

RULE NO.: R161-22.03**NOTICE OF PROPOSED RULE****POSTING DATE: January 12, 2022**

The Director of the Department of Austin Water proposes to adopt the following rule on or after February 14, 2022.

Comments on the proposed rule are requested from the public. Comments should be submitted to Mr. Eric Langhout, P.E.; Austin Water, 3907 S. Industrial Dr., Suite 236, Austin, Texas 78744, 512-972-0073, or via email at Eric.Langhout@austintexas.gov. To be considered, comments must be submitted before February 14, 2022, the 32nd day after the date this notice is posted. A summary of the written comments received will be included in the notice of rule adoption that must be posted for the rule to become effective.

An affordability impact statement regarding the proposed rule has been obtained and is available for inspection or copying at the address noted in the preceding paragraph.

EFFECTIVE DATE OF PROPOSED RULE

A rule proposed in this notice may not become effective before the effective date established by a separate notice of rule adoption. A notice of rule adoption may not be posted before February 14, 2022 (the 32nd day after the date of this notice) or not after March 23, 2022 (the 70th day after the date of this notice).

If a proposed rule is not adopted on or before March 23, 2022, it is automatically withdrawn and cannot be adopted without first posting a new notice of a proposed rule.

TEXT OF PROPOSED RULE

The text of the proposed rule, indicating changes from the current text, is attached to this notice.

BRIEF EXPLANATION OF PROPOSED RULE

R161-22.03: Proposed revision to the UCM 2.5.1, 2.5.3, 2.8.1, 2.9.2, & 2.9.4

Rule 1 – UCM 2.5.1, 2.5.3, 2.8.1, 2.9.2 & 2.9.4

1. **Section 2.5.1.E.3** – Add information that all TxDOT design build projects, CIP and GP projects should be at a 20' scale.
2. **Section 2.5.3.A.14** – Add language to require the location and dimensions of thrust anchors for connections of HDPE force mains to manholes. This requirement is in association with the changes to Section 2.9.4.J.7.a.

3. **Section 2.8.1.A** – Remove the requirement of adding grout to abandoned WWL. Abandoned lines are usually cut and plugged. The Standard Specifications or project specifications will provide the approved measures to abandon wastewater mains.
4. **Section 2.9.2.B.9** – Add University of Texas to the list in the last sentence and that restrained means "ductile iron pipe."
5. **Section 2.9.2.E.7** – Add information that hospitals need two feeds to their property. Add "Hospitals shall be provided with not less than two approved potable water sources that are installed in such a manner as to prevent interruption of service."
6. **Section 2.9.4** – Continue updating the new way of showing measurements.
7. **Section 2.9.4.G.1** – Add language that requires all wastewater services to be in accordance with COA standard details.
8. **Section 2.9.4.G.4** – Add "2-way" before cleanout as shown in the Standard Detail.
9. **Section 2.9.4.J.2.a** – Add language to allow a 1:1 slope on slick coated surfaces.
10. **Section 2.9.4.J.7.a** – Add language that requires all force mains to PE pipe per SPL WW-706. Alternative pipe material will be allowed on a case-by-case basis.
11. **Section 2.9.4.J.7.b** – Move the minimum size of a force main of 4" to 2.9.4.J.7.b instead of 2.9.4.J.7.a.
12. **Section 2.9.4.J.7.b** – Add language that requires all force mains be sized to have a velocity between 3 and 4 feet per second.
13. **Section 2.9.4.J.7.g** – Add "polymer" between "distinct" and "manhole."
14. **Section 2.9.4.J.7.i** – Add language that all PE pipes connections to other PE pipes and fitting shall be done by fusing.
15. **Section 2.9.4.J.7.j** – Add language on how to connect PE pipe to valves and ductile iron fittings.
16. **Section 2.9.4.J.7.k** – Add language to require the location of thrust anchors when PE force mains discharge into manholes.

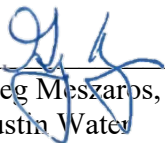
AUTHORITY FOR ADOPTION OF PROPOSED RULE

The authority and procedure for adoption of a rule to assist in the implementation, administration, or enforcement of a provision of the City Code is provided in Chapter 1-2 of the City Code. The authority to regulate construction requirements is established in Section 552.001 of the Texas Local Government Code and Title 15 of the City Code.

CERTIFICATION BY CITY ATTORNEY

By signing this Notice of Proposed Rule R161-22.03, the City Attorney certifies the City Attorney has reviewed the rule and finds that adoption of the rule is a valid exercise of the Director's administrative authority.

REVIEWED AND APPROVED



Greg Meszaros, Director
Austin Water

Date: 12/21/2021

Deborah Thomas for

Anne L. Morgan
City Attorney

Date: 12/23/2021

SUMMARY OF 1st QUARTER - 2022

UCM

Rule 1 – UCM 2.5.1, 2.5.3, 2.8.1, 2.9.2 & 2.9.4

1. **Section 2.5.1.E.3** – Add information that all TxDOT design build projects, CIP and GP projects should be at a 20' scale.
2. **Section 2.5.3.A.14** – Add language to require the location and dimensions of thrust anchors for connections of HDPE force mains to manholes. This requirement is in association with the changes to Section 2.9.4.J.7.a.
3. **Section 2.8.1.A** – Remove the requirement of adding grout to abandoned WWL. Abandoned lines are usually cut and plugged. The Standard Specifications or project specifications will provide the approved measures to abandon wastewater mains.
4. **Section 2.9.2.B.9** – Add University of Texas to the list in the last sentence and that restrained means "ductile iron pipe."
5. **Section 2.9.2.E.7** – Add information that hospitals need two feeds to their property. Add "Hospitals shall be provided with not less than two approved potable water sources that are installed in such a manner as to prevent interruption of service."
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11. **Section 2.9.4.J.7.b** – Move the minimum size of a force main of 4" to 2.9.4.J.7.b instead of 2.9.4.J.7.a.
12. **Section 2.9.4.J.7.b** – Add language that requires all force mains be sized to have a velocity between 3 and 4 feet per second.
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15. **Section 2.9.4.J.7.j** – Add language on how to connect PE pipe to valves and ductile iron fittings.
16. **Section 2.9.4.J.7.k** – Add language to require the location of thrust anchors when PE force mains discharge into manholes.

2.5.0 - CONSTRUCTION PLAN INFORMATION AND SUBMITTAL REQUIREMENTS

2.5.1 - General

- A. Construction plans for water, reclaimed water, and wastewater service shall be submitted to Austin Water's (AW) Utility Development Services (UDS) - Pipeline Engineering for verification of conformance to City of Austin (COA) Standards and Specifications. All plat, preliminary plan, site plan and subdivision construction cases shall be submitted in PDF (.pdf) format to allow electronic review by AW. Any other file type(s) submitted for review purposes will be rejected. In addition to providing PDF files, all final designs shall be submitted in Computer-aided design (CAD) format as follows: For AW funded Capital Improvement Projects, CAD files shall be in accordance with the COA Public Works Department Engineering Services Division Design CAD Standards Manual (<http://austintexas.gov/departments/engineering-services-division>), as amended, prior to AW approval; For water, wastewater, and reclaimed water infrastructure projects that are not AW funded Capital Improvement Projects, final designs shall be submitted in a CAD format (not necessarily using the City's CAD standards) prior to AW approval. Plans in CAD format shall only apply to base files and not sheet files (plan and profile) for all projects in which AW infrastructure is relocated, constructed, or repaired. The Pre-Construction Meeting must occur within two years of the date of AW plan approval, otherwise they must be resubmitted to the AW review team to ensure compliance with any changes in requirements related to health and safety.
- B. If the provider of service is a Municipal Utility District (MUD), Water Control and Improvement District (WCID) or private utility corporation, then prior approval by the provider of service is also required.
- C. Plans submitted to AW must show approved easements and/or permits on highway and/or railroad crossings.
- D. Plans that include fire lines must have approval by the City of Austin Fire Department and the Development Services Department.
- E. All water, reclaimed water, and wastewater plans will include the following items:
 1. Engineer's dated signature and seal of a Professional Engineer licensed in the State of Texas on each plan sheet.
 2. Date of Plans and revisions.
 3. North arrow and scale must be shown. The standard horizontal scale for plan and profile sheets shall be 1" = 40', 30' or 20' for the plan view. The vertical scale shall be 1" = 4', 3' or 2', respectively. The same scale shall be used on all plan and profile sheets. **All Texas Department of Transportation design build projects, Capital Improvement Projects, and General Permit projects shall be 1"=20' horizontal scale for the plan view.** For sheets other than plan and profile, horizontal scales of 1" = 40', 30' or 20' may be used as appropriate. Where relevant and applicable, a scale of 1" = 10' for plan views and a scale of 1" = 1', 2', 3', 4', or 5', as needed to fit the area on the page and provide the most clarity for profiles, shall be used for detailed water, reclaimed water, and wastewater connections, designs, utility crossings, and/or special detail drawings. The minimum size for plan and profile sheets shall be 22" x 34". Plan view and associated profile shall appear on the same sheet with the plan view at the top half of the sheet.
 4. A general location map, showing MAPSCO and grid numbers.
 5. Current standard COA Water and Wastewater construction notes.
 6. Indicate on the cover sheet, the subdivision file number, include a copy of the service extension form, and show all required permit numbers such as development permit, Texas Department of Transportation permit, railroad crossing permit, etc.
 7. Volume and page number of recorded easement and of any temporary working space.

8. For sites and subdivisions, show GIS numbers of all existing mains and appurtenances. For City-funded, City-reimbursed, and City-cost-participation projects, show GIS numbers for all existing and proposed mains and appurtenances.
 9. Property lines and dimensions, legal description, lot and block numbers, right-of-way dimensions, and curb and sidewalk locations and street names.
 10. Location, size, and material of all existing and proposed water, reclaimed water, and wastewater mains, lines and services with respect to easements and rights of way. Existing and proposed mains 24 inches and larger shall be shown by double lines indicating pipe outside diameter. The direction of flow in the wastewater mains shall be indicated on the drawings. COA record drawings for potable water, wastewater, and reuse water may not be reliable. The Engineer is encouraged to collect subsurface utility data according to American Society of Civil Engineers (ASCE), Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data.
 11. Location, size, and description of other existing and proposed utilities within the limits of construction. Existing and proposed utilities 24 inches and larger shall be shown by double lines indicating the outside diameter.
 12. Curve data for roads, property lines, water, and reclaimed water lines.
 13. Final plat recording or land status report.
 14. Street address for all existing structures shall be shown on the lot(s) where the structures are located.
 15. Pressure zone designation for subject tract and zone boundaries where applicable.
 16. Where water, wastewater, and/or reclaimed water mains cross each other, details shall be shown to indicate compliance with TCEQ requirements.
 17. Typical cross sections showing multiple utilities proposed to be within private streets or easements.
 18. An index on the cover sheet or on the 2nd page of the drawings.
 19. Construction drawings shall contain Overall Location Maps and Key Maps for any individual water, reclaimed water, or wastewater line that requires three or more plan and profile sheets.
- F. Final plan approval may require additional authorizations such as:
1. Texas Department of Transportation permit.
 2. Railroad permit.
 3. Gas Company permit.
 4. Easement acquisition (Vol. and Page or document number listed on plans).
 5. County approval.
 6. Water District approval.
 7. Municipal Utility District approval.
 8. Texas Department of Health approval.
 9. Texas Commission on Environmental Quality.
 10. Non-occupancy letter.
 11. Service Extension approval.
 12. Planning and Development Review Department approvals.

Source: [Rule No. R161-17.06](#), 5-31-2017; Rule No. [R161-19.10](#), 5-15-2019; [Rule No. R161-19.18](#), 11-13-2019.

2.5.2 - Water and/or Reclaimed Water System Plans

- A. All plan view drawings shall include all applicable items listed in the General Requirements above plus the following items:
1. Stations of all proposed service connections to existing or proposed mains, if the service line is not perpendicular from the main to the property line.
 2. For proposed connections to mains or facilities to be constructed by others: identify the project by project name, AW project number, and service extension request number.
 3. Station numbers for mains for beginning points, ending points, points of curvature, points of tangent, points of reverse curve, points of intersection, valves, fire hydrants, other appurtenances and grade breaks.
 4. Station numbers for the mains where they cross any other utility.
 5. Details of appurtenances.
 6. The location of all existing and proposed services, mains, valves, fire hydrants, water meters, and backflow preventers.
 7. One hundred year flood plain limits.
 8. Proposed and affected existing mains shall be labeled with design velocities at maximum day plus fire flow and at peak hour flow.
 9. Calculated design pressure at highest and lowest lot served.
 10. Location (beginning and ending station numbers) and type of thrust restraint.
 11. Retaining walls, including geogrid, straps, tiebacks and all other components.
 12. Culverts, bridges, and other drainage structures.
 13. Fire hydrants, located so as not to conflict with ADA features, traffic signal foundations, sign supports, and other surface features.
 14. Geotechnical borings (required for City funded projects only).
 15. Auxillary water sources, if any.
 16. If the existing main is CSC or Welded Steel, show locations of the existing pipe joints and the specific sections of the pipe that must be removed to accommodate the proposed connection.
- B. A profile drawing shall be provided for all water mains, per Austin City Code, Section 14-11-173 (C)(2), showing all applicable items listed in the General Requirements plus the following items:
1. The existing ground profile and proposed street finish grade or subgrade.
 2. Station numbers and elevations of all utility crossings.
 3. Station numbers and soil geology information at stream crossings to evaluate the need for special surface restoration.
 4. Identify pipe size, percent grade and pipe material to be used including ASTM and/or AWWA designation. If an alternate material is to be allowed, both should be listed (example "DI. or DR14 PVC"). Lines must be included to indicate pipe flowline and crown.
 5. Station numbers and elevations for starting points, ending points, point of intersection, grade breaks, valves, fire hydrants, air release valves, pressure/flow regulating valves and at intermediate points every 100 feet.

6. Retaining walls, including geogrid, straps, tiebacks, and all other components.
 7. Culverts, bridges and other drainage structures.
 8. Curb elevations at fire hydrant locations.
 9. Geotechnical boring graphic symbols, showing subsurface materials (required for City funded projects only).
 10. Locations by station of restrained pipe, indicating type of restraint.
 11. Beginning and ending stations for encasement pipe (per UCM 2.9.1.D).
 12. Air valve vaults, and piping from the main to the vault shall be included in the profile view. The rim elevation for the vault shall be shown along with the ground profile from the main to the vault.
- C. Special Details are required to show materials and method of connecting proposed water mains to existing CSC water mains. CSC water mains may be either bar-wrapped pipe (B303, P303, or P381) or pre-stressed pipe (L301 or E301), each requiring a different connection method. It is important that the pipe type and, for pre-stressed pipe, the locations of pipe joints be determined and identified in the plans during the design phase because these pipes typically consist of long lay lengths, which may result in substantial removal and replacement of the existing pipe and/or relocation of the proposed tie-in point because of joint locations, all of which may be highly problematic if not determined prior to construction. The Special Detail shall include the following at a minimum:
1. Pipe material of existing main;
 2. Locations of existing pipe joints if the existing main is pre-stressed pipe;
 3. Limits of existing pipe that must be removed and replaced to accommodate the proposed connection, including limits of required thrust restraint;
 4. Identification of each piping component necessary to complete the tie-in, including material specifications for each component;
 5. Identification of method used to connect proposed pipe to existing pipe, e.g., welding or MJ connections;
 6. Special Notes related to the connection.

Source: [Rule No. R161-17.06](#), 5-31-2017; [Rule No. R161-19.18](#), 11-13-2019.

2.5.3 - Wastewater System Plans

- A. All plan view drawings shall include all applicable items listed in the General Requirements mentioned above plus the following items:
1. Station numbers at all proposed service connections to existing or proposed wastewater mains if the service line is not perpendicular from the main to the property line.
 2. For proposed connections to wastewater mains or facilities to be constructed by others, identify the project by project name, AW project number, and service extension request number.
 3. The location, alignment and structural features of the wastewater main, including manholes and concrete retards, if applicable.
 4. Station numbers and GIS numbers for beginning points, ending points, manholes, clean-outs and other appurtenances.
 5. Details of all required appurtenances.
 6. Location of all existing and proposed wastewater services, mains and manholes.
 7. One hundred year flood plain limits.

8. Retaining walls, including geogrid, straps, tiebacks and all other components.
9. Culverts, bridges and other drainage structures.
10. Locations of geotechnical borings (required for City funded projects only).
11. Locations of bolted manhole covers.
12. A plan view detail of the invert of each manhole or junction box having three or more pipes connecting to it, regardless of the pipe sizes, or when two pipes connect to a manhole at an angle other than 180 degrees from each other.
13. Station numbers shall be identified for the mains where they cross any other utility.

14. The location and dimensions of longitudinal thrust anchors that are required where a run of PE force main pipe with fused joints discontinues and connects to a manhole or a gravity wastewater pipe having gasketed joints or to any similar feature.

- B. A profile view shall be provided for all wastewater mains and shall include all applicable items listed in the general requirements above plus the following items:
1. The existing ground profile and proposed street finish grade or subgrade or finished grade if not under pavement.
 2. Station numbers and elevations of all utility crossings.
 3. Station numbers and soil geology information at stream crossings to evaluate the need for special surface restoration.
 4. Identify the pipe size, percent grade and pipe material to be used including ASTM and/or AWWA designation. If an alternate material is to be allowed, both should be listed (example "DI or PVC"). Lines must be included to indicate pipe flowline and crown.
 5. Station numbers and elevations for starting points, ending points, manholes, clean-outs and at intermediate points every 100 feet.
 6. Elevations shall be indicated on the profile showing the finish floor elevations of all existing structures. If the structure has an active septic tank or other disposal system, the flow line elevation of the plumbing where it exits from the structure is to be indicated. If a lot or tract is vacant, side shots may be required from the middle of each lot to ensure gravity service is possible from the lot to the main.
 7. Peak dry weather flow and peak wet weather flow, as well as the associated velocities in each pipe.
 8. Retaining walls, including geogrid, straps, tiebacks and all other components.
 9. Culverts, bridges and other drainage structures.
 10. Rim elevations for manholes.
 11. Flow line elevations for all pipe connections at manholes and junction boxes.
 12. Geotechnical boring graphic symbols showing subsurface materials (required for City funded projects only).
 13. Beginning and ending stations for encasement pipe (per UCM 2.9.1.D).
 14. (NOTE: AW plan Approval shall expire three years from the date of current approval. If construction has not begun on the facility within three years of the approval date, Plans must be resubmitted for approval and must include all criteria in effect at the time resubmitted.)

Source: [Rule No. R161-17.06](#), 5-31-2017.

2.8.0 ABANDONMENT OF FACILITIES

If a new project will abandon existing facilities, the plans shall provide for the appropriate abandonment of these facilities. The plans shall include, at a minimum, the location, sequence, details, and methodology for abandoning the facility according to this section. Abandonment shall be considered permanent. Temporary abandonment must be approved on a case-by-case basis. For qualifying properties related to Ordinance 20141120-006 Austin Water (AW) will perform the necessary infrastructure work in the Right-of-Way. When the installation of new utility lines requires a trench to be cut through existing stormlines, waterlines, reclaimed lines, gas lines (if approved by the gas company) or wastewater lines, and the existing lines are confirmed to be abandoned, the abandoned lines shall be cut flush with the sides of the trench and blocked with an SPL approved plug or cap, or void filled with non-shrink grout in a manner satisfactory to the Owner's Representative.

Source: Rule No. R161-15.07, 9-25-2015 ; Rule No. R161-16.03, 5-25-2016 ; Rule No. R161-18.07 , 6-1-2018; Rule No. R161-18.11 , 9-14-2018; Rule No. R161-19.11 , 5-15-2019.

2.8.1 Wastewater Mains and Services

- A. Abandonment of wastewater mains shall consist of ~~filling the main with a pumpable grout or slurry and~~ meeting requirements of the ~~current~~ **project** specifications. Plans, drawings and specifications shall include method of abandoning or removing services and all other mains.
- B. If the existing wastewater service line and/or appurtenances are not to be used in the future, the plans shall call out and indicate the wastewater service line(s) to be abandoned and that they shall be cut and plugged at the main.
- C. Abandonment of wastewater force main valves shall be accomplished by removing the valve casing to the top of the subgrade or 24" below the surface, whichever is greater, and filling remaining casing with concrete such that the abandoned valve is not identifiable from the surface. The pavement repair shall follow the applicable 1100S Series Standard Detail(s).

Source: Rule No. R161-15.07, 9-25-2015 ; Rule No. R161-16.03, 5-25-2016 ; Rule No. R161-19.18 , 11-13-2019.

2.9.2 - Water Systems

A. Size/Capacity Determination

1. General

- a. Hazen Williams Friction Coefficient $C = 80$, higher C coefficient may be used for new mains only upon approval by Austin Water (AW) with sufficient documentation to show effects of long-term use.
- b. Average day demand = 200 gal/person/day.
- c. Peak day demand = 530 gal/person/day.
- d. Peak hour demand = 900 gal/person/day.
- e. Pressure reducing valves (PRV), as required by the plumbing code, that are to be installed outside of the footprint of a building must be illustrated and identified on site utility plans and must be located on private property outside of any public utility easements.
- f. Minimum operating pressure is 50 psi at the highest elevation meter location using average day demand.

2. Peak Hour Demand Requirements

- a. The maximum allowable velocity shall not exceed 5 feet per second (fps).
- b. The minimum pressure at any point in the affected pressure zone must not be less than 35 psi.

3. Emergency Demand Requirements

- a. Emergency demands are considered to be fire flow requirement plus peak day demands.
- b. Fire flow requirements (flow rate and duration) will be determined in accordance with the City of Austin (COA) Fire Code and associated rules under City Code. Where the COA Fire Code does not apply, the fire flow requirement (flow rate and duration) will be determined by the regulating fire department.
- c. The maximum allowable velocity shall not exceed 10 fps.
- d. The minimum residual pressure at any point in the affected pressure zone at peak day plus fire flow must not be less than 20 psi.
- e. Required fire pumps, for high-rise buildings, as defined in the building code, shall be supplied by connections to a minimum of two water mains. The domestic water line will be allowed off one of the fire lines. Domestic water lines must be metered either after the fire line or along the fire line that includes the domestic water line. Separate supply piping shall be provided between each connection to the water main and the pumps. Each connection and the supply piping between the connection and the pumps shall be sized to supply the flow and pressure required for the pumps to operate.

Exception: Two connections to the same main shall be permitted provided the main is valved such that an interruption can be isolated so that the water supply will continue without interruption through at least one of the connections.

4. Sizing of Water Mains

- a. Computer modeling is preferred for sizing water mains. However, for water mains less than 16 inches in diameter other engineering calculation methods may be accepted. The largest size, as determined by comparing the service area's peak hour demand and peak day plus fire flow demand, shall be used. The minimum size for any street

type, however, will be governed by various factors which include fire protection requirements, high density land usage, and the designer's consideration of general system gridding, future transmission mains, neighboring developments and area configuration. Transmission line sizes will be determined on a case-by-case basis. Minimum main size shall be 8 inches with consideration for 4-inch pipe in cul-de-sacs less than 200 feet in length. Provisions must be made in these cases for a flush valve at the end of dead end lines.

- b. For purposes of water main sizing the emergency demand shall be assumed at a single point on the existing or proposed water main at the subject tract or development phase, unless otherwise approved by AW.
5. Storage Requirements - If it is determined by AW that additional storage is required, the following criteria shall be used:

Effective Storage = 100 gal/connection

Emergency Storage = 100 gal/connection

TOTAL STORAGE = 200 gal/ connection

Effective Storage is defined as storage, which will provide a minimum of 35 psi of pressure at the highest service elevation in pressure zone.

The Owner's Consulting Engineer may be required to provide computer simulations as determined on a case-by-case basis.

B. Mains

1. While looped systems are required, it is recognized that in certain situations, installation of dead end pipe may be necessary. When a dead end section of water main is approved for installation, the following requirements must be met:
 - a. A gate valve shall be installed near the end of the main followed by an appropriate length of one joint of restrained pipe and a plug with a 1 inch or larger tap. Thrust blocking shall not be used as restraint at the end of the main. The engineer shall determine the necessary length of restraint on each side of the valve that will keep the main in place for future extension when the plug is removed. No services may be installed between the valve and the plug.
 - b. Adequate water circulation must be provided to achieve turn-over of water in the dead end main every 72 hours. Until such time as water demand from active services on the dead end section of main results in the 72 hour turn over, an approved automatic flushing device must be installed and programmed such that the 72 hour criterion is met.
2. Water mains should normally be located on the high side of the street.
3. Piping materials and appurtenances shall conform to COA Standard Specifications and AW's Standard Products List (SPL).
4. Minimum depth of cover over the uppermost projection of pipe shall be at least 48 inches below proposed ground elevation. If fill or embankment placed over existing water mains or services exceeds 4 feet or results in a final depth exceeding two times the easement width if applicable, AW review and approval is required. If a cut over the existing mains or services results in less than minimum cover, AW approval is required. If manholes, valves, hydrants, meters, cleanouts, etc. are located within the cut or fill area(s), adjustment must be made to match final grade and plans must be reviewed and approved by AW and the

construction inspected by the City. If the fill is located on top of an existing easement, see Section 2.9.1.A.1.

5. For mains 16 inches in diameter and larger and on smaller mains where appropriate, hydrants or drain valves shall be placed at low points and on the up-slope side of all valve locations.
6. All fire lines shall have a gate valve on the line at the connection to the main line and a backflow preventer inside the property line, but accessible for inspection by City personnel. All unmetered fire lines shall have an AW approved flow detection device. This flow detection service shall be located such that no more than 100 gallons of water is contained between the device and the point where the fire line is connected to the City's main.
7. The Engineer is responsible for determining the size and type of air release valves necessary to assure the water system operates properly based upon the water system characteristics and shall provide calculations determining the size and type of valves for review by AW when requested. Air release valves may be necessary on any size of main. Minimally, on water mains 16 inches in diameter and larger and on smaller mains where appropriate, combination air valves will be placed at all high points and air/vacuum valves shall be placed at the down-slope side of all gate valve locations. Air/vacuum and vacuum release valves shall be approved on a case-by-case basis. All mains 24 inches and larger will include an 18-inch outlet with flange including a 1-inch corporation (minimum) for installation at high points where the installation of an air release valve (ARV) would be necessary. In the absence of an ARV requirement, an 18-inch outlet with flange including a 1-inch corporation shall be placed every 2500 feet. Proposed waterline connections to air release valve piping are prohibited.
8. Joint restraint for pipes larger than 24 inches diameter shall be by use of integral, factory joint restraint systems. External mechanical joint restraint devices are allowed at all sizes of valves and fittings. Joint restraint for ductile iron pipes 24 inches and smaller may be by joint restraint gaskets.
9. Joint restraint shall be provided for all pipe bends and where necessary when joint deflection is utilized. A minimum safety factor of 1.5 shall be used when calculating restrained water pipe length. When joint restraint is required in intersections, extend the joint restraint, at a minimum, to the point of curvature (PC) of the curb line. Notes shall be placed in both plan and profile views and shall include at a minimum the type of restraint to be utilized and the beginning and ending stations of the restraint. Cast Iron and Asbestos Concrete Pipes cannot be mechanically restrained and shall be removed and replaced with Ductile Iron Pipe or PVC C-900 pipe to ensure adequate restraint. Concrete thrust blocking may be approved on a case by case basis. In cases where concrete thrust blocks are utilized, at a minimum the Engineer shall include block dimensions and locations on the plans. The proximity of other utilities and structures must be taken into account when specifying the use of thrust blocking. The use of thrust blocks will be prohibited in the downtown area (Loop 1 to I35 and Lady Bird Lake to 30th Street). All pipes, valves, and fittings, greater than 2 inches in size, installed in the TxDOT Right Of Way (ROW), and Austin Bergstrom International Airport (ABIA) property and University of Texas property shall be restrained ductile iron pipe.
10. Allowable pipe sizes. The following sizes will be the only sizes allowed for new water mains: 4 inches (see 2.9.2.A.4.a), 6 inches (fire-hydrant leads and services only), 8 inches, 12 inches, 16 inches, 24 inches, 30 inches, 36 inches, and 42 inches. Larger sizes may be approved on a case by case basis.
11. Connections 4 inches and larger of new mains to existing mains shall be made by cutting in a tee. Tapping sleeves may be allowed in lieu of cutting in a tee on a case-by-case basis. Full-body tapping sleeves shall be used. A tapping sleeve will not be allowed if the materials and conditions of the existing main preclude tapping. "Size on size" taps will not be

permitted, unless made by use of an approved full bodied mechanical joint tapping sleeve. Reconnection to existing tapping sleeves shall not be allowed.

12. Wyes are not allowed on waterlines.
13. The maximum bend for waterlines is 45 degrees.
14. All potable water mains shall be constructed of ductile iron or PVC pipe. For ductile iron pipes, Pressure Class 350 minimum for pipe 12-inch diameter and smaller and Pressure Class 250 for pipes greater than 12-inch diameter shall be used. For PVC pipe 16-inch diameter and smaller conforming to the requirements of AWWA C-900, DR 14 shall be acceptable. Alternative pipe materials may be considered on a project by project basis.
15. All potable water pipe within utility easements on private property shall be Ductile Iron Pipe, Pressure Class 350 minimum for pipe 12-inch diameter and smaller and Pressure Class 250 minimum for pipes greater than 12-inch diameter. AWWA C-900 pressure class 305 (DR14) potable water line pipe may be considered to be installed within utility easements on private property only when it meets the following criteria;
 - a. The finished surface of the water line easement over the potable water line must be paved. Where the water pipe is under HMAC or Portland cement concrete pavement designed structurally for automobile and truck traffic per the Geotechnical report, PVC pipe may be allowed just in those paved areas, provided it can be demonstrated that the pipe will not be damaged by construction traffic if it does not maintain a minimum of 48 inches of cover.
 - b. The potable water line must maintain a minimum 48 inches of cover over the uppermost projection of pipe to the finished grade.
 - c. The plan and profile must clearly identify the potable water line size, material type and class as well as the paved finished grade.
16. Changes in alignment in water lines, both horizontal and vertical, shall be achieved by deflection of joints or by use of fittings. Deflection of pipe joints at fittings is only allowed on ductile iron pipes. Longitudinal bending of pipe is not allowed.
17. Utility crossings constructed under water lines by trenchless methods are allowed only if the distance between the outside surface of the water line and the top, crown, or roof of the excavation made for the crossing utility is at least two times the diameter or horizontal span of the trenchless excavation below the water line, or 36 inches, whichever is larger. The trenchless method shall support the advancing face and roof or crown of the excavation at all times when within a horizontal distance of 10 feet of the water line.
18. Utility crossings constructed under water mains by open cut methods are not allowed if the water main consists of asbestos cement pipe or cast iron pipe with lead caulk joints. In those instances, the main must be removed and replaced to accommodate construction of the subject utility. Replacement will be with new pipe of the type currently used in the AW system for comparable size pipe. If the utility crossing under the water main is a water or wastewater service line, in lieu of replacing the main, the Engineer may provide a design detail showing how the main shall be supported during the open cut method.
19. Bedding and backfill for that portion of a utility installed by open cut construction under and within 5 feet horizontally of a water main shall be made using controlled low strength material from the bottom of the subject utility to the bottom of the bedding envelope of the water line even if that water line is removed and replaced as described above.
20. Connections to Concrete Steel Cylinder Pipe
 - a. Special Details are required to show materials and method of connecting proposed water mains to existing Concrete Steel Cylinder, or CSC, water mains.

- b. Connections to Bar-Wrapped CSC Pipe shall be by cutting and removing an appropriate pipe segment, and replacing with Ductile Iron fittings, valves, or pipe, using appropriate CSC to DI steel transition adapters and steel butt straps.
- c. Connections to Prestressed Concrete Cylinder Pipe (PCCP) shall be by removing entire pipe segments, joint to joint, and replacing with Ductile Iron pipe or welded steel pipe, as designated by AW, using appropriate bell-to-MJPE and spigot-to-MJPE transition adaptors.

C. Valves

1. There shall be a valve on each fire hydrant lead restrained to the main using bolt-through types of connections between the valve and the branch outlet from the main. These and all valves 24 inches and smaller shall be resilient seated gate valves.
2. Valves shall be located at the intersection of two or more mains and shall be spaced so that no more than thirty customers will be without water during a shutout. Water mains designated by Systems Planning for distribution, up to and including 24 inches in diameter, shall be valved at intervals not to exceed 500 feet in high-density areas and 1,200 feet in residential areas. Water mains 24 inches and larger designated by Systems Planning for transmission shall be valved at intervals not to exceed 2,000 feet or at a branched water main connection, whichever is less.
3. For valves at the end of dead end mains, see Section 2.9.2.B.1.a.
4. Branch piping (both new and future branches) shall be separated from the main with gate valves.
5. For all mains, valves at intersections shall be placed at point of curvature (p.c.) of the curb line.
6. Valves shall be located so that isolating any segment of water main requires closing of no more than three valves.
7. The operating nut or extension of any valve shall be between 18 inches and 24 inches below finished grade.
8. Valves with valve extensions and those at pressure zone boundaries shall be equipped with a locking type debris cap.
9. Each valve that is 16 inches and smaller in diameter shall be supported by a pre-cast or cast-in-place concrete pad conforming to details in COA valve installation Standards. Each valve that is 24 inches and larger in diameter shall be supported by a monolithic, cast-in-place reinforced concrete foundation conforming to project-specific detailed structural drawings. Cast-in-place supports shall not interfere with access to any nuts or bolts at the connecting pipes.
10. Valves having "push on" joints are not permitted for fire hydrant leads and laterals.
11. Butterfly valves shall not be allowed.
12. Water mains shall be designed so that valves can be installed vertically unless conditions dictate otherwise.
13. Water mains installed under TxDOT ROW, railroad ROW, or any flowing or intermittent stream, creek, river or semi-permanent body of water (water crossing), except when installed by horizontal directional drilling technology (or HDD), shall be installed in a steel pipe encasement with spacers, pipe joint restraint and factory end seals. The crossing design shall include the installation of a drain valve assembly at the lowest point in the

crossing, and an isolation valve at the high point on each side of the crossing with a CARV installed on the downslope side of each valve.

Water crossings shall conform to current COA Erosion Hazard Zone (EHZ) crossing criteria.

14. Valve operators shall be located a minimum of 24 inches from an existing property line.

D. Fire Hydrants

1. Hydrants shall be installed at the intersection of two streets and between intersections where necessary, at distances not in excess of 300 feet between hydrants in commercial or other high-density areas and not more than 600 feet in residential areas.
2. Hydrants shall be installed on both sides of all divided road/highways to provide adequate firefighting coverage. Roads/highways where opposing lanes of traffic are separated by a vehicle obstruction shall be considered a divided road/highway.
3. The entire fire hydrant assembly shall have restrained joints.
4. Fire hydrants shall not be designed to be within 9 feet in any direction of any wastewater main, lateral, or service regardless of material of construction.
5. Fire hydrants shall be designed so as not to interfere with sidewalk ramps, trash receptacles, and street light and signal pole foundations.
6. To avoid sidewalks, ramps, and other features, fire hydrants placed near a street corner should in general be located outside the curve radius and a minimum of 4 feet from ramps. Exceptions may apply in existing neighborhoods or long (>5 feet) radius curb return.
7. Placement of fire hydrants should take into consideration above ground improvements, landscaping, critical root zones, grades and other utilities.
8. In existing neighborhoods, new fire hydrants should be placed as close as possible to the existing fire hydrant locations with the exception of new hydrants needed to meet minimum spacing requirements.
9. Fire hydrants should be placed on the short side of the street where possible unless there are site constraints.
10. When fire hydrants are subjected to pressures above 150 psi, they shall have an attached PRV installed and set to reduce the operating pressure of the fire hydrants below 150 psi.
11. When new water lines are installed along with new fire hydrant leads, the drawings shall indicate existing fire hydrants are to be replaced with a new one, if the existing fire hydrant is older than 10 years old.
12. Fire Hydrants shall not be designed in such a manner as to provide fire flow for developments served by other water utility service providers.

E. Services

1. Water services shall be in accordance with COA Standard Details.
2. Individual meter services and fire lines will not be taken from transmission lines. Transmission lines are generally considered to be 24 inches in diameter or larger.
3. Water meters shall be placed within the public ROW or in an easement immediately adjacent to the ROW. Meters may not be located inside fences and must be accessible by vehicle. Water meter boxes and its appurtenances are not allowed in sidewalks, paved areas, driveways or load bearing pavement.
4. Service taps to the main shall have a minimum separation distance of 3 feet.

5. Service taps, regardless of type, shall not be made in vaults.
6. Domestic water services shall not be supplied from fire hydrant leads.
7. *Per the Texas State Department of Health Services, hospitals shall have no less than two approved potable water services that are installed in such a manner as to prevent interruption of service. The two services shall be from two different water mains, if possible, and separated by a water valve. If served by the same main, the services shall be separated by a water valve on that main.*

F. Water Meters

1. Properties with two, three, or four individual dwelling units (attached or detached) shall have an individual AW water meter serving each dwelling unit. Dwelling units are defined as a residential unit providing independent living facilities. Accessory uses defined in the Land Development Code, are not viewed as dwelling units and will not be required to provide multiple meters.
2. Commercial and Multi-family separate meter requirements:
 - a. Except as provided by subsection b. of this section, commercial and multi-family properties shall purchase and install a separate AW meter or meters to measure water used for all common areas and outdoor purposes, including swimming pools, fountains, permanently installed irrigation systems, and irrigation with quick-coupler hose bibbs.
 - b. Upon receipt of a completed application on a form approved by AW, AW may grant a waiver from this requirement if:
 - 1) the development does not include any landscaping; or
 - 2) a permanent automatic irrigation system does not exist nor is planned to be installed and multiple hose bibbs are available for any necessary hand watering; or
 - 3) commercial landscaping requirements do not apply to the property; or
 - 4) there is impervious cover of 90% or more; or
 - 5) the water is being used for a new fire in-line installation; or
 - 6) air conditioning condensate or other alternative on-site water is being required to meet common areas and outdoor water demands; or
 - 7) there has been a change of use for interior remodeling; or
 - 8) well water is being used to meet all common areas and outdoor water demands.
3. For properties with five or more attached or detached living units on a single lot, including mobile home communities, commercial facilities with multiple occupants, and/or multi-use facilities, that do not have public water meters for each unit, owners must comply with private submetering requirements established by plumbing code and/or TCEQ.
4. Requirements for meters 3 inches and larger
 - a. Bypasses shall be provided on all meters 3 inches and larger except those used for irrigation only.

- b. Pipe and meter size shall be determined by Owner based upon plumbing code and AWWA Water Meter Standards. Plans must be prepared by a Licensed Engineer Registered in the State of Texas.
 - 5. Fire Demand Meters (4"x2", 6"x2", 8"x2", 10"x2", 12"x2") shall be allowed only if domestic demand necessitates a domestic meter of 3 inches or larger. If domestic demand does not require a 3 inches or larger meter, required fire flow shall be provided via an appropriately sized dedicated fire line with a double check detector backflow prevention assembly per AW Standard Detail. For small fire demand applications where both fire demand and domestic demand can be provided with 2 inches or smaller meter, a single meter may be used for both fire and domestic.
 - 6. New water meters shall be in conformance with AW's automated metering infrastructure technology, and with the applicable standard product list. Applicants filing a tap plan will be responsible for the costs of extending AW's technology to the tract of land requiring service through the granting of an easement to the City as applicable. Applicants filing a site plan or subdivision plan will be responsible for the costs of extending AW's technology to the tract of land requiring service including technical assessments by AW and its agent; an easement granted to the City; poles, street lights, or other structures to locate a data collection units upon; and providing electrical service to the data collection units where solar power is not practical. AW or its agent shall determine the location of the data collection units, and perform the installation, and ongoing maintenance and repair of such infrastructure.
- G. Reserved

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2.9.4 Wastewater Systems

A. Determination of Wastewater Flow.

1. Residential single-family units shall be assumed to produce an average wastewater flow of 245 gallons/day.
2. Industrial wastewater flows will be evaluated on a case-by-case basis.
3. Inflow/Infiltration.

In sizing sewers, external contributions are accounted for by including 750 gallons per day per acre served for inflow and infiltration. For sewers in the Edwards Aquifer Zone refer to the Texas Commission on Environmental Quality (TCEQ) requirements. Strict attention shall be given to minimizing inflow and infiltration.

4. Peak Dry Weather Flow (PDWF).

The PDWF is derived from the formula:

$$Q_{pd} = [(18 + (0.0206 \times F)^{0.5}) / (4 + (0.0206 \times F)^{0.5})] \times F$$

where: F = 70 gal./person/day × population/1440
= average dry-weather flow in gpm

5. Peak Wet Weather Flow (PWWF).

The PWWF is obtained by adding inflow and infiltration to the peak dry weather flow. In designing for an existing facility, flow measurement shall be used when available for the preexisting developed area if the reference indicates higher peak wet weather flows than the calculated method.

B. Determination of Pipe Size.

1. Minimum Size.

The minimum diameter of all gravity sewer mains shall be ~~eight (8)~~ inches. For service line sizes, refer to the City of Austin Standard Details.

2. Design Requirements.

For sewer mains, 15 inches in diameter or smaller, use the larger size as determined below:

- a. The main shall be designed such that the PDWF shall not exceed 65% of the capacity of the pipe flowing full.
- b. The main shall be designed such that the PWWF shall not exceed 85% of the capacity of the pipe flowing full.
- c. For sewer mains, 18 inches in diameter or larger, the main shall be designed such that the PWWF shall not exceed 80% of the capacity of the pipe flowing full.

3. Minimum Design Velocities.

The minimum design velocity calculated using the PDWF must be at least ~~two (2)~~ feet per second (fps). If a minimum velocity of ~~two (2)~~ fps cannot be achieved due to the low projected

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wastewater flows, velocities lower than ~~two (2)~~ fps at PDWF may be allowed provided that all of the following requirements are met:

- a. The Engineer substantiates in writing and to the satisfaction of Austin Water (AW) that is not possible to meet the ~~two (2)~~ fps velocity at PDWF.
- b. A minimum of 0.01 ft./ft. (1.0 percent grade) is provided.

4. Maximum Design Velocities.

The maximum design velocity calculated using the PWWF should not exceed ~~ten (10)~~ fps. Velocities in excess of 10 fps may be considered under special conditions where no other options are available. In such cases, proper consideration shall be given to pipe material, abrasive characteristics of the wastewater flows, turbulence and displacement by erosion or shock.

5. Minimum Slope.

The minimum allowable slope for ~~eight (8)~~ inches mains within the service area of the City of Austin shall be 0.005 ft./ft. (0.5 percent grade) unless otherwise required by 3.b of this section.

6. Allowable pipe sizes.

The following sizes will be the only sizes allowed for use in the gravity system: 6" ~~inches~~ (for services only), 8" ~~inches~~, 12" ~~inches~~, 15" ~~inches~~, 18" ~~inches~~, 21" ~~inches~~, 24" ~~inches~~, 30" ~~inches~~, 36" ~~inches~~, 42" ~~inches~~. Larger sizes may be approved on a case by case basis. These pipe sizes do not apply to force mains.

C. Design Considerations.

1. Materials and Standards.

All materials and appurtenances shall conform to the AW Standard Products List.

2. Protecting Public Water Supply.

No physical connection shall be made between a drinking water supply and a sewer or any appurtenance thereof. An air gap of a minimum of two inlet pipe diameters between the potable water supply and the overflow level connected to the sewer shall be provided.

3. Location.

The location of the wastewater main shall be in conformance with the City of Austin ~~(COA)~~ Standard Details Manual. Alternative assignments must be approved by AW Utility Development Services (UDS) - Pipeline Engineering. Outside the City Limits, the design engineer shall coordinate utility assignments with both AW and the appropriate county authority.

4. Steep grades.

Where the pipe grade exceeds 12% and the construction is outside of any pavement, concrete retards conforming to the City standards will be required at intervals of no more than ~~twenty-five (25)~~ feet (preferably at joint locations).

5. Depth of Cover.

If fill or embankment placed over existing wastewater mains exceeds ~~four (4)~~ feet above the existing ground, AW approval is required. If cuts exceed the minimum depth of cover stated

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below, AW approval is required. The minimum depth of cover over the upper-most projection of the main shall be as follows:

- a. Wastewater piping installed in natural ground in easements or other undeveloped areas which are not within existing or planned streets, roads or other traffic areas, shall be laid at least 42 inches below ground elevation.
- b. Wastewater piping installed in proposed streets, existing streets, roads or other traffic areas shall be laid at least 66 inches below proposed ground elevation.

6. Turbulence.

Wastewater lines shall be designed to minimize turbulence to prevent release of sulfide gases and subsequent corrosion.

7. Wastewater lines are prohibited in a critical water quality zone, except for a necessary crossing.
8. Curved wastewater mains are prohibited.

D. Manholes.

1. Location.

Manholes shall be located and spaced so as to facilitate inspection and maintenance of the wastewater main. All manholes must be accessible to maintenance equipment, including 2½ ton straight trucks, dump trucks, vacuum trucks, and standard (not compact) sizes of backhoes and loaders. In isolated cases, construction of all-weather access roads may be necessary for manhole and/or wastewater line access. If required, design guidance is provided in Section 2.9.4.D.12. Manholes shall be placed at the following locations:

- a. Intersections of mains.
- b. Horizontal alignment changes.
- c. Vertical grade changes.
- d. Change of pipe size.
- e. Change of pipe material.
- f. The point of discharge of a force main into a gravity wastewater main.
- g. For multi-family projects exceeding 15 dwelling units and for commercial developments containing more than 4,000 square feet of air conditioned space and requiring a water meter greater than ~~two~~ (2) inches, a manhole is required on the main at the point of connection to the wastewater service.
- h. At the upstream end of mains.
- i. At other locations as required by City Code.

2. Spacing.

Manhole spacing for lines smaller than 24 inches should not exceed 500 ft.; for larger mains, spacing may be increased, subject to approval by the Utility.

3. Covers.

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- a. All manholes located in unpaved areas or in the TCEQ Edwards Aquifer Recharge Zone (EARZ) shall have bolted, watertight covers.
 - b. When existing manholes are adjusted in height to match finished surface elevations, the most current manhole ring and cover size shall be utilized. This may require removal and replacement of the existing manhole cone section to facilitate the above work.
4. Corrosion Prevention.
- Manholes shall be constructed of or lined with a corrosion resistant material. Where new construction ties into an existing manhole, the existing manholes must be lined, coated, or replaced with a corrosion resistant material. The Design Engineer shall provide an AW Manhole Inspection report for Wastewater Manhole replacement or rehabilitation for both CIP and non-CIP projects.
5. All lines into manholes, including drop connections, shall match crown-to-crown where feasible. Any deviation must be approved in advance by AW UDS - Pipeline Engineering.
 6. Drop manholes are not allowed where the size of the incoming main requiring the drop exceeds 15 inches diameter. External drops will be limited to a depth of 15 feet from the lid of the manhole to the base. Drop manholes in excess of 15 feet deep must be designed with an internal drop and must be a minimum size of ~~five (5)~~ foot diameter.
 7. Minimum inside manhole diameters shall be as indicated in the following table:

Main Size	Depth		
	Less than 20'	20'—30'	Greater than 30'
Up to 15"	48"	60"	72"
18"—24"	60"	60"	72"
30" and 36"	72"	72"	72"

Note 1: In the event a structure is utilized inside a manhole, the clear space between the structure and the manhole wall shall be a minimum of 48" ~~inches~~.

Note 2: If more than two mains connect to a manhole, or if two mains connect to a manhole at an angle other than 180 degrees from each other, a larger diameter manhole may be required in order to accommodate mandrel insertion and hydraulically efficient flow. A straight section of invert that is 4" ~~inch~~ to 6" ~~inch~~ in length is required to transition between the curved portion of the invert channel and the connecting pipes in order to accommodate the mandrel apparatus for up to 15" ~~inch~~ diameter pipes.

Note 3: New pipe connections to existing manholes shall provide a minimum of 12" ~~inches~~ clearance between the existing pipe ID and the new core hole ID measured on the inside surface of the manhole, regardless of the orientation of the pipes with respect to one another. New precast manholes and manholes with cast-in-place bases shall have holes for pipe penetrations in the manhole wall separated by a minimum of ~~seven (7)~~ inches, designed by the manhole manufacturer and as measured from the inside diameter of the cored holes on the inside wall of the manhole to ensure the structural integrity of the manhole wall.

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Note 4: The vertical distance between the highest point of the invert shelf and the bottom of any horizontal or near-horizontal surface protruding into a manhole or junction box, shall be at least ~~six (6)~~ feet, when the depth of the main is sufficient.

8. Where a separation of ~~nine (9)~~ feet between an existing water main and a new manhole cannot be achieved during construction of a new wastewater main the joints in the wastewater manhole shall be made watertight using externally applied joint wraps. Where a separation of ~~nine (9)~~ feet between a water main and an existing manhole cannot be achieved during construction of a new water main, the manhole shall be assessed as per Section 2.9.4.D.4 to determine if the manhole is watertight and if not, the manhole shall be made watertight.
9. Manholes constructed on existing wastewater mains may have a cast-in-place base. All other manholes shall have a precast base.
10. Manhole and junction box inverts shall have a minimum slope of 2.5% between the inlet and outlet pipe inverts.
11. Manholes and junction boxes located below ground water.
 - a. When the interior surface of a concrete manhole or junction box is coated with a urethane, polyurethane, or epoxy liner, the exterior surface of that portion of a manhole or junction box located below ground water level shall be water proofed using a flexible system applied to the exterior surface. The drawings shall indicate which structures must be water proofed and the elevation to which water proofing must be applied (~~two (2)~~ feet above ground water level).
 - b. Manhole joints below the ground water level and/or located in the 100-year floodplain shall be sealed by installing a joint wrap material over the joint on the manhole exterior.
 - c. Construction joints in cast-in-place junction boxes shall be water proofed using water stops.
12. All-weather access roads should be at least 12 feet wide and placed within a 20-foot wide (minimum) access easement. It is intended for emergency use by maintenance equipment. If the wastewater easement is wide enough to accommodate the access road, it may be used in lieu of an access easement. This 12 foot maintenance access road should be outside the toe of any fill slope and the top of any cut slope and shall not have a post construction longitudinal slope greater than 15% nor a post construction transverse slope greater than 5%, shall not have a vertical grade break of greater than 12%, should have an inside turning radius of no less than 28.3 feet, an outside turning radius of no less than 42 feet, shall be cleared of all vegetation and graded, and should maintain a horizontal and vertical clearance from existing and proposed vegetation and all other objects of no less than 14 feet.

The access road shall include a means for equipment to turn around when located more than 200 feet from a paved public roadway. Turn around shall meet the above listed design criteria. Access roads shall be cleared, graded and stabilized with stones in accordance with Standard Detail 662S-2, Pond Maintenance Road Typical Cross Section. Other materials and geometrics may be approved on a case by case basis by AW.
13. If a proposed development intends to connect to an existing brick manhole, the manhole will need to be removed and replaced.

E. Ventilation.

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Ventilation shall be provided as required by TCEQ Rules and Regulations.

F. Inverted Siphons.

The use of siphons is discouraged. When no other feasible option exists, the following criteria apply. Siphons shall have a minimum of two barrels. The minimum pipe size shall be ~~six (6)~~ inches with a minimum flow velocity of 3.0 fps at peak dry weather flow. The minimum dry weather flow shall be used to size the smallest barrel. Three-barrel siphons shall be designed to carry the capacity of the incoming gravity wastewater main(s) with one barrel out of service.

An additional corrosion resistant pipe shall be designed to allow for the free flow of air between the inlet and outlet siphon boxes. The diameter of this air jumper shall not be smaller than one-half the diameter of the upstream sewer. Air jumper pipe design shall provide for removal of condensate water that will collect in the pipe.

Siphons shall be designed to allow draining, cleaning, and diversion of flow from individual barrels and inspection. Siphon inlet and outlet structures shall be manufactured with polymer concrete.

G. Service Lines.

1. **Wastewater services shall be in accordance with COA Standard Details.**

~~2.1~~ Wastewater service lines, between the main and property line, shall have an inside diameter not less than ~~six (6)~~ inches. The minimum grade allowed for service lines is ~~one (1)~~ percent. In all new systems, grade breaks exceeding allowable joint deflection must be made with approved fittings and shall not exceed a cumulative total of 45 degrees.

~~3.2~~ No service connections shall be made to mains larger than 15 inches in diameter.

~~4.3~~ Service connections to force mains that are ~~two (2)~~ inches in diameter and smaller may be allowed on a case by case basis. Service connections to force mains that are larger than ~~two (2)~~ inches in diameter shall not be allowed.

~~5.4~~ Potable water and wastewater service lines shall be a minimum of nine feet apart unless the potable and wastewater service lines are located on a common lot line and constructed in accordance with ~~City of Austin~~ **COA** Standard Details per TCEQ rules. Services to lots without a water/wastewater easement shall terminate at the property line with a **2-way** cleanout. Service to lots having a ~~5 feet~~ by ~~5 feet~~ water/wastewater easement shall terminate within the easement with a **2-way** cleanout. **A 2-way cleanout shall be installed for service lines 4 inches to 6 inches in diameter, and a large diameter cleanout shall be installed for service lines 8 inches to 12 inches in diameter. For service lines larger than 12 inches in diameter, contact Industrial Waste for design requirements.** For details, see the ~~City of Austin~~ **COA** Standard Details.

~~6.5~~ Wastewater clean-outs are not allowed in sidewalks, paved areas, load bearing pavement, or driveways.

~~7.6~~ Sample and inspection ports are required for service lines when industrial waste monitoring is required. They shall be located at the property line within the public right-of-way (ROW) or utility easement line to indicate the line of responsibility of the utility. They shall not be located in traffic areas, paved parking areas or sidewalks.

H. Reserved.

I. Requirements for Existing and Proposed Wastewater Infrastructure beneath Circular Intersections or Other Geometric Street Features.

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1. Installation of Circular Intersections or Other Geometric Street Features over existing wastewater infrastructure.
 - a. Existing wastewater infrastructure may be allowed to exist beneath circular intersections or other geometric street features such as, but not limited to, modern roundabouts, medians, bulb-outs, splitter islands, channelization islands, and other types of physical roadway features. These features may contain hardscaping, landscaping, water quality features, public art, permanent structures, street furniture, or other similar amenities.
 - b. The planning and design of these features and their amenities shall include consideration for access, maintenance, protection, testing, cleaning, and operations of the wastewater infrastructure. Where existing wastewater facilities are to remain, trees with root zones of 18 inches in depth or greater at maturity may be considered for inclusion provided the drip lines at maturity of the proposed trees are not located within a minimum horizontal separation of ~~seven and one-half~~ (7.5) feet from any wastewater infrastructure. Public art, permanent structures, and other similar amenities may be considered for inclusion provided they are not located within a minimum horizontal separation of ~~seven and one-half~~ (7.5) feet from any wastewater infrastructure. The drip lines at maturity of ornamental trees with root zones at maturity of less than 18 inches in depth, grasses, woody or herbaceous shrubs, and street furniture may be located within a minimum horizontal separation of ~~seven and one-half~~ (7.5) feet from any wastewater infrastructure.
 - c. The need for relocating, replacing or protecting in place existing wastewater infrastructure beneath these features and their amenities shall be determined on a case-by-case basis by AW.
2. Installation of Circular Intersections or Other Geometric Street Features in new areas of development with no existing wastewater infrastructure.
 - a. Proposed wastewater infrastructure may be placed beneath proposed circular intersections or other geometric street features such as, but not limited to, modern roundabouts, medians, bulb-outs, splitter islands, channelization islands, and other types of physical roadway features. These features may contain hardscaping, landscaping, water quality features, public art, permanent structures, street furniture, or other similar amenities.
 - b. The planning and design of these features and their amenities shall include consideration for access, maintenance, protection, testing, cleaning, and operations of utility infrastructures. Trees with root zones of 18 inches in depth or greater at maturity may be considered for inclusion provided the drip lines at maturity of the proposed trees are not located within a minimum horizontal separation of ~~seven and one-half~~ (7.5) feet from any wastewater infrastructure. Public art, permanent structures, and other similar amenities may be considered for inclusion provided they are not located within a minimum horizontal separation of ~~seven and one-half~~ (7.5) feet from any wastewater infrastructure. The drip lines at maturity of ornamental trees with root zones at maturity of less than 18 inches in depth, grasses, woody or herbaceous shrubs, and street furniture may be located within a minimum horizontal separation of ~~seven and one-half~~ (7.5) feet from any wastewater infrastructure.

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- c. The need for alternative alignments or the inclusion of protective systems for the proposed wastewater infrastructure beneath these features and their amenities shall be determined on a case-by-case basis by AW.

J. Lift Stations (Excluding low pressure systems).

Lift stations are discouraged and will be allowed only where conventional gravity service is not feasible (Lift Station installation cost plus 30 years O&M expense is less than installation cost for gravity system). This subsection details the specific design criteria for wastewater lift stations proposed for immediate or future City operation and maintenance within the City of Austin or its ETJ. Additional requirements for individual lift stations may be imposed by the Director of AW or his designee as conditions warrant.

In addition to these criteria, all lift stations must meet TCEQ rules and AW Submersible Wastewater Lift Station General Specifications.

1. Flow Development.

Calculation of wastewater flow shall be done in accordance with Section 2.9.4.A. The following calculations shall be included:

a. Maximum Wet Weather Flow (Design Flow).

This flow is used to determine the lift station design capacity. All lift stations shall be designed to handle the maximum wet weather flow for its service area.

Equation:

$$(\text{Population of service area} \times 70 \text{ gallons per capita per day (gpcd)} \times \text{maximum flow peaking factor}) + (750 \text{ gallons per acre served}).$$

b. Maximum Dry Weather Flow.

This flow is used to determine pipe size in the collection system.

Equation:

$$(\text{Population of service area}) \times (70 \text{ gpcd}) \times (\text{maximum flow peaking factor})$$

c. Average Dry Weather Flow.

This is the flow developed without the maximum flow peaking factor. This flow is used to determine the average detention time in the wet well.

Equation:

$$(\text{Population of service area}) \times (70 \text{ gpcd})$$

d. Minimum Dry Weather Flow.

This is used to determine the maximum detention time in the wet well.

Equation:

$$(\text{Population of service area}) \times (70 \text{ gpcd}) \times (\text{minimum flow peaking factor})$$

- e. A minimum of ~~two (2)~~ pumps shall be required for all lift station. The capacity of the pumps shall be such that the maximum wet weather flow can be handled with the largest pump out of service.

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2. Wet Well Design.

- a. The bottom of the wet well shall have a minimum slope to the intake of ~~two (2)~~ vertical to ~~one (1)~~ horizontal **with a smooth concrete surface, or 1 vertical to 1 horizontal with a slick coated surface per SPL WW-511**. There shall be no projections in the wet well, which would allow deposition of solids.
- b. The wet well volume shall be sized to provide adequate storage volume at peak design flows and a pump cycle time of sufficient duration to prevent pump short cycling and consequential motor damage. Pump cycle time, defined as the sum of "pump off" time plus "pump on" time, shall be as follows:

Motor H.P.	θ Min (Minimum Cycle Time in Minutes)
2 to 50	10
51 to 75	15
76 to 250	30
251 to 1,500	45

Volume between "pump on" and "pump off" elevation (of the pump cycle) shall be determined by the following criteria:

$$V = \frac{\theta q}{4}$$

Where: q = pump capacity in gpm and θ is the minimum cycle time in minutes

- c. All "pump on" levels shall have a minimum separation of ~~one (1)~~ foot between levels. All "pump off" levels shall be at least ~~six (6)~~ inches above the top of the pump casing. For more than ~~two (2)~~ pumps, the "pump off" levels shall be staged with a minimum separation of ~~one (1)~~ foot between levels.
- d. An example of a ~~two (2)~~ pump staging sequence follows:

High-level alarm

Lag pump on

Lead pump on

Lag pump off

Lead pump off

Low-level alarm

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The high level alarm shall be at least ~~one (1)~~ foot above the last (highest) "pump on" level in the wet well and also at least ~~one (1)~~ foot below the flow line of the lowest influent line into the wet well.

- e. For lift stations with ~~three (3)~~ pumps or more, the following method for calculating the wet well volume may be used:

$$V = \frac{\theta \times q_1}{4}$$

and $K = (q_1 - q_2) + q_1$

$V_2 = V' \times N \times V_1$

Where:

V_1 = working volume for the first pump in gallons

θ = minimum cycle time in minutes

Q_1 = capacity of the first pump in gpm

Q_2 = capacity of the second pump in gpm

K = the ratio of the discharge increment to the discharge of the first pump, dimensionless

V_2 = working volume for the second pump gallons

V' = the ratio of additional draw down volume to the volume for one pump, dimensionless

N = number of pumps

- 1) Calculate V_1 and K ;
- 2) Locate K on Table 1 and read the corresponding value for V' ;
- 3) then calculate V_2 .

- f. An example of a ~~three (3)~~ pump starting sequence is as follows:

High-level alarm

Third pump on

Second pump on

First pump on

Third pump off

Second pump off

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First pump off

Low Level alarm

For the location of the high level alarm, refer to the example of a two-pump starting sequence.

TABLE 1: V' values Corresponding to various K Values

K	V'	K	V'	K	V'
0.00	0.00	2.10	1.36	3.49	2.63
0.33	0.00	2.13	1.39	3.53	2.67
0.44	0.01	2.17	1.42	3.57	2.70
0.53	0.04	2.20	1.45	3.61	2.74
0.62	0.08	2.23	1.49	3.65	2.77
0.70	0.12	2.27	1.52	3.69	2.81
0.77	0.16	2.30	1.55	3.73	2.85
0.84	0.21	2.34	1.58	3.77	2.88
0.90	0.25	2.37	1.62	3.81	2.92
0.96	0.29	2.41	1.65	3.85	2.96
1.02	0.34	2.45	1.68	3.89	3.00
1.07	0.38	2.48	1.71	3.93	3.03
1.12	0.42	2.52	1.75	3.97	3.07
1.17	0.46	2.55	1.78	4.01	3.11
1.22	0.51	2.59	1.81	4.05	3.15
1.26	0.55	2.62	1.84	4.09	3.18
1.30	0.59	2.66	1.88	4.13	3.22
1.34	0.63	2.70	1.91	4.17	3.26
1.38	0.66	2.73	1.94	4.21	3.30
1.42	0.70	2.77	1.97	4.25	3.34
1.46	0.74	2.81	2.01	4.29	3.38
1.50	0.78	2.84	2.04	4.33	3.42
1.54	0.81	2.88	2.07	4.38	3.45
1.57	0.85	2.92	2.11	4.42	3.49
1.61	0.89	2.95	2.14	4.46	3.53
1.65	0.92	2.99	2.18	4.50	3.57
1.68	0.96	3.03	2.21	4.54	3.61
1.72	0.99	3.07	2.24	4.58	3.65
1.75	1.03	3.10	2.28	4.63	3.69
1.79	1.06	3.14	2.31	4.67	3.73
1.82	1.09	3.18	2.35	4.71	3.77
1.86	1.13	3.22	2.38	4.75	3.81
1.89	1.16	3.26	2.42	4.79	3.85
1.92	1.19	3.29	2.45	4.84	3.89
1.96	1.23	3.33	2.49	4.88	3.93

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1.99	1.26	3.37	2.52	4.92	3.97
2.03	1.29	3.41	2.56	4.96	4.01
2.06	1.33	3.45	2.59	5.01	4.05

K = Pump discharge (Dimensionless) V' = Volume (Dimensionless) Source: ALBERT PINCINE

3. Wet Well Detention Time.

- a. Calculate the detention time (Td) in the wet well for the maximum wet weather flow, maximum dry weather flow and average dry weather flow using the following equation:

$$T_d = t_f + t_e$$

Where:

$T_f = (v) \div (i)$ = time to fill the wet well in minutes

$T_e = (v) \div (q - i)$ = time to empty the wet well in minutes

v = Volume of wet well between "pump on" and "pump off" elevations in gallons

q = Pump capacity in gpm

i = flow into the station corresponding to the maximum wet weather flow, maximum dry weather flow or average dry weather flow in gpm.

- b. Maximum detention time shall be calculated with i = minimum dry weather flow.
- c. Odor control shall be provided for the wet well if the total detention time in the wet well and force main system exceeds 180 minutes.

4. Static Head.

The static head shall be calculated for "pump on" and "pump off" elevations in the wet well.

5. Net Positive Suction Head.

The net positive suction head (NPSH) required by the pump selected shall be compared with the NPSH available in the system at the eye of the impeller. The engineer shall consult the pump manufacturer for the NPSH required values for that pump and compare them with calculated values for the NPSH available. The NPSH available should be greater than the NPSH required for a flooded suction pump. The following equation may be used for calculating the NPSH available:

$$NPSH_A = P_B + H_s - P_v - H_{f_s}$$

Where:

P_B = barometric pressure in feet absolute,

H_s = minimum static suction head in feet,

P_v = vapor pressure of liquid in feet absolute,

H_{f_s} = friction loss in suction in feet.

For lift stations in Austin's service area a barometric pressure of 33.4 feet may be used and a vapor pressure of one and four tenths (1.4) feet may be used. These value are based on the

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following assumptions: an altitude of 500 feet above sea level, a water temperature of 85°F and a specific gravity of water of 0.996 at 85°F.

6. Suction Piping Design.

- a. All suction piping shall be flanged ductile iron and have a minimum diameter of ~~four (4)~~ inches. Each pump shall have a separate suction pipe.
- b. Suction piping shall have a velocity of ~~three (3)~~ to ~~five (5)~~ fps.
- c. All suction pipes inside the wet well shall be equipped with a flare type, down-turned intake. The distance between the bottom of the flare and the floor of the wet well shall be between D/3 and D/2 where D is the diameter of the flare inlet.

7. Force Main Design.

- a. All force mains ~~pipe and fittings outside the lift station site~~ shall be polyethylene (PE) except where PE components of the required size, pressure class, or configuration are not available. In those cases, alternative materials will be considered, subject to AW approval. ~~ductile iron with non-corrosive lining or an approved HDPE with a minimum diameter of four (4) inches. Force main pipe within the station shall be flanged.~~ Flexible fittings shall be provided at the exit wall.
- b. Force mains shall be a minimum of 4 inches in diameter and sized so that the flow velocity is between ~~three (3.0)~~ and ~~six (6.0)~~ feet per second at initial and ultimate development. Initially, the force main shall be sized so the flow velocity is at least 3 feet per second and less than 4 feet per second for the most efficient operations. Velocities above 4 feet per second will be reviewed/approved on a case by case basis. The pump size may need to be increased above the minimum size pump in order to meet the minimum flow rate in the force main. During initial development phases for lift stations with ~~three (3)~~ or more pumps, flow velocities may be as low as ~~two and one-half (2.5)~~ feet per second with one pump running.
- c. The maximum time required to flush the force main shall be calculated on the basis of average dry weather flow. Flush time shall be calculated for average dry weather flow using the following equations:

$$T_{\text{flush}} = (t_f + t_e) \times \frac{(\text{Force Main Length})}{(\theta/2) (V_{\text{fm}}) (60 \text{ sec/min})}$$

Where:

t_e = Time to empty wet well in minutes

t_f = Time to fill wet well in minutes

V_{fm} = Flow velocity in the force main in feet per second

θ = Pump cycle time in minutes

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$$*t_e = v/(q-i)$$

$$*t_f = v/i$$

i = average dry weather flow in gpm

*See Section 2.9.4.J.3.a, "Wet Well Detention Time", for an explanation of v and q.

- d. Odor and corrosion control shall be provided for the force main if the force main detention time exceeds 30 minutes if dual force mains are not feasible.
- e. Location and size of all air release valves shall be evaluated for odor or nuisance potential to adjacent property by the design engineer.
- f. Sulfide Generation Potential.
- g. The force main shall discharge into it's own distinct polymer manhole. (i.e. multiple force mains shall not discharge into a single manhole.)
- h. Thrust restraint when required shall be shown on the plan view.
- i. All PE-pipe-to-PE-pipe and PE-pipe-to-PE-fitting connections shall be fused.
- j. Polyethylene MJ adaptors shall be used to join PE pipe to valves and ductile iron fittings. PE flange adaptors may be used only on a case-by-case basis and with pre-approval by AW.
- k. Anchors to control thermal thrust forces and Poisson Effects forces shall be specified at locations where PE force mains discharge into manholes, gravity wastewater pipes or under any similar circumstances where excessive movement of gasketed joints at or beyond the end of the fused PE pipe could occur. The anchors shall be designed using accepted engineering practice and assuming a Poisson's Ratio of 0.35, the thermal coefficient of expansion of PE is 1×10^{-4} in/in/°F, the apparent elastic modulus is 55,000 psi, and the temperature change is 40°F. The anchor shall be located on the PE pipe as close as possible to the end of the fused pipe.