SUBCHAPTER C: CONVENTIONAL COLLECTION SYSTEMS
§§217.51 - 217.70
Effective August 28, 2008

§217.51. Applicability.

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

Adopted August 6, 2008 Effective August 28, 2008

§217.52. Edwards Aquifer.

An owner who plans to install a wastewater collection system located over the Edwards Aquifer recharge zone must design and install the system in accordance with Chapter 213 of this title (relating to Edwards Aquifer), in addition to these rules.

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§217.53. Pipe Design.

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

(1) An owner must design a wastewater collection system to handle the transport of the peak dry weather flow from the service area, plus infiltration and inflow.

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

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

(b) Gravity Pipe Materials.

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

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

(A) the characteristics of the wastewater conveyed;

(B) the character of industrial wastes;

(C) the possibility of septic conditions;

(D) the exclusion of inflow and infiltration;

(E) any external forces;

(F) any groundwater;

(G) the internal pressures; and

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

(c) Joints for Gravity Pipe.

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

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

(A) include rubber gaskets;

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

(C) include high density polyethylene compression joints

(D) be welded;

(E) be heat fused; or

(F) include other types of factory-made joints.

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

(d) Separation distances between public water supply pipes and wastewater collection system pipes or manholes.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(I) A minimum separation distance is two feet.

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

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

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

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

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

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

(-a-) centered on the crossing;

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

(-c-) at least 18 feet long;

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

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

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

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

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

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

(1) include a manufactured fitting that limits infiltration;

(2) prevent protruding service lines; and

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

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

(g) Corrosion potential.

(1) If a pipe or an integral structural component of a pipe will deteriorate when subjected to corrosive internal conditions or if a pipe or component does not have a corrosive resistant liner installed by the pipe manufacturer, the report must demonstrate the structural integrity of a pipe during the minimum 50-year design life cycle.

(2) A pipe must have an appropriate lining if the corrosion analysis indicates that corrosion will reduce the functional life of the pipe to less than 50 years.

(h) Odor Control.

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

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

(i) Active Geologic Faults.

(1) An owner shall identify any active faults within the area of a collection system and minimize the number of collection system lines crossing faults.

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

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

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

(ii) manholes on each side of the fault so that a portable pump may be used in the event of a wastewater collection system failure.

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

(j) Capacity Analysis.

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

(2) An owner must include in the report the calculations that demonstrate that the hydraulic capacity of a collection system includes the peak flow of domestic sewage, peak flow of waste from industrial sites, and maximum infiltration rates.

(3) A collection system must be designed to prevent a surcharge in any pipe at the expected peak flow.

(4) The minimum diameter allowed for a gravity pipe is 6.0 inches.

(5) Connecting storm water drains to a collection system is prohibited.

(6) An owner may use the data from an existing collection system. In the absence of existing data, a design must use data from a similar system or as described in paragraph (7) of this subsection.

(7) New collection systems.

(A) The sizing of pipe for a new collection system must be based on an engineering analysis of initial and future flows.

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

(k) Structural Analysis.

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

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

(A) live load calculations;

(B) allowable buckling pressure determinations;

(C) prism load calculations;

(D) wall crushing determinations;

(E) strain prediction calculations;

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

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

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

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

(iii) modulus of elasticity,

(iv) tensile strength,

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

(vi) Leonhardt's zeta factor;

(vii) trench width;

(viii) depth of cover;

(ix) water table elevation; and

(x) unit weight of soil.

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

Equation B.1.

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

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

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

(A) open trench design;

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

(C) buried 17 feet or less;

(D) diameter of 12 inches or less;

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

(F) no effects on a pipe due to live loads;

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

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

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

(l) Minimum and Maximum Slopes.

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

(2) Absent site-specific data, a collection system must be designed in accordance with the minimum and maximum slopes specified in this paragraph.

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

Table C.1 - Minimum and Maximum Pipe Slopes

Size of Pipe *(inches)*	**Minimum Slope** *(%)*	**Maximum Slope** *(%)*
6	0.50	12.35
8	0.33	8.40
10	0.25	6.23
12	0.20	4.88
15	0.15	3.62
18	0.11	2.83
21	0.09	2.30
24	0.08	1.93
27	0.06	1.65
30	0.055	1.43
33	0.05	1.26
36	0.045	1.12
39	0.04	1.01
>39	*	*

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

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

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

(B) If a velocity greater than 10 feet per second will occur when a pipe flows full, based on Manning’s formula, shown in the following figure, and an "n" value of 0.013, special provisions must protect against pipe and bedding displacement.

Equation C.2. Manning's Formula.

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

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

(m) Alignment.

(1) A gravity collection system must be laid with a uniform grade between manholes.

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

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

(4) The calculations for horizontal pipe curvature and the detail of the proposed curvature on the plans must be included in the report.

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

(A) equal to 5 degrees;

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

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

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

(n) Inverted Siphons and Sag Pipes.

(1) A sag pipe must include:

(A) two or more barrels;

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

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

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

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

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

(5) A system must allow any barrel to be taken out of service for cleaning.

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

(7) Sag pipe must be designed to minimize nuisance odors.

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

(o) Bridged Sections.

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

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

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

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

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

§217.54. Criteria for Laying Pipe.

(a) Pipe Embedment.

(1) A rigid pipe must be laid with the adequate bedding, haunching, and initial backfill to support the anticipated load. The bedding classes that are allowed are A, B, or C, as described in American Society for Testing and Materials (ASTM) C 12, American National Standards Institute (ANSI) A 106.2,Water Environment Federation Manual of Practice No. 9 or American Society of Civil Engineers (ASCE) MOP 37.

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

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

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

(5) If trenching encounters significant fracture, fault zones, caves, or solutional modification to the rock strata, an owner must halt construction until an engineer prepares a written report detailing how construction will accommodate these site conditions.

(b) Compaction.

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

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

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

(c) Envelope Size.

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

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

(d) Trench Width.

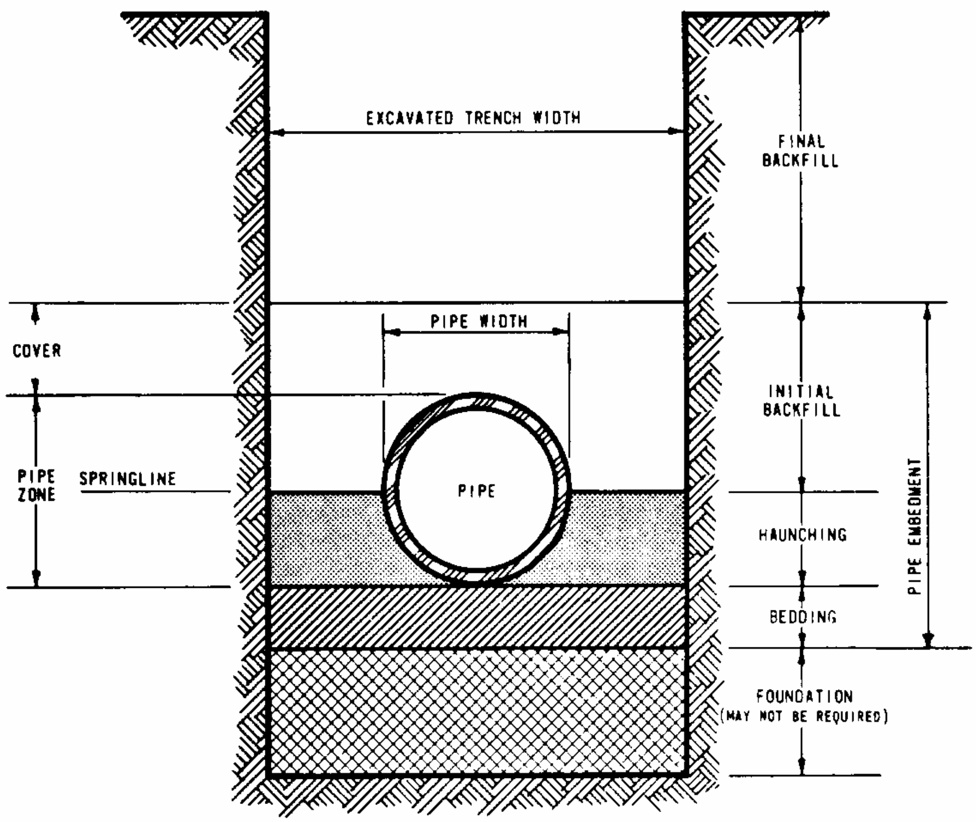
(1) The width of a trench must allow a pipe to be laid and jointed properly and must allow the backfill to be placed and compacted as needed.

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

(3) The width of a trench must be sufficient to properly and safely place and compact haunching materials.

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

TRENCH CROSS-SECTION SHOWING TERMINOLOGY



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§217.55. Manholes and Related Structures.

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

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

(2) at the intersection of all pipes; and

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

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

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

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

(e) A manhole must be made of monolithic, cast-in-place concrete, fiberglass, pre-cast concrete, high-density polyethylene, or equivalent material that provides adequate structural integrity.

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

(g) Manholes may be spaced no further apart than the distances specified in the following table for a wastewater collection system with straight alignment and uniform grades, unless a variance based on the availability of cleaning equipment that is capable of servicing greater distances is granted by the executive director.

Table C.2. - Maximum Manhole Spacing

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

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

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

(j) A manhole must not be located in the flow path of a watercourse, or in an area where ponding of surface water is probable.

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

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

(1) Manhole Covers.

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

(B) A manhole located within a 100-year flood plain must have a means of preventing inflow.

(C) A manhole cover construction must be constructed of impervious material.

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

(2) Manhole Inverts.

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

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

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

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

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

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

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

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

(m) The inclusion of steps in a manhole is prohibited.

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

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

(1) Vent design must minimize inflow;

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

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

(p) Cleanouts. The size of a cleanout must be equal to the size of the wastewater collection system main.

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§217.56. Trenchless Pipe Installation.

(a) The following trenchless technologies may be used for installation of new wastewater collection system pipe:

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

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

(3) microtunneling, which is a remotely controlled mechanical tunneling system where the spoil is removed from the cutting head within the new pipeline, which is advanced by pipe jacking. The cutting head must have the appropriate cutting tools and crushing devices for the range of gravels, sands, silts, and clays that may be found at the collection system site.

(b) The following trenchless technologies may be used for replacement of wastewater collection system pipe:

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

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

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

(c) The following trenchless technologies may be used for lining of existing wastewater collection system pipe, which reduces the inside diameter of the pipe:

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

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

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

(4) sliplining, by which continuous or discreet pipes are inserted within existing pipes.

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

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

(f) The report must include the following;

(1) the trenchless method;

(2) the type of pipe;

(3) the type(s) of soil;

(4) the pipe length and diameter;

(5) pipe slope;

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

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

(8) the pipe standard.

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

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

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

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

(1) Low Pressure Air Test.

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

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

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

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

Equation C.3.

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

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

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

Table C.3. - Minimum Testing Times for Low-Pressure Air Test

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

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

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

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

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

(2) Infiltration/Exfiltration Test.

(A) The total exfiltration, as determined by a hydrostatic head test, must not exceed 50 gallons per inch of diameter per mile of pipe per 24 hours at a minimum test head of 2.0 feet above the crown of a pipe at an upstream manhole.

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

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

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

(E) If the quantity of infiltration or exfiltration exceeds the maximum quantity specified, an owner shall undertake remedial action in order to reduce the infiltration or exfiltration to an amount within the limits specified. An owner shall retest a pipe following a remediation action.

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

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

(A) Mandrel Sizing.

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

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

(iii) All dimensions must meet the appropriate standard.

(B) Mandrel Design.

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

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

(iii) A barrel section length must equal at least 75% of the inside diameter of a pipe.

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

(C) Method Options.

(i) An adjustable or flexible mandrel is prohibited.

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

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

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

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

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

(5) Gravity collection system pipe deflection must not exceed five percent (5%).

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

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

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

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

Adopted August 6, 2008 Effective August 28, 2008

§217.58. Testing Requirements for Manholes.

(a) All manholes must pass a leakage test.

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

(1) Hydrostatic Testing.

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

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

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

(2) Vacuum Testing.

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

(B) No grout must be placed in horizontal joints before testing.

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

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

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

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

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

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

Adopted August 6, 2008 Effective August 28, 2008

§217.59. Lift Station Site Requirements.

(a) Site access.

(1) A lift station design must include an access road located in a dedicated right-of-way or a permanent easement.

(2) A road surface must have a minimum width of 12 feet and must be constructed for use in all weather conditions.

(3) A road surface must be above the water level caused by a 25-year rainfall event.

(b) Security.

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

(2) A lift station must include an intruder-resistant fence, enclosure, or a lockable structure.

(3) An intruder-resistant fence must use a minimum of a 6.0 feet high chain link, masonry, or board fence with at least three strands of barbed wire or 8.0 feet high chain link, masonry, or board fence with at least one strand of barbed wire.

(c) Flood Protection. The design of a lift station, including all electrical and mechanical equipment, must be designed to withstand and operate during a 100-year flood event, including wave action.

(d) Odor Control. The design of a lift station must minimize potential odor. An owner shall include any design for odor control in the report.

Adopted August 6, 2008 Effective August 28, 2008

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

(a) Pump Controls.

(1) A lift station pump must operate automatically, based on the water level in a wet well.

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

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

(4) Wet well controls with a bubbler system require dual air supply and dual controls.

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

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

(b) Wet Wells.

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

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

(3) A wet well must not contain equipment requiring regular or routine inspection or maintenance, unless inspection and maintenance can be done without staff entering the wet well.

(4) A gravity pipe discharging to a wet well must be located so that the invert elevation is above the liquid level of a pump's "on" setting.

(5) Gate valves and check valves are prohibited in a wet well.

(6) Gate valves and check valves may be located in a valve vault next to a wet well or in a dry well.

(7) Pump cycle time, based on peak flow, must equal or exceed those in the following table:

Table C.4. - Minimum Pump Cycle Times

Pump Horsepower	**Minimum Cycle Times** *(minutes)*
< 50	6
50-100	10
> 100	15

(8) An evaluation of minimum wet well volume requires the following formula:

Equation C.5.

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

Where:
V = Active volume (cubic feet)
Q = Pump capacity (gallons per minute)
T = Cycle time (minutes)
7.48 = Conversion factor (gallons/cubic foot)

(c) Dry well access.

(1) An underground dry well must be accessible.

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

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

(d) Lift Station Ventilation.

(1) Passive Ventilation for Wet Wells.

(A) Passive ventilation structures must include screening to prevent the entry of birds and insects to a wet well.

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

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

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

(E) A vent outlet must be at least 1.0 foot above a 100-year flood plain elevation.

(2) Mechanical Ventilation in Lift Stations.

(A) Dry Wells.

(i) A dry well must use mechanical ventilation.

(ii) Ventilation equipment under continuous operation must have a minimum capacity of six air exchanges per hour.

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

(B) Wet Wells.

(i) A wet well must use continuous mechanical ventilation.

(ii) The ventilation equipment must have a minimum capacity of 12 air exchanges per hour and be constructed of corrosion resistant material.

(iii) The design of a wet well must reduce odor potential in a populated area.

(e) Wet Well Slopes.

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

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

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

(f) Hoisting Equipment. A lift station must have permanent hoisting equipment or be accessible to portable hoisting equipment for removal of pumps, motors, valves, pipes, and other similar equipment.

(g) Valve Vault Drains. A floor drain from a valve vault to a wet well must prevent gas from entering a valve vault by including flap valves, "P" traps, submerged outlets, or a combination of these devices.

(h) Dry Well Sump Pumps.

(1) Pumps.

(A) A dry well must use dual sump pumps, each with a minimum capacity of 1,000 gallons per hour and capable of handling the volume of liquid generated during peak operations.

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

(C) A dry well floor must slope toward a sump sized for proper drainage.

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

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

(2) Pipes.

(A) A sump pump must use separate pipes capable of discharging more than the maximum liquid level of an associated wet well.

(B) A sump pump outlet pipe must be at least 1.5 inches in diameter and have at least two check valves in series.

Adopted August 6, 2008 Effective August 28, 2008

§217.61. Lift Station Pumps.

(a) General Requirements. A raw wastewater pump, with the exception of a grinder pump, must:

(1) be designed to prevent clogging;

(2) be capable of passing a sphere of 2.5 inches in diameter or greater; and

(3) have greater than 3.0 inch diameter suction and discharge openings.

(b) Submersible and Non-submersible Pumps.

(1) A non-submersible pump must have inspection and cleanout plates on both the suction and discharge sides of each pumping unit that facilitate locating and removing blockage-causing materials, unless the pump design accommodates easy removal of the rotation elements.

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

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

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

(c) Lift Station Pumping Capacity. The firm pumping capacity of a lift station must handle the expected peak flow.

(d) Pump Head Calculations.

(1) An owner shall select a pump based upon analysis of the system head and pump capacity curves that determine the pumping capacities alone and with other pumps as the total dynamic-head increases due to additional flows pumped through a force main.

(2) The pipe head loss calculations, using the Hydraulic Institute Standards, pertaining to head losses through pipes, valves, and fittings, must be included in the report.

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

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

(e) Flow Control.

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

(2) A wastewater treatment system with a peak flow that is greater than 300,000 gallon per day must use three or more pumps, unless duplex, automatically controlled, variable capacity pumps are provided.

(f) Self-Priming Pumps.

(1) A self-priming pump must be capable of priming without reliance upon a separate priming system, an internal flap valve, or any external means for priming.

(2) A self-priming pump must use a suction pipe velocity at least 3.0 feet per second but not more than 7.0 feet per second, and must incorporate its own suction pipe.

(3) A self-priming pump must vent air back into the wet well during priming.

(g) Vacuum-Priming Pumps.

(1) A vacuum-primed pump must be capable of priming by using a separate positive priming system with a dedicated vacuum pump for each main wastewater pump.

(2) A vacuum-priming pump must use a suction pipe velocity at least 3.0 feet per second but less than 7.0 feet per second and must have its own suction pipe.

(h) Vertical Positioning of Pumps. A raw wastewater pump must have positive static suction head during normal on-off cycling, except a submersible pump with "no suction" pipes, a vacuum-primed pump, or a self-priming unit capable of satisfactory operation under any negative suction head anticipated for the lift station.

(i) Individual Grinder Pumps. A grinder pump serving only one residential or commercial structure that is privately owned, maintained, and operated is not subject to the rules of this chapter.

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

Adopted August 6, 2008 Effective August 28, 2008

§217.62. Lift Station Pipes.

(a) Horizontal Pump Suctions.

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

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

(b) Valves.

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

(A) A check valve must be a swing type valve with an external lever.

(B) A valve must include a position indicator to show its open and closed positions, unless a full-closing valve is a rising-stem gate valve.

(2) A grinder pump installation may use a rubber-ball check valve or a swing-type check valve.

(3) A butterfly valve, tilting-disc check valve, or any other valve using a tilting-disc in a flow pipe is prohibited.

(c) Pipes.

(1) A lift station pipe must have flanged or flexible connections to allow for removal of pumps and valves without interruption of the lift station operations.

(2) Wall penetrations must allow for pipe flexure while excluding exfiltration or infiltration.

(3) Pipe suction velocities must be at least 3.0 feet per second but not more than 7.0 feet per second.

Adopted August 6, 2008 Effective August 28, 2008

§217.63. Emergency Provisions for Lift Stations.

(a) A collection system lift station must be equipped with a tested quick-connect mechanism or a transfer switch properly sized to connect to a portable generator, if not equipped with an onsite generator.

(b) Lift stations must include an audiovisual alarm system and the system must transmit all alarm conditions through use of an auto-dialer system, Supervisory Control and Data Acquisition system, or telemetering system connected to a continuously monitored location.

(c) An alarm system must self-activate for a power outage, pump failure, or a high wet well water level.

(d) A lift station constructed to pump raw wastewater must have service reliability based on:

(1) Retention Capacity.

(A) The retention capacity in a lift station's wet well and incoming gravity pipes must prevent discharges of untreated wastewater at the lift station or any point upstream for a period of time equal to the longest electrical outage recorded during the past 24 months, but not less than 20 minutes.

(B) For calculation purposes, the outage period begins when a lift station pump finished its last normal cycle, excluding a standby pump.

(2) On-Site Generators. A lift station may be provided emergency power by on-site, automatic electrical generators sized to operate the lift station at its firm pumping capacity or at the average daily flow, if the peak flow can be stored in the collection system.

(3) Portable Generators and Pumps.

(A) A lift station may use portable generators and pumps to guarantee service if the report includes:

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

(ii) the amount of time that will be needed to transport each generator or pump to a lift station;

(iii) the number of lift stations for which each generator or pump is dedicated as a backup; and

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

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

(C) The size of a portable generator must handle the firm pumping capacity of the lift station.

(e) Spill Containment Structures.

(1) The use of a spill containment structure as a sole means of providing service reliability is prohibited.

(2) A lift station may use a spill containment structure in addition to one of the service reliability options detailed in this in subsection (a) of this section.

(3) The report must include a detailed management plan for cleaning and maintaining each spill containment structure.

(4) A spill containment structure must have a locked gate and be surrounded an intruder resistant fence that is 6.0 feet high chain link, masonry, or board fence with at least three strands of barbed wire or 8.0 feet high chain link, masonry, or board fence with at least one strand of barbed wire.

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

(g) Lift station system controls must prevent over-pumping upon resumption of normal power after a power failure. Backup or standby units must be electrically interlocked to prevent operation at the same time that other lift stations pumps are operating only on the resumption of normal power after a power failure.

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§217.64. Materials for Force Main Pipes.

(a) Force main pipe material must withstand the pressure generated by instantaneous pump stoppage due to power failure under maximum pumping conditions.

(b) The use of pipe or fittings rated at a working pressure of less than 150 pounds per square inch is prohibited.

(c) Pipe must be identified in the technical specifications with the appropriate specification number for both quality control and installation from the American Society For Testing And Materials, American National Standards Institute, or American Water Works Association.

(d) Pipe material specified for a force main must have an expected life equal to or longer than that of the lift station and must be suitable for the material being pumped.

Adopted August 6, 2008 Effective August 28, 2008

§217.65. Force Main Pipe Joints.

(a) An underground force main pipe joint must include either push-on rubber gaskets or mechanical joints with a pressure rating equal or greater than the force main pipe material.

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

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

Adopted August 6, 2008 Effective August 28, 2008

§217.66. Identification of Force Main Pipes.

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

(b) The detector tape must bear the label "**PRESSURIZED WASTEWATER**" continuously repeated in at least 1.5 inch letters.

Adopted August 6, 2008 Effective August 28, 2008

§217.67. Force Main Design.

(a) Velocities.

(1) A force main must be a minimum of 4.0 inches in diameter, unless it is used in conjunction with a grinder pump station.

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

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

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

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

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

(b) Detention Time.

(1) A force main detention time calculations must be included in the report.

(2) The force main detention time calculations must be performed using a range of flow rates that represent the flows expected to be delivered to a force main by an upstream pump station during any 24-hour period.

(c) Water Hammer. A force main design must include surge control measures to manage pressure due to water hammer that may exceed the working strength of a force main pipe.

(d) Connection to Gravity Main.

(1) A force main must terminate in an appropriate structure and either at a manhole on the wastewater collection system or at a wastewater treatment facility.

(2) The discharge end of a force main inside a manhole must remain steady and produce non-turbulent flow.

(3) A receiving wastewater collection system must accept the maximum pump discharge without surcharging.

(e) Pipe Separation. A separation distance between a force main and any water supply water pipe must meet the minimum separation requirements established in §217.53(d) of this title (relating to Pipe Design).

(f) Odor Control.

(1) A force main must terminate below a manhole invert with the top of the pipe matching the water level in the manhole at design flow.

(2) A force main must be designed to abate any anticipated odor.

(g) Air Release Valves in Force Mains.

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

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

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

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

Adopted August 6, 2008 Effective August 28, 2008

§217.68. Force Main Testing.

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

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

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

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

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

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

(g) The leakage rate must not exceed 10.0 gallons per inch diameter per mile of pipe per day.

Adopted August 6, 2008 Effective August 28, 2008

§217.69. Reclaimed Water Facilities.

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

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

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

(d) A distribution system designed to transport Type I reclaimed water, as defined by §210.33 of this title must meet the following requirements:

(1) Type I reclaimed water gravity pipes must comply with §§217.53 - 217.55, 217.58, and 217.59 of this title (relating to Pipe Design; Criteria for Laying Pipe; Manholes and Related Structures; Testing Requirements for Manholes; and Lift Station Site Requirements).

(2) A design must prevent pipe and bedding displacement.

(3) The design of a pipe must prevent the deposition of solids in a gravity pipe.

(e) Each appurtenance designed to handle reclaimed water must be identified.

(1) An above-ground hose bib, spigot, or other hand-operated connection is prohibited, excepted in secured areas of a facility that only trained staff has access to.

(2) An underground hose bib must be:

(A) located in locked, below-grade vaults, and clearly labeled "**NON-POTABLE WATER**"; or

(B) operated only by a special tool in non-lockable, underground service boxes clearly labeled as non-potable water;

(C) purple; and

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

(3) Storage areas, hose bibs, and faucets must include signs in both English and Spanish reading "**NON-POTABLE WATER, DO NOT DRINK**" and "**El AGUA NO-POTABLE, NO BEBE**."

(f) Cross Connection Control and Separation Distances.

(1) A type I reclaimed water pipe must be at least 4.0 feet from a potable water pipe, as measured from the outside surface of each of the respective pipes.

(2) A physical connection between a potable water pipe and a reclaimed water pipe is prohibited.

(3) An appurtenance must prevent any possibility of reclaimed water entering a drinking water system.

(4) Where a 4.0 foot separation distance cannot be achieved, a reclaimed water pipe must meet the following requirements:

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

(i) maintain a horizontal separation distance of no less than 3.0 feet with a potable water pipe at the same level or above a reclaimed water pipe;

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

(iii) is embedded in cement stabilized sand, if parallel to a potable water pipe, is placed in the same benched trench as a reclaimed water pipe; and

(iv) if cement-stabilized sand is used, the sand must:

(I) have a minimum of 10% cement**,** based on loose dry weight volume;

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

(B) New Type I Reclaimed Water Pipe - Crossing Pipes.

(i) If a new Type I reclaimed water pipe is installed crossing an existing potable water pipe, one segment of a Type I reclaimed water pipe must be centered on a potable water pipe such that the joints of the reclaimed water pipe are equidistant from the center point of the potable water pipe.

(ii) A crossing of the two pipes must be centered between the joints of the potable water pipe.

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

(D) The minimum distance between a reclaimed water pipe and any potable water pipe is 6.0 inches.

(E) Any portions of reclaimed water pipe within 4.0 feet of a potable water pipe must be embedded in cement stabilized sand.

(F) The cement stabilized sand must comply with the requirements listed in subparagraph (A) of this paragraph.

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

(h) Design of Type I Reclaimed Water Pump Stations. A design must comply with §§217.60(d) and (g), 217.61(d), and 217.62(a) and (c) of this title (relating to Lift Station, Wet Well, and Dry Well Designs; Lift Station Pumps; and Lift Station Pipes), and paragraphs (1) - (3) of this subsection.

(1) Pump Controls.

(A) All electrical equipment must be operable during a 100-year flood event and be protected from potential flooding from a wet well.

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

(2) Pumps.

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

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

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

(3) Pump Station Valves.

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

(B) Check valves must be swing type with an external lever.

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

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

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

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

Adopted August 6, 2008 Effective August 28, 2008

§217.70. Storage Tanks for Reclaimed Water.

Ground level storage tanks and elevated storage tanks for reclaimed water must be designed, installed, and constructed in accordance with the American Water Works Association standards with reference to materials and construction practices, except for health-based standards strictly related to potable water storage and contact practices.

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