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## SECTION 7 WATER DESIGN REQUIREMENTS

### 7.1 General

- 7.1.1 General Design Criteria – It is the responsibility of the Engineer to ensure that all water construction plans are in conformance with the current edition of the following:
- Texas Commission on Environmental Quality (TCEQ) Rules and Regulations;
  - 30 Texas Administrative Code (TAC) Chapter 290 – Public Drinking Water Subchapter D: Rules and Regulations for Public Water Systems;
  - 30 TAC Chapter 217 – Design Criteria for Domestic Wastewater Systems Subchapter C: Conventional Collection Systems;
  - American Water Works Association (AWWA) Standards.
- 7.1.2 No other utilities are ever to be installed in the same ditch as public utilities.
- 7.1.3 All new NON-METALLIC buried public utility mains must have both locator (i.e. detector) tape and wire installed over and parallel to the pipe.
- 7.1.4 All New METTALIC buried public utility mains must have locator (i.e. detector) tape installed over and parallel to the pipe.
- 7.1.5 The required accuracy for utility Global Positioning System (GPS) coordinates will be within 1" to 3" of the actual locations. GPS coordinates are required on all as-built drawings at all manholes, valves, taps, appurtenances, and at no less than 50' intervals along all public mains.
- 7.1.6 Residential lots are to only have one (1) domestic water and one (1) wastewater tap unless written justification is provided to and accepted by The Utilities Director or their designee. The domestic water tap will also be used for irrigation.
- 7.1.7 Commercial lots are to only have one (1) domestic water, one (1) irrigation, and one (1) wastewater tap unless written justification is provided to and accepted by The Utilities Director or their designee. The domestic water and irrigation taps must be separately metered taps.
- 7.1.8 Domestic, irrigation, fire, and wastewater laterals as well as meters, vaults, and cleanouts must all be shown on construction drawing set submittals, including those for both building permits and subdivisions. Cleanouts are private, not public, and are required at building permit.
- 7.1.9 Underground public infrastructure such as water, wastewater, and storm drains must be designed and sized for the ultimate needs of the region they provide service to.
- 7.1.10 Adequate public facilities policy. The land proposed for subdivision must be served adequately by essential public facilities and services. Land will not be approved for platting unless and until adequate public facilities exist or provision has been made for water facilities, wastewater facilities, drainage facilities and transportation facilities in the manner required by Section 11 - 2-4, which are necessary to serve the development proposed, whether or not such facilities are to be located within the property being platted or off-site. This policy may be defined further and supplemented by other ordinances adopted by the City.
- 7.1.10.A Conformance to plans and regulations. Proposed public improvements will conform to and be properly related to the City's Capital Improvements Plan and to all requirements of these subdivision regulations.

#### 7.1.10.B Utilities

7.1.10.B.i Accessible public water supply and wastewater facilities. Water mains will be installed to serve all lots within the proposed subdivision and will be extended to the property to be platted in accordance with the water and wastewater extension provisions of Section 11-2-5(E) and (F), provided that water and wastewater mains are reasonably accessible.

7.1.10.B.ii All subdivisions within any area of special flood hazard as defined in this Title, including manufactured home subdivisions and any containing or intended to contain a manufactured home park, will have public utilities and facilities such as wastewater, and water systems located and constructed to minimize or eliminate flood damage.

7.1.11 All water system designs will meet the criteria of the adopted International Fire Code (IFC) as amended and all applicable requirements of the most recent edition of National Fire Protection Association (NFPA) 24. NFPA standards are effective on the January 1st of the year following the effective date printed in the standard. All water system designs will also meet the requirements set forth in adopted ordinances and City of Midland (COM) utility standards.

7.1.12 Water System Design – All components of the water system (pipe, valves, fittings, restraints, blocking, services, and appurtenances) will be designed for the working pressure specified in the *City of Midland Standard Specifications*.

7.1.13 Water Plan Requirement – Construction plans are required for all water mains. A profile is required for all water mains. A profile is not required for water service laterals.

7.1.14 Public water mains are to be extended across the full limits of all platted property.

7.1.15 The developer will construct all water mains and appurtenances, including major distribution facilities, necessary to connect the development with the approved water supply and distribution system.

#### 7.2 Design Flow

7.2.1 Water Demand and Supply – Residential development submittals will include the total number of units and the total acres of the proposed development. Non-residential development submittals will include estimated water use records showing the minimum hourly demand, maximum hourly demand, maximum daily demand, total building square footage, and the total acres for the proposed development. The projected maximum daily demand and maximum hourly demand will be calculated and shown in million gallons per day (MGD).

#### 7.3 Pipe Sizing and Spacing

7.3.1 Water main pipes must be the same pipe size from fitting to fitting.

7.3.2 The minimum size for water mains in residential and retail development is 8" in diameter, and the minimum size for water mains in non-residential and non-retail development is 12" in diameter.

#### 7.4 Pipe Materials

7.4.1 Pipe Materials – Pipe materials are to meet the requirements of the City Standard Details and Specifications unless the design Engineer determines that the needs of the specific project exceed the typical City standards, in which case it is the responsibility of the design Engineer to

submit alternate pipe material specifications meeting the needs of the specific project to the Utilities Director or their designee for approval.

7.4.2 Water main pipes must be the same pipe material from fitting to fitting.

7.5 *Design Pressure*

7.5.1 Minimum pressure under normal conditions should exceed 35 pounds per square inch (psi) while pressure during extreme events, such as fire flow events, will not drop below 20 psi.

7.6 *Methods of Connection*

7.6.1 Cut-in Tees – When connecting to existing water mains, the City preference is that the connection be made with a cut-in tee fitting when possible rather than a tapping sleeve and valve. Size on size connections, and connections to 16" and larger existing water mains, must always be made with a cut-in tee. When a new main connects with an existing main and the City determines that a new in-line valve is needed on the existing water main, a cut-in tee connection will be required. Any cut-in tee connection is to meet the requirements of the City's Standard Details and Specifications.

7.6.2 Tapping Sleeves and Valves – Tapping sleeves and valves are not allow for connections to existing water mains (6" through 12" in size) unless written approval by the Utilities Director or designee.

7.6.3 Water service laterals are not to connect to 16" or larger water mains unless there is no other option and written permission is giver by the Utilities Director or their designee.

7.6.4 Cross - When connecting crossing pipes, a cross fitting connection is to be used rather that two offset tee or tapping sleeve connections whenever possible. When connecting a new main to an existing main next to an existing tee, replace the existing tee with a new cross fitting connection.

7.7 *Looped Water Main Systems And Dead-End Water Mains*

7.7.1 All public water mains must be looped. Water service to each lot included on the final plat will be from a looped water main. In addition, the water supply to the subdivision will be based on a plan for an area-wide looped system of trunk lines which will supply water flow from two directions or sources.

7.7.2 Dead-end water mains will not be allowed if a looped or interconnected water main system is feasible or if the dead-end water main proposed would be longer than 300'. If a looped or interconnected water main system is not feasible, then a dead-end water main will be allowed only if infrastructure is in place to allow for routine flushes of the water main and a written approval by the Utilities Director or their designee is obtained.

7.7.3 *Flushing Requirements* – Where dead-end mains are approved, the design will allow for routine flushing of stagnant water through a flushing device in accordance with Table 7-1.

Table 7-1. Flushing Requirements

Dead-End Length (Feet)	Flushing Requirement
Less than 200	Fire Hydrant
200 – 300	Chlorine Analyzing Flushing Station
More than 300	Not allowed

7.7.4 *Temporary Dead-End Mains* - Where temporary dead-end water mains are approved by the Utilities Director or their designee, the dead-end water main will extend a minimum of 5' beyond the edge of pavement for a future water main extension to connect to. If the end of a temporary dead-end water main is adjacent to a fitting, the a dead-end water main that is 12" in diameter or smaller must extend a minimum 20' (one full pipe joint) beyond the fitting, and a dead-end water main that is 16" in diameter or larger must extend a minimum 30' (two full pipe joints) beyond the fitting.

7.7.5 Water mains serving two (2) or more fire hydrants must be on a looped water system.

7.7.6 Private water systems looped through a site connecting to the public water system must be connected to two different existing public water mains to provide system redundancy.

7.8 *Fire Protection Requirements*

7.8.1 Fire flow requirements may be ascertained by applying Appendix B of the adopted IFC to the building in question.

7.8.2 Fire flow data older than one year will not be accepted.

7.8.3 Fire Hydrants

7.8.3.A General – All fire hydrants supplied will comply with AWWA C-502 and the City Standard Details and Specifications.

7.8.3.B Fire Hydrant Placement

7.8.3.B.i Fire Hydrants should be placed at intersections for increased flexibility. Where this not possible, a hydrant may be placed along a curb. Access turning radius must always be in consideration.

7.8.3.B.ii Fire Hydrants should be located on the same side of the street as the building.

7.8.3.B.iii Hydrants will be located so the center of the larger diameter outlet is not less than 18" above final grade.

7.8.3.B.iv Fire Hydrant coverage does not extend across arterial or major collector streets.

7.8.3.B.v Fire hydrants will be located within public street rights-of-way (ROW) and water main easements.

7.8.3.B.vi Fire Hydrants will be spaced in accordance with the City's current adopted edition of the IFC, Appendix C: Fire Hydrant Locations and Distribution and current City standards, whichever is more restrictive.

7.8.3.B.vii Fire Hydrant coverage along frontage is 250' as the hose lies off the truck.

- 7.8.3.C Spacing and Location
  - 7.8.3.C.i Fire hydrants will be located within public street rights-of-way (ROW) and water main easements and be spaced in accordance with the City's current edition of the IFC, Appendix C: Fire Hydrant Locations and Distribution, with adopted City amendments. Refer to the City Standard Details for typical fire hydrant locations.
  - 7.8.3.D Public fire hydrants are to be yellow, and private fire hydrants are to be red. All fire hydrants are to be coated (not painted) at the factory prior to delivery.
  - 7.8.3.E If a fire hydrant needs to be set to meet the distance requirement to a Fire Department Connection (FDC) and the fire hydrant cannot be set at a typical, common location (e.g. street corner, lot line, etc.), then the fire hydrant needs to be set on site as a private fire hydrant and will be coated red.
- 7.8.4 Fire Department Connection (FDC)
  - 7.8.4.A FDCs are to be installed per the City's currently adopted version of the IFC and as directed by the City's Fire Marshal.
  - 7.8.4.B If a FDC is required, a hydrant will be installed withing 100' of the FDC as a hose would lay off the truck and 50' from a fire lane.
  - 7.8.4.C Consult with the City's Fire Marshal and the IFC concerning maximum distance from an FDC to a fire hydrant as measured along a route approved by the City's Fire Marshal.
- 7.8.5 Post Indicator Valves (PIV)
  - 7.8.5.A PIVs will be installed on fire lines according to NFPA-13 and NFPA-24. All PIV's will be secured by a KNOX® padlock #3770. All PIV's will be Fire Department Red in color.
- 7.8.6 Fire Lines
  - 7.8.6.A Fire Line - That portion of the pipe from the PIV to a building dedicated to a fire sprinkler or standpipe system.
  - 7.8.6.B Dedicated fire lines must be separate from domestic lines.
  - 7.8.6.C Fire lines will be installed by a licensed underground contractor registered for "Underground Fire Main", Texas Insurance Code Chapter 6003, Section 34.710 (i) (3).
  - 7.8.6.D Each fire line underground contractor will have a registered Responsible Managing Employee (RME Underground Fire Main), Texas Insurance Code 6603 Section 34.716(3).
  - 7.8.6.E Each fire line will be hydrostatically tested and flushed according to NFPA-24 Chapter 10 Underground Piping.
  - 7.8.6.F Thrust blocks will be approved by the Fire Marshall prior to backfilling. All trench depth, bedding and backfill will meet NFPA 24 standards and the City's Standard Details and Specifications.
  - 7.8.6.G Where meters are required by other authorities, they will be listed for fire service.

- 7.8.6.H Non-residential developments with fire lines must provide a 6" or 8" manifold from the existing or proposed water main in the public ROW and tap all fire, water, and irrigation service laterals off the manifold pipe.

## 7.9 *Fittings and Pipe Restraints*

- 7.9.1 Joint Restraint – All fittings must be restrained with either mechanical or flanged joint restraints as per the City Standard Details and Specifications.
- 7.9.2 Thrust Blocking – All fittings, valves, hydrants, and other appurtenances will be blocked with concrete. Sizing and construction of blocking will be in accordance with City Standard Details and Specifications.
- 7.9.3 All fittings must be wrapped in an approved plastic wrap or equivalent material.

## 7.10 *Gate Valves*

- 7.10.1 General – All valves for public water mains will be gate valves in accordance with the City Standard Details and Specifications.
- 7.10.2 Large Gate Valve Requirements – Valves 16" and larger require horizontal gate valves and will be placed within a valve vault as per the City's Standard Details.
- 7.10.3 All valves must be restrained with either mechanical or flanged joint restraints as per the City Standard Details and Specifications. Valves will be anchored to adjacent fittings at tee and cross fittings and on fire hydrant leads as per the City's Standard Details. Valves will not be used at the dead end of mains as a cap.
- 7.10.4 Valve Orientation – All valves must be placed perpendicular to the ground elevation as per the City's Standard Details.

## 7.11 *Air Valve Assemblies*

- 7.11.1 *General* – Air relief valves will be installed in locations such to exhaust trapped air from the water distribution system.
- 7.11.2 *Installation Requirements* – Air relief valves will be installed in accordance with the City Standard Details and Specifications.

## 7.12 *Backflow Prevention*

- 7.12.1 *General* – As a condition of water service, all customers will install, maintain, and operate their piping and plumbing systems in accordance with City Standard Details and Specifications. Irrigation will have a backflow prevention device to protect the public water system from cross contamination. Looped private systems with more than one meter will have a backflow at connection points
- 7.12.2 *Circumstances Requiring Use of Backflow* – An approved backflow preventer will be installed before the first branch line leading off the service line wherever the following conditions exist:
  - 7.12.2.A When the nature and extent of any activity at a premise, or the materials used in connection with any activity at a premise, or materials stored at a premise, could contaminate or pollute the potable water supply;
  - 7.12.2.B When a premise has one or more cross connections;

- 7.12.2.C When an auxiliary water supply that is not, or may not be, of safe bacteriological or chemical quality;
- 7.12.2.D When industrial fluids or any other objectionable substances are handled in such a fashion as to create an actual or potential hazard to the public water system. This will include the handling of processed waters and waters originating from the utility system that have been subject to deterioration in quality;
- 7.12.2.E When internal cross connections are present that are not correctable; and/or,
- 7.12.2.F When intricate plumbing arrangements are present that make it impractical to ascertain whether cross connections exist.
- 7.12.3 *Location* – An approved backflow preventer will be set in vault per the City's standard details.
- 7.12.4 *Type of Backflow Preventer* – Any backflow prevention assembly that is required will be an approved backflow assembly of a model and size approved by the Utilities Director or designee that has been manufactured in full conformance with the AWWA C510-89 – Standard for Double Check Valve Backflow Prevention Assembly and AWWA C511-89 – Standard for Reduced-Pressure Principle Backflow Prevention Assembly. The type of backflow preventer required will depend upon the degree of hazard that exists as follows:
  - 7.12.4.A In the case of any premises where there is an auxiliary water supply and it is not subject to any of the following rules, the public water system will be protected by an approved air-gap separation or an approved reduced-pressure backflow prevention assembly.
  - 7.12.4.B In the case of any premises where there is water or a substance that would be objectionable, but not a health hazard, if introduced into the public water system, an approved double check valve assembly will protect the public water system.
  - 7.12.4.C In the case of any premises where there is any material dangerous to health that is handled in such a fashion as to create an actual or potential hazard to the public water system, the public water system will be protected by an approved air-gap separation or an approved reduced-pressure backflow prevention assembly. Examples of premises where these conditions may exist include sewage treatment plants, sewage pumping stations, chemical manufacturing plants, hospitals, mortuaries, and plating plants.
  - 7.12.4.D In the case of any premises where there are "uncontrolled" cross connections, either actual or potential, the public water system will be protected by an approved air-gap separation or an approved reduced-pressure backflow prevention assembly at the service connection.
  - 7.12.4.E In the case of any premises where, because of security requirements or other prohibitions or restrictions, it is impossible or impractical to make a complete in-plant cross connection survey, the public water system will be protected by either an approved air-gap separation or an approved reduced-pressure backflow prevention assembly on each service to the premises.
  - 7.12.4.F In the case of any premises where, in the opinion of the Utilities Director, an undue health hazard exists because of the presence of extremely toxic substances, the Utilities Director may require an air-gap at the service connection to protect the

public water system. This requirement will be at the discretion of the City Official and is dependent on the degree of hazard.

7.12.5 Installation Requirements – Backflow prevention assemblies will be installed in accordance with the City Standards. The assembly installer will obtain the required plumbing permits prior to installation and will have the assembly inspected annually by a certified cross connection inspector.

7.12.5.A All assemblies will be readily accessible with adequate room for maintenance and testing.

### 7.13 Water Services

7.13.1 General - All water service laterals and fittings will be in accordance with the City Standard Details and Specifications.

7.13.2 Meter and Service Location

7.13.2.A Meters and services must be located within ROW or easements in accordance with City Standard Details.

7.13.2.A.i Meters must be placed to enable meter reading without hazards and be in ROW or an easement accessible from the ROW to allow for vehicle access.

7.13.2.B Water meters are to only be located in unpaved areas.

7.13.3 *Meter Size* – Bullheaded or “split” ganged meters are not allowed in lieu of a larger meter. The Utilities Director or designee may require meter sizing calculations in accordance with the *International Plumbing Code* or *AWWA Manual of Water Supply Practices M22 –Sizing Water Service Lines and Meters*.

7.13.4 Irrigation service laterals and meter locations will be shown on all construction drawing submittals, including residential developments.

7.13.5 Commercial developments are required to have irrigation meters or a water well to be used for irrigation.

7.13.6 Wherever possible water laterals are to connect to water mains at 90° angles.

### 7.14 Typical Layout

7.14.1 General – Refer to the City Standard Details for typical water main, service line, appurtenance locations, and depths.

7.14.2 Radius of Curvature/Joint Deflection – Minimum radius of curve and maximum deflection angle of pipe joints will be restricted to 50% of manufacturer’s recommendation, after which the use of horizontal or vertical bends will be required. No bending of pipe is allowed.

7.14.3 Bends – All bends will be 90 degrees or less and designed for industry standard fittings sizes and angles. Designs should avoid excessive bends in the pipe system when possible.

7.14.4 Depth of Cover – The design engineer is responsible for ensuring that sufficient depth is maintained for all water mains in accordance with the City’s Standard Details and Specifications.



- 7.14.5 A minimum vertical separation of 2.0' is to be maintained for all crossings with public utilities unless written approval for a variance is first obtained from the Utilities Director or their designee.
- 7.14.6 Water mains are to be located over wastewater mains, storm drains, gas lines, oil lines, buried electric lines, and buried franchise lines at all utility crossings. Other utilities or lines are to be lowered beneath water mains at crossings unless a variance is first obtained from the Utilities Director or their designee.
- 7.14.7 All metal pipes must be wrapped in an approved plastic wrap or equivalent material.
- 7.14.8 Where it facilitates a water main crossing over another underground utility, a water main may have a minimum cover of 30" at the crossing with other utility while maintaining all other minimum required vertical separations. Water mains are to return to the standard cover depth shown in the City's Standard Details once they have completed any such utility crossing.
- 7.15 *Separation of Water Main from Wastewater Mains*
  - 7.15.1 Minimum Separation of Water Mains from Wastewater Mains – Minimum horizontal and vertical clearances will be in accordance with TCEQ and City Standard Details.
  - 7.15.2 TCEQ Requirements – When minimum separation distance cannot be achieved, water mains and wastewater mains will be separated per TCEQ Rules and Regulations and City Standard Details. Refer to the following:
    - 7.15.2.A 30 TAC Chapter 290 – Public Drinking Water Subchapter D: Rules and Regulations for Public Water Systems; and,
    - 7.15.2.B 30 TAC Chapter 217 – Design Criteria for Domestic Wastewater Systems Subchapter C: Conventional Collection Systems.
- 7.16 *Trenching and Bedding*
  - 7.16.1 General – Refer to the City Standard Details for the typical water main pipe embedment requirements.
  - 7.16.2 Trench walls for new utilities must maintain at least 2.0' horizontal separation from existing utility trench walls.
- 7.17 *Removal or Abandonment of Water Infrastructure*
  - 7.17.1 General - All existing water mains, valves, service laterals, or other infrastructure that are to be replaced within the City will be removed unless approved by the Utilities Director or designee.
  - 7.17.2 Removal of Existing Water Mains and Laterals - All existing water mains and laterals that are to be removed are to be removed in their entirety. Any existing water mains that dead-end as a result of the existing water main being removed are to be capped. Any existing infrastructure the removed water main or lateral connected to that will remain is to be replaced or repaired as needed to City standards.
  - 7.17.3 Abandonment of Existing Water Mains and Laterals - All existing water mains and laterals that are to be abandoned are to be abandoned in place, filled with flowable fill 2-sack (2-sack = 188 lbs Portland Cement / cubic yard of concrete), and capped. Any existing water mains that dead-end as a result of the existing water main being abandoned are to be capped. Any existing infrastructure the abandoned water main or lateral connected to that will remain is to be replaced or repaired as needed to City standards.

- 7.17.4 Abandonment of Existing Water Valves - Existing water valves are never to be abandoned in place if the existing water main is removed. If the existing water main is abandoned in place, then the existing water valves are to be closed, the valve nut is to be broken off, and the valve box is to be filled with concrete meeting or exceeding City standards for concrete pavement.
- 7.17.5 Removal of Existing Fire Hydrants - Existing fire hydrants that are removed are to be returned to the City of Midland. Fire hydrants are never to be abandoned in place.
- 7.17.6 Removal of Existing Water Meters - Existing water meters that are removed are to be returned to the City of Midland. Water meters are never to be abandoned in place. When a water meter is removed from an active lateral, the angle stop on the lateral must be closed and locked before the meter is removed.
- 7.18 *Easements*
  - 7.18.1 See Section 1, Sub-Section 1.12 of this Manual for easement information.
- 7.19 *Trenchless Requirements*
  - 7.19.1 Design Requirements - Engineers are to design all trenchless utility installations, rehabilitations, replacements, etc., including all pipe-bursting, slip lining, cured-in-place pipe, tunneling, jacking, boring, etc. in compliance with all applicable standards and requirements, including City Standards, Details, and Specifications. The design and specification submittal requirements for trenchless installations, rehabilitations, and replacements are the same as for open trench design submittals, including plan and profile sheets, designs for boring and receiving pits, etc.
  - 7.19.2 Trenchless Installations For New Pipe - Trenchless installations for new pipe are to only be utilized for straight pipe alignments with no horizontal or vertical deviations. When crossing a ROW, easement, street, utility, etc. the crossing is to be as close as possible to ninety degrees (90°).
  - 7.19.3 Trenchless Replacement Or Rehabilitation Of Existing Pipe - Trenchless replacement or rehabilitation of existing pipe are to match the existing pipe alignment.
  - 7.19.4 Boring And Receiving Pits - Whenever possible boring and receiving pits are to be located behind the back-of-curb or, where curb does not exist, behind the edge-of-pavement. Additional setback distances may be required for public and construction crew safety as well as to maintain the integrity of any existing street or alley being crossed.
  - 7.19.5 Trenchless Casing Pipe - Casing pipe is required for all trenchless installations for new pipe installed by tunneling, jacking, or boring per the City Standard Details.
- 7.20 *Midland County Subdivision Regulations*
  - 7.20.1 *Article X – Water*