

Appendix EWATER DESIGN CRITERIA**E.1 General**

This section presents the criteria, standards and regulations related to the design of water distribution systems for general development service within the City of Poteet water service area. The material is directed to the competent design professional and is not intended to be a detailed design handbook.

Designs for water system construction and improvements shall conform to the most recent edition of Rules and Regulations for Public Water Systems as published by the Texas Commission on Environmental Quality (TCEQ).

**E.2 Waterline Designations**

Waterline Designations are as follows:

1. Transmission water lines are generally lines conveying water from pumping facilities to reservoirs or lines conveying water directly between pumping facilities or directly between reservoirs. Such lines may not be tapped for any purpose without special approval.
2. Distribution water lines are generally lines providing local distribution of water and from which individual user service taps are made. Distribution lines stem from transmission lines or from other local distribution lines.
3. Service water lines are lines providing service from the distribution line directly to the individual's meter.

**E.3 Facility Location**

All water utility facilities not intended for private ownership and maintenance shall be located in dedicated public right-of-way or in a waterline easement dedicated to the City. The width of the easement shall be a minimum of fifteen (15) feet, unless the line is 16-inches or larger, in which case the minimum easement width shall be twenty-five (25) feet. Pipes with more than 5 feet of cover will increase the required width of the easement by five (5) feet. Prior approval from the City is required before additional uses may be designated for these easements. Water lines should be located so that they can be maintained without disturbing sidewalks, curbs, gutters, structures, or any other utility.

The typical assignment for new waterlines in new streets shall be outside the pavement, six (6) feet from the right-of-way. Where feasible, these assignments should be maintained for new waterlines installed in existing streets. Assignments for major streets should be discussed with the City. Alternative assignments must maintain appropriate separation distances per TCEQ regulations and must be approved by the City.

Inductive Tracer Detection Tape shall be placed directly above the centerline of all pipe. The tape will be 12" wide and shall be placed above the rock embankment covering the pipe. The tape shall be encased in a protective, inert, plastic jacket and color-coded in accordance with APWA Uniform Color Code. All pipes shall be placed in position where all labels face at the 12 o'clock position.

**E.4 General Design Requirements**

**E.4.1 Line Sizes**

The developer's engineer is responsible for sizing all new waterlines within the development and submitting these sizing calculations to the City for acceptance. The minimum distribution system line size is eight (8) inches, with the exception of short Cul-de-Sacs and parallel lines as indicated in Sections E.4.10 and E.5.2. Sizing of off-site waterlines shall conform to the Water Distribution System Master Plan, where applicable. In other instances, computer modeling is the preferred method for sizing water lines. At a minimum, the design engineer shall submit hand calculations justifying the size of the proposed waterlines. The following criteria are to be used in sizing new waterlines.

**Design Parameters:**

Hazen Williams Coefficient (PVC)	110
Hazen Williams Coefficient (DI or CSC)	100
Service Unit Equivalent (SUE) <sup>1</sup>	
Single-family residential	1.0
Multi-family residential	0.66
Average Day Demand	0.24 gal/min/SUE
Maximum Day Demand	0.70 gal/min/SUE
Peak Hour Demand	1.2 gal/min/SUE
Maximum Pressure	110 psi
Minimum Pressure <sup>2</sup>	35 psi

<sup>1</sup> The number of SUEs for commercial uses shall be based on the meter size calculated as being needed by the developer's engineer per Section E.5.8. The SUE equivalency per meter size is established in the Impact Fee Study.

<sup>2</sup> The City will maintain a minimum pressure of 35 psi in its distribution system. In some areas the minimum pressure may be greater than 35 psi due to topography and location within the system. The developer's engineer is responsible for determining that the minimum system pressure at the service meter is sufficient to provide adequate service to each customer, considering all losses through the meter, internal plumbing, and differences in elevation between the service meter and the highest water-using fixture. The engineer shall submit the basis of the minimum system pressure used in the calculations.

Lines shall be sized to provide for either the peak hour demand or the maximum day demand plus a fire flow demand. Fire flows shall conform to Insurance Standards Office (ISO) standards. The fire marshal has identified minimum fire flow requirements based on type of construction for use in determining line sizing. In all instances, a minimum fire flow of 1000 gpm will be required for design purposes. When the City determines that a waterline needs

to be larger than required to facilitate future services in the area, the City may require that a waterline may be oversized.

The minimum sizes of service lines that shall be used are as follows:

Dwelling Units	Minimum Line Size
1	3/4"
2	1 1/2"
3-6	2"
7-11	4"
12-75	6"

**E.4.2 Pipe Material**

The following table summarizes the acceptable pipe materials and their uses.

Pipe Material	Use	Pipe Size	Classification
Copper Tubing	Service lines	< 2"	Type K
PVC	Service lines	2" – 3"	Schedule 80
PVC	Distribution, service lines	4" – 12"	C900 DR 14
Ductile Iron	Fir hydrant lead, distribution	6"	C115 CI 350
Ductile Iron	Distribution line	8" – 12"	C115 CI 350
Ductile Iron	Transmission line	16" – 60"	C151 CI 250
Concrete Steel Cylinder	Transmission line	16" – 60"	C301
PVC	Transmission line	16" – 24"	C905 DR 18

Pipe materials other than those identified in this section may be proposed, but shall meet appropriate American Water Works Association Standards (AWWA) and bare the National Science Foundation (NSF) approval for use in potable water systems. Acceptance of alternative pipe material is subject to City approval.

When ductile iron pipe or fittings are used, they shall be lined on the inside with cement mortar in accordance with AWWA C104. All ductile iron pipe shall be wrapped with a minimum 8-mil thick polyethylene film conforming to AWWA C105. In highly corrosive soils, ductile iron pipe shall be double wrapped.

**E.4.3 Embedment and Depth of Cover**

Embedment material for water system construction shall conform to the City's standard details and the pipe manufacturer's recommendations, whichever is more conservative. The depth of cover to the top of the pipe shall be a minimum of three (3) feet below natural ground or the bottom of the flex base course. If three (3) feet of cover is not achievable, a concrete trench cap shall be installed per the City's standard detail. In rural areas and for pipes 16 inches in diameter and larger, the minimum depth of cover to the top of the pipe shall be four (4) feet. In no case will a minimum depth of cover of less than two (2) feet be allowed.

**E.4.4 Fittings**

When Ductile Iron or PVC pipe is used, the fittings for distribution and transmission mains shall be Ductile Iron, in conformance with AWWA C110. The pressure class shall be the same as the pipe with a minimum of Class 250. Concrete Steel Cylinder (CSC) fittings shall be allowed when CSC pipe is utilized. All fittings shall have either mechanical or flanged joints.

**E.4.5 Pipe Joints**

Push-on, mechanical, or flanged joints shall be allowable unless otherwise indicated in this chapter.

**E.4.6 Thrust Restraint**

All thrust restraint shall be accomplished with mechanically restrained joints. Concrete thrust blocking is NOT acceptable. The restrained joint design shall conform to the following:

1. Water line tees, bends, valves and fittings must be restrained against thrust forces to prevent movement or failure of the water line.
2. The designer is responsible for providing, on the construction drawings, an adequate restraining system design for the waterline, including minimum length of restrained pipe required in each direction. Computer programs to calculate restrained joint requirements, as distributed by EBAA Iron, Inc. and CertainTEED are acceptable.

**E.4.7 Fire Hydrants**

Fire hydrants shall conform to AWWA Standard for Dry Barrel Fire Hydrants, C-502-85. Fire hydrants shall have one 4-1/2 inch steamer connection and two 2-1/2 inch side connections with National Standard Threads. The centerline of the steamer connection shall be a minimum of eighteen inches above the ground surface. Standard three-way hydrants shall have ductile iron, Class 350, six-inch or larger connection to mains with a minimum of five-inch valve opening. Hydrants shall be located with a maximum spacing of 300 feet in mercantile and industrial areas and 500 feet in residential areas. Additional fire hydrants shall be installed as necessary, so that every portion of every building in the city limits will be within 500 feet of a standard city fire hydrant, measured along accessible approved roadways. Drain hydrants shall be located at all low points on transmission lines. Fire hydrants shall be located within the distances from public streets as shown in the Standard Details and shall be marked by a blue reflector in the roadway 6-8" offset from the center of the roadway on the fire hydrant side.

**E.4.8     Looping**

Where feasible, all pipelines other than those in cul-de-sacs, should be connected to other distribution system pipelines so that all services may receive feed from two directions for system redundancy.

**E.4.9     Cul-de-Sacs**

If the distance from the centerline of the connecting street to the centerline of the cul-de-sac circle is greater than 300 feet, a fire hydrant shall be located at the intersection and in the cul-de-sac. The fire hydrant in the cul-de-sac may be omitted if the distance is 300 feet or less. If a fire hydrant is not required, a 2-inch blow off valve should be located behind the curb at the end of the line and the line size may be reduced to six (6) inches.

**E.4.10    Trench Safety**

In accordance with state law, whenever trench excavation exceeds a depth of five feet trench safety systems that meet current federal standards of the Occupational Safety and Health Administration (OSHA) shall be provided.

**E.5     Service Connections****E.5.1     Service Lines**

House services, single and dual, shall be 1-inch diameter, Type 'K' copper tubing. The developer's engineer shall determine service line sizes for multi-family, commercial, or fire lines. The pipe material for these services shall be in accordance with Section E.4.3.

**E.5.2     Service Taps**

Lines that are 16 inches in diameter or larger, are designed to deliver water from a large supply to a large demand area. Connections of individual services to these principal transmission mains are prohibited. Parallel distribution mains must be constructed to provide for the service tap. The parallel main shall be extended across the width of the property frontage in accordance with the City's main extension policy. These parallel lines shall be connected to the transmission main or other distribution mains at intervals not to exceed 500 feet. The minimum size of the parallel line shall be six (6) inches.

**E.5.3     Tapping Sleeves and Saddles**

All tapping sleeves and saddles shall be constructed of stainless steel. Double strapped saddles shall be acceptable for taps less than four (4) inches. Taps greater than or equal to four (4) inches shall require full tapping sleeves. Requests for size on size taps with the use of a full tapping sleeve may be approved upon review by the Department of Environment and Engineering.

**E.5.4 Tapping Valves**

Taps that are two (2) inches or greater shall require resilient seated or wedge type gate valves. Corporation stops are only acceptable on taps smaller than two (2) inches. This would include taps made for air release valves.

**E.5.5 Pressure Reducing Valves**

Individual pressure reducing valves (PRVs) shall be installed on services where the static pressure in the main is greater than 80 psi. The PRV shall be located on the property owner's side of the water meter.

**E.5.6 Backflow Prevention**

All service lines shall be provided with a testable, double check back flow prevention device approved by AWWA, as a minimum. Service lines for customers that have been identified as having a high backflow hazard will be required to install a reduced pressure zone (RPZ) backflow prevention assembly. The back flow prevention device should be located on private property, as close as possible to the public right-of-way or easement.

**E.5.7 Meter Boxes**

Meter boxes may be of plastic construction with cast iron lids. The contractor shall set all meter boxes and city cutoff valves per the standard detail.

**E.5.8 Meter Sizing**

The engineer shall be responsible for sizing all meters in accordance with AWWA Manual 6 "Water Meters: Selection, Installation, Testing, and Maintenance". The engineer shall consider head losses through the selected meter as discussed in Section E.4.2, and shall submit his calculations to the City for review.

**E.6 Valves****E.6.1 Isolation Valve Types**

Valves on six (6) inch to sixteen (16) inch lines shall be of the resilient "wedge" or "seated" type, in conformance with AWWA C509. Valves on mains larger than 16 inches shall be rubber-seated butterfly valves in conformance with AWWA C504. Butterfly valves on lines 24 inches and larger must be placed in a vault, direct bury of these valves is not acceptable.

**E.6.2 Isolation Valve Locations**

Isolation valves should be located on all branches of new mainline tees or crosses, including those cut into an existing main. If an existing main is tapped to make a connection, only one valve at the tap is required. Additional isolation valves shall be installed on the main at intervals of no greater than 800 feet in residential and commercial areas and 2000 feet on

transmission mains. The Director of Public Works may require more frequent spacing of valves. Isolation valves shall be placed on all fire hydrant leads. Tees for fire hydrant leads only require one valve on the lead. However, the designer is encouraged to coordinate the placement of the additional isolation valves with the location of fire hydrant leads.

### **E.6.3 Air Release Valves**

On mains twelve (12) inches and larger, air/vacuum release valves shall be located at all significant high points. A significant high point is defined where the crown of the pipe is greater than 1.5 times the diameter of the pipe above the flowline of the pipe in the adjacent low points.

## **E.7 Boring and Jacking**

### **E.7.1 Encasement Pipe**

When necessary, waterlines shall be installed using boring and/or jacking technologies to avoid disturbance to surface features. All carrier pipes installed by boring or jacking shall be placed in an encasement pipe. The encasement pipe shall be steel pipe conforming to ASTM 134 with a minimum thickness of 3/8 inches.

### **E.7.2 Joints**

All joints for the carrier pipe shall be mechanically restrained within the limits of the encasement pipe.

### **E.7.3 Spacers**

Casing spacers shall be provided for all boring/jacking operations. The casing spacers shall have stainless steel bands and fasteners with reinforced plastic runners. The size, length, number, and location of the spacers shall be per the manufacturer's recommendation.

### **E.7.4 Annular Space**

The annular spaces on the outside of the encasement pipe shall be filled by pressure grouting for the entire length before the carrier pipe is set in place.

### **E.7.5 Encasement Ends**

The ends of the encasement pipe will be sealed with a boot or seal wrap to prevent migration of adjacent backfill into the encasement pipe.

### **E.7.6 Isolation Valves**

Bores under State highways or large creeks/rivers (generally defined as bores in excess of 100 feet) shall have isolation valves provided on both sides of the bore.

**E.8 Testing**

Testing of water utility improvements shall be in accordance with those procedures and standards required per TCEQ and the standard specifications. All utility lines are to be tested at 200 psi for 10 minutes to discover any defective materials or workmanship. After the initial testing, any required repairs shall be completed and the repaired lines shall be tested at 150 psi for one hour. All fire lines are to be tested at 200 psi for two hours. A State licensed/certified back flow prevention assembly tester must inspect all backflow prevention devices and the results shall be submitted to the City.