. Additional chlorination injection station should be placed throughout the system as needed to ensure that the required chlorine residual and reclaimed water quality is maintained
 - B. Chlorine at injection stations should be handled as indicated in Section 324 of this Chapter

SUBCHAPTER D: ALTERNATIVE COLLECTION SYSTEMS

§§217.90 – 217.100

Statutory Authority

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

Note: The **1st paragraph** of a Statutory Authority should state what the rules are proposed "under the authority of," and the **2nd paragraph** should list (no titles) any bills, statutes (state or federal) the rules implement.]

RULE OF THUMB: for existing rules/sections, language must have been downloaded from 30 Texas Administrative Code as this is the *official* version of the rules.

- **NEW language:** to designate language that is *new* to 30 TAC, you **must** underline new language that does *not* currently exist in TAC, including punctuation
- **Delete existing language:** to designate existing language in 30 TAC that is *obsolete, no longer required/needed*, [you **must** place that language between brackets] in order to show deletion of that language from 30 TAC
- new language before [old language]

§217.90. Applicability.

This subchapter applies to the design, construction, operation, maintenance, and testing standards for alternative collection systems. Conventional collection systems and reclaimed water conveyance systems are covered in Subchapter C of this chapter (relating to Conventional Collection Systems). This subchapter does not apply to individual private grinder pumps or septic tank effluent pumps that discharge

directly into a conventional collection system and are not part of an alternative collection system.

§217.91. Edwards Aquifer.

An owner who plans to install an alternative collection system located over the recharge zone of the Edwards Aquifer, as "recharge zone" is defined in §213.3 of this title (relating to Definitions), must design and install the alternative collection system in accordance with Chapter 213 of this title (relating to Edwards Aquifer) in addition to this subchapter. The completed alternative sewage collection system (SCS) design and Water Pollution Abatement Plan (WPAP) must be submitted to the Edwards Aquifer Protection Program (EAPP) for review and approval.

§217.92. Component Sizing.

(a) The components of an alternative collection system must be sized based on existing flow data from a system and service area with similar characteristics, if such data is available. Similar characteristics for sizing alternative collection systems include:

(1) location;

(2) inflow and infiltration characteristics;

(3) peak flows;

(4) pipe materials;

(5) customer base, including sources of wastewater and percent contribution from the wastewater sources; and

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

(b) If flow data from a similar service area with a conventional collection system is used, the engineering report must include the expected effects of inflow and infiltration on the peak flow of the conventional collection system.

(c) Design and construction of an alternative collection system must minimize excess flows from inflow and infiltration.

(d) Roof drains, street drains, or other types of drains that allow entrance of stormwater into an alternative collection system are prohibited.

(e) In the absence of existing data, the sizing of on-site components in an alternative collection system must be based on Table B.1. in Figure: 30 TAC §217.32(a)(3) of this title (relating to Organic Loadings and Flows for New Wastewater Treatment Facilities), 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 (gallons per minute)

A = Design coefficient, typically 0.5

N = Number of equivalent dwelling units served by the off-site component

B = Safety factor, assumed to be 20.0

(1) An equivalent dwelling unit (EDU) is assumed to have an occupancy of 3.5 people. For EDU populations 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 (gallons per minute)

A₁ = Derived from A in Equation D.2. in Figure: 30 TAC §217.92(f), 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 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 that specifies 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 collection system.

(c) An owner shall certify by letter to the executive director that the requirements in subsection (b) of this section have been met. The letter must include the permit number and name(s) of the owner(s) of the associated wastewater treatment facility.

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

(e) A manhole must not be located in the flow path of a watercourse, or in an area where surface water accumulates.

(f) An alternative collection system must discharge to a wastewater treatment facility that is permitted by the commission or to a collection system that flows to a wastewater treatment facility permitted by the commission.

§217.94. Maintenance and Inspection Program.

An alternative collection system owner shall develop and implement a maintenance and inspection program in accordance with §217.69 of this title (relating to Maintenance, Inspection, and Rehabilitation of the Collection System).

§217.95. Alternative Collection System Service Agreements.

(a) An alternative collection system service agreement must be executed between the alternative collection system owner and each real property owner served by the alternative collection system. The service agreement must authorize the collection system owner to place and maintain alternative collection system components on the real property owner's property.

(b) An alternative collection system service agreement must identify the owner of the on-site components and specify the responsible party for the construction and maintenance of the on-site components.

(c) An alternative collection system owner shall submit a copy of the alternative collection system service agreement to the executive director with the summary transmittal letter required in §217.6 of this title (relating to Submittal Requirements and Review Process), for the executive director to review.

(d) An alternative collection system service agreement must include:

(1) a requirement that the alternative collection system owner shall ensure that all existing alternative collection system components and building laterals that will be incorporated into a new or altered alternative collection system must be cleaned, inspected, tested, maintained, altered, or replaced, as necessary, to the

satisfaction of the collection system owner before connecting the alternative collection system component to the collection system;

(2) a requirement that the alternative collection system owner shall approve all materials and equipment before incorporating the materials and equipment into any construction or maintenance of an alternative collection system component;

(3) a requirement that the alternative collection system owner shall have an engineer inspect and approve the installation of all new or replacement alternative collection system components before placing the system into service;

(4) a provision that the alternative collection system owner shall have access at all reasonable times to inspect on-site alternative collection system components;

(5) a provision that the alternative collection system owner has the right to make an emergency repair and perform emergency maintenance to any alternative collection system component, including building laterals and on-site collection system components;

(6) a statement of whether the alternative collection system owner or the property owner is responsible for non-emergency maintenance of on-site components;

(7) a statement of whether the alternative collection system owner or the property owner is responsible for paying maintenance costs for on-site components, or how the costs to each party will be determined if responsibility is shared;

(8) a statement of whether the collection system owner or the property owner is responsible for paying the electrical power cost of operating an on-site component, or how the costs to each party will be determined if responsibility is shared;

(9) a payment method, including a payment schedule, for the alternative collection system owner to recover costs paid by the alternative collection system owner that the property owner is responsible for paying;

(10) a payment method, including a payment schedule, for the property owner to recover costs paid by the property owner that the alternative collection system is responsible for paying;

(11) a provision that authorizes the alternative collection system owner to inspect and approve pretreatment units before installation;

(12) a requirement that an on-site component owned by the alternative collection system owner must have an upstream isolation valve;

(13) a requirement that an on-site component must have a service isolation valve located downstream on a service pipe from an on-site component to the collection system;

(14) a provision that service isolation valves must be accessible to the alternative collection system owner at all times, through an easement or other legal agreement or contract between the property owner and the alternative collection system owner; and

(15) a provision that the alternative 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 according to §285.32(b)(1) of this title (relating to Criteria for Sewage Treatment Systems).

(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 on the criteria in Chapter 285 of this title (relating to On-Site Sewage Facilities).

(3) The volume of a multiple equivalent dwelling unit (MEDU) interceptor tank 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 ADF)

VCZ = Volume in gallons of the clear zone between maximum sludge depth and scum accumulation (1.0 ADF)

VSO = Volume in gallons dedicated to scum and sludge storage (1.85 ADF)

(b) Pretreatment units.

(1) A non-residential contributor to an alternative collection system 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 be at least 60% of the total tank volume.

(4) 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 at least twice the pretreatment unit's flow capacity, in gallons per minute. The FOG retention capacity of a grease trap is the amount of FOG that it can hold before its efficiency drops below 90%.

(6) Plumbing for a pretreatment unit must be designed to prevent wastes, other than FOG, from entering the pretreatment unit.

(7) A pretreatment unit must be designed to allow monitoring of the sludge and FOG levels.

(c) Service pipe design.

(1) Pipe materials used for service pipe must meet or exceed the performance characteristics of American Society for Testing and Materials (ASTM) D 2241 Class 200 polyvinyl chloride (PVC) pipe.

(2) An interceptor tank must include a pumping unit if the interceptor tank's outlet elevation is below the main pipe elevation or if the hydraulic grade line is within a depressed section of a main pipe.

(3) A service pipe for an EDU or MEDU must be sized to transport the highest flow expected from the building, but must not be less than 2.0 inches in diameter.

(4) The diameter of a service pipe must be no greater than the diameter of the collection pipe it is connected to.

(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;

(C) provides an unobstructed flow way; and

(D) is a swing type valve with an external position indicator to show the open and closed positions.

(d) Collection system design.

(1) Hydraulic design.

(A) A small diameter effluent sewer (SDES) system with open channel flow must use a design depth of flow of 100% of the pipe diameter.

(B) The minimum flow velocity in a collection pipe must be no less than 1.0 foot per second (fps).

(C) The maximum flow velocity in any portion of an SDES system is 8.0 fps without thrust restraint and 13.0 fps with thrust restraint.

(D) The engineering 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 engineering 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 engineering 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 an 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 peak flow.

(B) Venting must be provided upstream and downstream of pipe segments that are below the hydraulic grade line.

(C) The pipes must have a uniform profile (i.e., no abrupt or sharp changes in vertical direction).

(D) A 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.

(3) Odor Control. A collection pipe must have permanent odor control devices attached to the line and must prevent nuisance odors. Odor control devices must be accessible for maintenance.

§217.97. Pressure Sewers.

(a) Pumps. A pressure sewer system must include a grinder pump or a septic tank effluent pump (STEP).

(b) Exceptions. Except where this section specifically states otherwise, the requirements of this section apply to both grinder pumps and STEPs.

(c) Service Pipe Requirements.

(1) A pressure sewer service pipe that is buried less than 30 inches below ground must incorporate a check valve and a fully closing gate or ball valve at the junction of a collection pipe and a service pipe to allow isolation of the service pipe.

(2) A check valve must allow an unencumbered flow when fully open.

(3) A valve must be made of corrosion-resistant material and must have a position indicator to show its open and closed position.

(4) The minimum size service pipe for an equivalent dwelling unit (EDU) is 1.25 inches.

(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 to which it is connected.

(8) Material used in a service pipe must have performance characteristics that are at least equivalent to 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 engineering report must include an analysis that justifies the size of 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 engineering report must include an analysis that justifies the size of the selected pumps.

(4) The calculations in the engineering report must show that all lift stations and pump chambers are protected against buoyancy forces.

(5) Control panels for all pumps must be at least 2.0 feet above the ground floor elevation of the structure being served by the equipment.

(6) All pipes and appurtenances within a wet well must be corrosion-resistant.

(7) A wet well must include an audiovisual alarm system.

(A) An alarm for an EDU must activate at the high water level specified in the engineering report, plans, or specifications for the project.

(B) An alarm for an MEDU must activate in the event of unit failure or a high water level.

(8) An EDU wet well must have a reserve volume of at least 100 gallons after the activation of a high water alarm.

(9) The reserve volume of an MEDU wet well must equal the volume accumulated during an average two-hour period or 100 gallons, whichever is greater.

(10) A pump located in a STEP chamber that is integrated with an interceptor tank may use the reserve volume of the interceptor tank for the required reserve volume.

(11) A housing that contains mechanical equipment or controls must be watertight if immersion of the mechanical equipment or controls would cause failure.

(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 Fire Protection Association 70 National Electrical Code®.

(13) STEP system equipment.

(A) A pump used in a STEP system may be housed either in an interceptor tank or in a separate stand-alone unit.

(B) A pump housed in the interceptor tank of a STEP system must be located in separate chamber from the influent chamber.

(C) The water level in a STEP system pump chamber must not affect the water level in the interceptor tank, to prevent the disturbance of settleable and floatable solids in the interceptor tank.

(D) A design that allows a variable liquid elevation in an interceptor tank is prohibited.

(14) Housing for on-site mechanical equipment and any associated control mechanisms must be:

- (A) lockable and 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 at 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) The velocity of wastewater in a grinder pump pressure system main pipe must not be less than 2.0 feet per second nor 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. The use of a "C" factor greater than 140 is prohibited.

(5) 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 either elastomeric pipe joints or gasketed joints with a restraining rib.

(8) A pumping unit affected by less than full flow conditions must incorporate an anti-siphon device.

(9) 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 an area of unstable soil; and
- (D) maximum intervals of 2,500 feet.

(10) 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.

(11) Each peak in elevation and each location where air may accumulate due to a difference in flow conditions requires a wastewater air release valve.

(A) A valve orifice must be at least 0.25 inches in diameter.

(B) An air release valve within 50 feet of a residence or building must control odor. An owner shall implement odor control measures necessary to prevent a collection system from becoming a nuisance.

(12) 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 a non-conforming 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 constructed using pipe material that has performance characteristics at least equivalent 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] pits and vaults 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 on the lateral line.

(6) A vacuum valve must have a minimum capacity of 30 gallons per minute.

(7) A service pipe must be at least 3.0 inches in diameter.

(8) The performance characteristics of a service pipe must meet or exceed the performance characteristics of ASTM D 2241 Class 200 PVC pipe.

(9) A service pipe joint must be made using either vacuum-rated elastomeric gasket or solvent welding.

(10) A vacuum valve and a main pipe must be separated by at least 5.0 feet of service pipe.

(11) If there is a vertical profile change in a service pipe, the vacuum sewer system must have at least 5.0 feet between the vacuum valve and the first profile change, and between the last profile change and the main pipe.

(12) A service pipe must have a minimum slope of 0.2%.

(13) The connection of a service pipe to a main pipe must use a wye and a long radius elbow, oriented so that the invert of the service pipe is higher than the crown of the collection pipe, and must not be located within 6.0 feet of a collection pipe vertical profile change.

(c) Vacuum Sewer System Design.

(1) The performance characteristics of a pipe in a vacuum sewer must meet or exceed the performance characteristics of ASTM D 2241 Class 200 PVC pipe.

(2) A pipe joint must have a vacuum-rated rubber gasket and [or] be solvent welded or held with a restraining rib.

(3) A pipe in a vacuum sewer must be at least 4.0 inches in diameter. A service pipe must be at least 3.0 inches in diameter.

(A) The length of a 4.0 inch diameter vacuum pipe must not exceed 2,000 feet.

(B) The maximum length of a pipe larger than 4.0 inches in diameter must be determined by the amount of friction and lift head loss.

(4) The total available head loss from the farthest input point in a system is 18 feet, consisting of 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 designed to balance pressures within the system. A pipe must have a saw-tooth profile that slopes toward a vacuum station.

(6) The design of an upgrade main line transport pipe must reduce the risk of blocking a pipe with trapped sewage.

(7) A collection pipe that is depressed in order to avoid an obstruction must have at least a 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, at both sides of an area of unstable soil, and at intervals of no more than 1,500 feet.

(A) A division valve must be either a plug valve or a resilient-seated gate valve capable of sustaining a vacuum of 24 inches of mercury.

(B) A gauge tap must be located downstream of each 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.

$$Q_{vp} = \frac{A \times Q_{max}}{7.5g/cf} + B \times N$$

Where:

Q_{vp} = Minimum vacuum pump capacity

A = Variable based on pipe length

Q_{max} = Station peak flow (gallons per minute)

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 be capable of evacuating the system to restore the design vacuum pressure in less than 180 seconds.

(2) The vacuum system must include duplicate vacuum pumps. Each vacuum pump must be capable of delivering 100% of the required airflow and be capable of operating continuously.

(3) A vacuum pump may be either liquid-ring or sliding-vane type. Liquid-ring pumps must be sized at least 15% larger than the necessary vacuum pump capacity.

(4) The transfer pipe must have an electrically or pneumatically controlled plug valve between the collection tank and the reservoir to prevent carryover 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) equipped with 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 the required net positive suction head for the expected vacuum operating range.

(6) The pump suction pipe must be sized 2.0 inches larger than the discharge pipe to prevent wastewater from forming a vortex in the collection tank.

(7) The pump design calculations and pump curves must be included in the engineering report.

(g) Vacuum Reservoir.

(1) A vacuum system that requires a collection tank of 1,600 gallons or more must also include a vacuum reservoir tank with a capacity of at least 400 gallons.

(2) Liquid from a vacuum pump must be piped to the top of the vacuum reservoir tank.

(3) A vacuum reservoir tank must include internal access for periodic cleaning and inspection.

(4) All main pipes must connect to the collection tank.

(5) The wastewater pump suction pipe must lie at the lowest point on the collection tank and away from the main pipe inlet.

(6) The main pipe must enter at the top of the collection tank with the inlet elbows inside the tank turned at an angle away from the pump suction opening.

(7) The collection tank must include probes for liquid level sensing for operation of the discharge pumps.

(8) A vacuum pump must include automatic vacuum switch controls, which must operate based on the liquid level in the reservoir tank.

(9) The collection tank and low system vacuum must include an audiovisual alarm for high liquid level.

(h) An owner shall include a description of the alternative collection system's anti-corrosive protection in the engineering report.

§217.99. Testing Requirements.

(a) Components of an alternative 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 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 (Small Diameter Effluent Sewer (SDES))	Hydrostatic head test for pipe (HHP)
Collection Pipe (Pressure)	PLT
Collection Pipe (SDES)	Low pressure air test for pipe 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 below the specified maximum limits.

(c) Hydrostatic Head Test for Tanks. The test consists of filling the tank to the top and holding the water for 24 hours to determine whether the tank is leaking.

(1) The hydrostatic head test must demonstrate that the tank is not leaking before the placement of backfill around a tank.

(2) The hydrostatic head test for a tank constructed from flexible or semi-rigid material is required after placement and backfilling according to the tank manufacturer's recommendations.

(d) Low-Pressure Air Test. The low-pressure air test must conform to the requirements of §217.57 of this title (relating to Testing Requirements for Installation of Gravity Collection System Pipes).

(e) Pressure Pipe Test.

(1) The test pressure must be a minimum of 25 pounds per square inch or 1.5 times the maximum pipe design pressure, whichever is larger. The maximum allowable leakage must be calculated using 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), gauge

(2) If the leakage exceeds the maximum amount calculated, the owner shall take remedial action to reduce the leakage to an amount within the allowable limit from paragraph (1) of this subsection.

(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 five minutes.

(3) A tank constructed of flexible or semi-rigid material must not allow more than a 3% change in tank dimensions in any direction while under vacuum.

(4) If the quantity of vacuum loss or if tank deformation equals or exceeds the maximum quantity specified in paragraph (2) of this subsection, then the owner shall take remedial action to reduce the amount of vacuum loss or amount of deformation to comply with this subsection.

§217.100. Termination.

(a) An alternative collection system must terminate at a wastewater treatment facility or into a manhole that is part of a conventional collection system.

(b) Release of gases must be controlled by minimizing turbulence in the discharge into a manhole.

(c) An alternative collection system that terminates at a wastewater treatment facility must discharge below the liquid level at the headworks or the influent lift station.

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