



APACHE JUNCTION WATER UTILITIES CFD

CONSTRUCTION SPECIFICATIONS: WD-2

FOR THE INSTALLATION OF DUCTILE IRON PIPE

AND

STANDARD DETAIL DRAWINGS, W-1

2022 EDITION

Q1 REVISIONS

APACHE JUNCTION WATER UTILITIES CFD

CONSTRUCTION SPECIFICATIONS FOR THE INSTALLATION OF WATER DISTRIBUTION SYSTEMS DUCTILE IRON

DEFINITIONS

- A. District. The word "District" or "Apache Junction Water District" means Apache Junction Water Utilities Community Facilities District, whose principal place of business is located at: 300 East Superstition Boulevard, Building D, Apache Junction, Arizona 85119 (Post Office Box 4768, Apache Junction, Arizona 85178-0014)
- B. District's Authorized Representative. The words "District's Authorized Representative" means any member of the District, any of the District's Engineers, any District Project Manager or Superintendent of the District and/or such other person(s) designated in writing as the "District's Authorized Representative" by the District Director.
- C. Contractor. The word "Contractor" means either an individual or other entity employed to do the work as shown on the Construction Drawings and as specified herein.
- D. Construction Drawings. The words "Construction Drawings" mean plans prepared by or on behalf of Apache Junction Water District.
- E. Contract. The word "Contract" means the written document titled "Proposal/Contract" when such document has been signed by the authorized representatives of both the Contractor and the District.

APACHE JUNCTION WATER UTILITIES CFD

CONSTRUCTION SPECIFICATIONS FOR THE INSTALLATION OF WATER DISTRIBUTION SYSTEMS DUCTILE IRON

1. GENERAL

All work is to be completed in a safe, workmanlike manner and in accordance with these Construction Specifications; any deviation therefrom must be approved in writing by the District.

Installations must conform with the requirements of all governmental regulating agencies and the cost of conforming to such regulations must be included in the unit bid prices. Examples of such regulations, without attempting to be inclusive, are:

- a. Special compaction and paving for street crossing.
- b. Shoring when required because of the trench depth.
- c. Closing a trench in those areas where no open trench is allowed overnight.
- d. Barricading and traffic control as required.

2. LOCATION MARKING

Alignment stakes as required, in the opinion of the District, will be furnished by the Contractor and will be set at agreed upon intervals and offsets. Under normal circumstances these will reference the pipeline location. Grade stakes will be provided only when the Construction Drawings show a pipeline depth other than covered in these Specifications. It is the responsibility of the Contractor to preserve all survey work.

3. TRENCH EXCAVATION

The trench location is to be determined by the Construction Drawings.

FOR 8-INCH OR SMALLER PIPE: The depth of the trench prior to pipe laying will be such that the finished pipeline will have between thirty-six inches (36") and forty-two inches (42") of cover unless otherwise specified on the Construction Drawings.

FOR 12-INCH AND LARGER PIPE: The depth of the trench prior to pipe laying will be such that the finished pipeline will have between forty-eight inches (48") and sixty inches (60") of cover unless otherwise specified on the Construction Drawings.

The width of the trench at and below the level at the top of the pipe will be a minimum of twelve inches (12") plus the outside diameter of the pipe barrel and a maximum of twenty-four inches (24") plus the outside diameter of the pipe barrel.

The bottom of the trench will be accurately graded to provide a uniform bearing for each length of pipe for the full length of the pipe. If the bedding material on the trench bottom can be reasonably dug by hand, bell holes will be dug for the joints so that the joints in no way support the pipe.

Bedding material will be placed by hand in four-inch (4") lifts and compacted to ensure uniform compaction and to eliminate any voids under the pipe. When the space between the pipe and trench bottom varies, this must be backfilled and compacted in four-inch (4") lifts to the mid-section of the pipe. Whenever the trench is over-excavated for whatever reason, the trench bottom will be brought up to the correct depth at the Contractor's expense using A.B.C. material will be used and compacted to a uniform density of not less than 80% of the maximum density as determined by AASHTO T-99 method A and T-191.

4. MATERIALS TO BE PROVIDED BY CONTRACTOR

Unless otherwise specified on the Construction Drawings or in the Contract, the Contractor will supply all of the necessary materials which will become a permanent and integral part of the water distribution system, including concrete blocking, anchors, backfill material, paving material and supplies used during the prosecution of the work. All materials provided by the Contractor to construct the water distribution system must be NSF Standard 61 approved. All potable water pipes and fittings will have NSF-PW seal. Construction materials used in the water system will be lead free as defined at AAC R28-4-504 and R18-1-101. Any alternate material or method not listed or described herein will be considered for approval, which must be made in writing to the District. Any alternate must be equal to or exceed the minimum requirements set forth in these specifications. The Contractor will provide the following materials:

- a. **FIRE HYDRANTS:** Mueller Super Centurion 250, meeting ANSI/AWWA C502 Standard for dry-barrel fire hydrants, Model No. A-423, 5¼-inch main valve opening, three-way, 6-inch Mechanical Joint Shoe, 1½-inch pentagon operating nut, 4½-inch Pumper Nozzle, NST and two – 2½-inch Hose Nozzles, NST, color: chrome yellow (potable); silver (non-potable), drain open, open direction – left, 4-foot or 4-foot 6-inch bury depending on application. Safety flange and stainless steel safety stem coupling. Bonnet color per NFPA standard 291 for potable water. For deep hydrant installations, use a vertical flanged shoe with 6-inch class 125 flange, ASME B16.1 drilling. See details W-1-600 through W-1-604.
- (i) Clow Medallion, meeting ANSI/AWWA C502 Standard for dry-barrel fire hydrants, 5¼-inch main valve opening, three-way, 6-inch Mechanical Joint Shoe, 1½-inch pentagon operating nut, 4½-inch Pumper Nozzle, NST and two – 2½-inch Hose Nozzles, NST, color: chrome yellow (potable); silver (non-potable), drain open, open direction – left, 4-foot or 4-foot 6-inch bury depending on application. Safety flange and stainless steel safety stem coupling. Bonnet color per NFPA standard 291 for potable water. For deep fire hydrants installations, use a vertical flanged shoe with 6-inch class 125 flange, ASME B16.1 drilling. See details W-1-600 through W-1-604.

- b. **FITTINGS:** Ductile Iron Push-On ("PO") and Mechanical Joint ("MJ") fittings for water lines will be made of ductile iron per ASTM A536. All fittings will be manufactured and tested in accordance with ANSI/AWWA specifications A21.53/C153 for compact design and with ANSI/AWWA specifications A21.10/C110 for full body design. MJ joints will be provided with corten tee-head nuts and bolts that meet or exceed ASTM A242 and AWWA C111.

Ductile Iron Flanged ("FLG") fittings for water lines will be made of ductile iron per ASTM A536. All fittings will be manufactured and tested in accordance with ANSI/AWWA A21.10/C110 specifications. FLG x FLG and MJ by FLG fittings will match ANSI/AWWA specifications A21.15/C115 and ANSI B16.1 for class 125 flanges. All nuts and bolts used with flanged joints will be made of low alloy steel that meets or exceeds AWWA C111.

In accordance with ANSI/AWWA specifications A21.4/C104, all fittings 2-inch thru 3-inch will be single thickness lined and 4-inch thru 64-inch will be cement mortar lined. All fittings will be asphaltic seal coated on the exterior in accordance with ANSI/AWWA specification A21.4/C104. All fittings, PO, MJ, FLG, and FLG x MJ will be NSF-61 listed for use with potable water.

- (i) Star Pipe, Clow, Tyler-Union, United, SIP Industries, American, US Pipe, Sigma.
- (ii) Foster Adaptors, bolt-through mechanical joint restraints, made by Infact Corporation: Available in sizes: 6-inch thru 36-inch, manufactured and tested in accordance with ANSI/AWWA specifications A21.53/C153 for compact design and with ANSI/AWWA specifications A21.10/C110 for full body design. *Use must be approved in writing by the District.*
- (iii) Sigma MJ Connector, bolt through mechanical joint restraints, made by Sigma Corporation: Available in sizes 6-inch thru 36-inch, manufactured and tested in accordance with ANSI/AWWA specifications A21.53/C153 for compact design and with ANSI/AWWA specifications A21.10/C110 for full body design. *Use must be approved in writing by the District.*

- c. **GATE VALVES:** Mueller Full Body Resilient Wedge Mechanical Joint Ductile Iron Gate Valves, meeting AWWA C509 specifications, 250 psi working pressure rating, low zinc silicon bronze non-rising stem, Catalog No. A-2361-20, sizes 2-inch thru 12-inch, A-2362-20, sizes 14-inch thru 48-inch; inside and outside to meet the NSF 61 rating. The bonnet and stuffing box will have 304 stainless steel bolts/nuts. Details W-1-400 thru W-1-406.

- (i) Clow Resilient Wedge Mechanical Joint Ductile Iron Gate Valves, meeting AWWA C509 specifications, 250 psi working pressure rating, low zinc silicon bronze non-rising stem, sizes 2-inch thru 48-inch; inside and outside to meet the NSF 61 rating. The bonnet and stuffing box will have 304 stainless steel bolts/nuts.
- (ii) Valve Stem Extensions by Trumbull or Pipeline Products.

d. **TRACER WIRE, WARNING TAPE, and ELECTRONIC MARKER BALLS:**

1. **TRACER WIRE:** Will be direct bury AWG #14 solid strand copper wire, Color: Blue for potable and Purple for reclaimed. Copperhead 1445-SF-B. Service Wire UF14SOL. Regency Wire, 14AWG .045 LLDPE Insulation. Detail W-1-200.
2. **WARNING TAPE:** Standard non-detectible 3-inch width as manufactured by Reef Industries, Christy's or Trumbull. APWA Color Code per ANSI Standard Z535.1, Blue for potable water; Purple for non-potable water. Detail W-1-200.
3. **ELECTRONIC MARKER BALLS:** 4-Inch, passive antenna as manufactured by 3M, Model 1403-XR, Blue, for potable water and Model 1408-XR, Purple, for non-potable water. Detail W-1-202.

e. **COMBINATION AIR RELEASE VACUUM VALVE:** DeZurik Model 142 with 1-inch NPT inlet and 1-inch NPT outlet, ductile iron body and top flange; Stainless steel float, BUNA-N rubber seat, and mushroom cap. Meets or exceeds AWWA C512. Also, Crispin AL Series, Apco, or Val-Matic. Detail W-1-701.

f. **PRESSURE RELIEF VALVE:** Watts 174A, Model M, 2-inch inlet, 2-inch outlet, Bronze Body, 30 psi to 150 psi pressure range. Detail W-1-702.

g. **JOINT RESTRAINTS:** Mechanical Joint Restraints for ductile iron water mains will be made of ductile iron per ASTM A536 specifications. All mechanical joint restraints will be manufactured in accordance with ANSI/AWWA A21.10/C110 specifications. All mechanical joint restraints will have a minimum working pressure rating of 350 psi for pipe diameters 3-inch thru 16-inch and 250 psi for pipe diameters 18-inch thru 48-inch. All mechanical joint restraints will have UL certification for pipe diameters 3-inch thru 24-inch and FM approval for pipe diameters 3-inch thru 12-inch. Approved manufacturers: EBAA Iron series 1100, Star Pipe StarGrip series 3000, Tyler-Union TUFgrip 1000 series, US Pipe Field LOK Gasket 350, McWane Sure Stop 350 Gasket, American Fast-Grip Gaskets, Sigma One-Lok Series D-SLDE, Ford Uni-Flange 1400. Detail W-1-502.

- (i) Joint Restraints for C909 PVCO will be made of ductile iron per ASTM A536 specifications and manufactured in accordance with ANSI/AWWA A21.10/C110. Minimum working pressure to be equal to or greater than the pressure rating of the pipe being restrained (DR-18). Sizes 6-inch thru 30-inch. Approved manufacturers: Tyler-Union TufGrip 2000, Star Stargrip 4000, Ford Uni-Flange 1500, Sigma One-Lok D-SLCE, SIP Industries PTPDF Series.

h. **METER BOXES:** (Custom) Detail W-1-810

1. Armorcast P6001835A-MAG2-H2 (Number 2 Meter Box)
2. Armorcast P6001854AX12-MAG4-H2 (Number 4 Meter Box)

3. Armorcast P6001854AX24-MAG4-H2 (Tall Number 4 Meter Box)

- i. **COPPER PIPE:** 1-inch and 2-inch, Type K soft copper available in 100 and 60-foot coils respectively, meets or exceeds ASTM B88, available from Cambridge-Lee, Cerrotube, Mueller, Howell, or Streamline. 2-Inch is limited to commercially available rolls of 60 feet.
- j. **COPPER FITTINGS:** Available from Nibco or Cello.
- k. **DUCTILE IRON PIPE:** Ductile Iron Pipe, Cement Lined, Push-On and Mechanical Joint, ANSI/AWWA Specification A21.51/C151, Pressure Class 350 (sizes 4-inch thru 12-inch), Pressure Class 250 (sizes 14-inch thru 20-inch), and Pressure Class 200 for 24-inch thru 36-inch pipe. Available in 18 and 20-foot laying lengths. Approved manufacturers: Pacific States Cast Iron Pipe Company, Griffin Pipe, United States Pipe and Foundry Company, American Ductile Iron Pipe, Clow Pipe. (Mc Wane, Inc.)
- l. **PVCO PIPE:** Push-On, AWWA C909, ductile iron outside diameter, pressure class 235 (DR-18) for sizes 6-inch thru 30-inch. Available in 20-foot laying lengths. Used for reclaimed water only. Color = Purple. Approved manufacturers: Ipex Bionax, JM Eagle UltraBlue. Where purple pipe is unavailable, blue pipe may be used, but must be encased in purple polyethylene wrap. Detail W-1-301.
- m. **POLYETHYLENE ENCASEMENT:** (AKA Polywrap) For all pipelines and related fittings installed. Minimum 8 mil, meets or exceeds AWWA/ANSI C105/A21.5 and ASTM A-674 specifications. Tube color = Blue and Purple, available in 200 and 400-foot rolls. Perforations every 20-feet for 18-foot pipe lengths; perforations every 22-feet for 20-foot pipe lengths, manufactured by Christy's, Anaheim, CA. The wrapping tape will be minimum 10 mil vinyl tape. No duct tape will be used. Trumbull and Northtown are also acceptable. Detail W-1-301.
- n. **SERVICE COUPLING:** Mueller, straight three-part union, H15403, conductive compression (CC) both ends, CTS, tested to meet ANSI/AWWA C800, Sizes: 1-inch, 2-inch.

Mueller, H15428, straight coupling, conductive compression (CC) by male iron pipe thread (MIPT), tested to meet ANSI/AWWA C800 specification. Sizes: 2-inch CC by 1-3/4 inch MIP, 2-inch CC by 2-inch MIP. Details W-1-700, W-1-802.

Mueller, H15451, straight coupling, conductive compression (CC) by female iron pipe thread (FIPT), tested to meet ANSI/AWWA C800 specification. Sizes: 2-inch CC by 1-3/4 inch FIP, 2-inch CC by 2-inch FIP. Detail W-1-700
- o. **PIPE COUPLING:** Viking Johnson, sold by Mueller: MaxiFit Straight (2-inch thru 24-inch), MaxiFitXtra Straight (4-inch thru 8-inch) or MaxiStep Transition, tested to meet AWWA/ANSI C.219-91 specifications – certified to ISO 9001:1994, Also Smith – Blair Quantam, Ford, Dresser, JCM, and Infact.

- p. **ANGLE METER VALVE:** Mueller, ball angle meter valve, B24258-1, conductive compression (CC) by meter swivel nut (MN) without saddle, tested to meet ANSI/AWWA C800, size: 1-inch. Two (2) Mueller H-10889 meter bushings required for 5/8" x 3/4" meters. Detail W-1-800.
- q. **CORPORATION STOP:** Mueller, ball valve, B25008, taper thread (TPR) by conductive compression (CC), tested to meet ANSI/AWWA C800 specification, sizes: 1-inch and 2-inch. Details W-1-701, W-1-702, W-1-800.

Mueller, ball valve, B25028, male iron pipe thread (MIPT) by conductive compression (CC), tested to meet ANSI/AWWA C800 specification, sizes: 1-inch and 2-inch. Details W-1-701, W-1-702, W-1-800.

Mueller, 300 Ball Curb Valve, B-25122N, quarter-turn check, male iron pipe thread (MIPT) by conductive compression (CC), tested to meet ANSI/AWWA C800 specification, size: 2-inch. Detail W-1-802.

- r. **CURB STOP:** Mueller, oriseal valve, H10291, male iron pipe thread (MIPT) by male iron pipe thread (MIPT), quarter turn check, brass, tested to 300 psi working pressure, tested to meet tested to meet ANSI/AWWA C800 specification, size: 2-inch.

Mueller, 300 ball curb valve, B-20283N, female iron pipe thread (FIPT) by female iron pipe thread (FIPT), quarter turn check, tested to meet ANSI/AWWA C800 specification, size: 2-inch. Detail W-1-700.

Mueller, brass square wrench nut adapter, B-20299.

- s. **SERVICE SADDLE:** Smith Blair, Cast Bronze ASTM-B584 85-5-5-5, double strap, iron pipe threads, Models 321 and 323. Washers are silicon bronze, ASTM-B36. Gaskets are grade 60 Buna N, or Mueller bronze double strap service saddle, BR2B series, female iron pipe thread (FIPT) or taper (TPR), cast bronze, ASTM-B585, 85-5-5-5, or H16084, 200 psig, meets ANSI/AWWA C800. Also, AY McDonald 3845/3846, Jones J-979, Ford 202B. Details W-1-800, W-1-802.
- t. **TAPPING SLEEVE:** Mueller H615 Mechanical Joint Tapping Sleeve, ductile iron body with 3/4-Inch NPT test plug, Class 125 flange outlet, ANSI 61 certified, for size-on-size taps 4-Inch thru 24-Inch. For all other taps Mueller H304, JCM 432, Romac SST, and Cascade CST-EX, Ford FAST 304. Detail W-1-404.
- u. **TAPPING VALVE:** Mueller Resilient Wedge tapping valve, Catalog Number T-2361-16, Class 125, sized 4-inch thru 12-inch, T-2361-16, Class 125, sizes 14-inch thru 36-inch, all with Type 304 stainless steel fasteners; bypass valves are required on 18-inch thru 36-inch valves, flange by mechanical joint per ANSI/AWWA C111, iron wedge, non-rising stem. Epoxy coated interior/exterior per ANSI/AWWA C550 for NSF 61 compliance. 250 PSI range for valves 4-inch thru 12-inch and 150 PSI range for valves 14-inch thru 36-inch. Detail W-1-404.

v. **VALVE BOXES:** For non-traffic areas, Tyler Union Series 6855 5¼-inch adjustable slip type cast iron two-piece valve box, for 4-inch thru 12-inch valves, Box No. 562-A, assembled (16T, 24B) with 5¼-inch cast iron drop lid, marked "AJWD". For areas subject to vehicular traffic use Tyler Union Series 6855 5¼-inch slip type valve box, for 4-inch thru 12-inch valves, Box No. 564-A, Also, Star Pipe VB562AHD slip type valve box, VB-006 valve box lid. Detail W-1-405.

w. **METER VAULTS:** Jensen Precast or Oldcastle. Detail W-1-811.

1. 575-WA concrete vault with a 4872 aluminum double torsion door with a recessed padlock hasp, two – 18-inch x 24-inch center knockouts.
2. 575-LA concrete vault with a 4872 aluminum double torsion door with a recessed padlock hasp, two – 18-inch x 24-inch standard knockouts at each end and adjustable frame.
3. 612-5X-LA concrete vault with a 4872 aluminum double torsion door with a recessed padlock hasp, two – 18-inch x 24-inch center knockouts.
4. 444-WA concrete vault, 444-BW Base, 44-332P Cover.

x. **METER SETTER:** Mueller meter setter, B2429N, FIP vertical inlet, FIP horizontal outlet, 12-inch riser height, lock-wing Mueller 300 ball angle meter valve with meter flange by lock-wing Mueller ball angle meter valve with meter flange. Bypass with lock-wing Mueller 300 ball valve. Sizes: 1-1/2 inch, 2-inch. Detail W-1-802.

y. **MISCELLANEOUS:**

Enclosures: Guardshack or Gorilla Cages, Tan, size per application

Pipe Supports: Pipeline Products, Standon, Trumbull, or Guardshack

Pipe Markers: Carsonite, CIB03-66-08 Blue, stock decal, both sides, "Caution – Water Pipeline"; Carsonite CIB03-66, Purple, stock decal, both sides, "Caution – Non-Potable Water Pipeline" or Rhino 4-Rail, 66-in, Blue, stock decal, both sides, "Caution – Water Pipeline"; Rhino 4-Rail, 66-in, Purple, stock decal, both sides, "Caution – Non-Potable Water Pipeline".

Raised Reflective Pavement Markers For Fire Hydrants: 3M Series 290, No.295-2B or Stimsonite Model 980

Valve Box Debris Cap: SW Services, DC457

Water Sampling Station: Koraleen, Station Guard XLT

Specialty Valves:	Cla-Val, Bermad, Tideflex, Apollo
Backflow Prevention:	Watts, Febco, Ames, Apollo, Zurn-Wilkins
Brass Pipe Fittings:	Cambridge Brass, Lee, Smith-Cooper, Merit

The Contractor also will be required to provide the following materials, the cost of which will be included in its unit bid price:

All material and Portland cement concrete for thrust blocks, other anchors, reinforcing steel; all gravel, crushed stone, A.B.C., earth, sand, CLSM, slurry, or screened material which may be required; all material for bracing, shoring, and shielding trenches and for construction of forms; all barricades and traffic control equipment; all material for paving replacement and any water used for compaction of backfill and dust control.

5. INSTALLATION OF MATERIALS

All materials are to be installed in accordance with manufacturer's recommendations unless otherwise directed by these Specifications.

All pipe, fittings and valves will be laid true to the lines, grades and locations established by the Specifications and the Construction Drawings. Trench bedding per W-1-100.

The ends and inside of the pipe will be thoroughly cleaned and inspected for damage. No damaged materials will be installed in the water distribution system.

Whenever the work ceases for any reason, all open pipeline ends will be tightly plugged by the Contractor. Plugs will be watertight and approved by the District's Authorized Representative.

Concrete thrust blocks when required by the construction plans, specifications, or where conditions warrant their use over joint restraints, are to be provided at all changes in direction or size, or at any other point where an unbalanced thrust due to water pressure would exist. Thrust blocks will be formed to prevent any concrete from spilling over or onto fasteners, fittings, or water main joints.

Trench curves as shown on the Construction Drawings may be made without fittings when using push on joint pipe up to twelve inches (12") in diameter, if the deflection of the pipe does not exceed five degrees (5°) or nineteen inches (19") per eighteen-foot (18') length of pipe. The minimum radius of such curves will be two hundred five feet (205').

Prior to construction, the appropriate agency(ies) will be notified as required by the permit(s).

It is the Contractor's responsibility to uncover all existing water lines being connected to, and to verify the location, depth and size of pipe before any construction begins.

Any construction performed without the knowledge of the District's Authorized Representative is liable for removal and replacement at the Contractor's expense.

All fire hydrants, frames, covers and valve boxes, etc. will be adjusted to finished grade prior to the placing of the asphalt concrete surface course by the Contractor (where applicable).

Air/vacuum valves will be installed at water system high points and on long runs to release the accumulation of air during filling or to allow the inlet of air when draining or when the distribution system is subject to negative pressure. Detail W-1-701.

All potable water services will be set a minimum of two feet (2') inside the edge of right-of-way when there is no curb and no sidewalk. Where there is a curb, but no sidewalk, the meter box will be set between a minimum of six inches (6") and a maximum of two feet (2') behind the curb. Where there is a curb and a detached sidewalk, the meter box will be centered in the middle of the verge. Where there is a curb and attached sidewalk, the meter box will be set between a minimum of six inches (6") and two feet (2') behind sidewalk. Acceptable alternatives, where conditions warrant, are within a P.U.F.E. or P.U.E as determined and approved by the District. W-1-400-2.

The same distances described above for meter boxes apply to the installation of air/vacuum valve enclosures, pressure relief valve enclosures, water sampling station enclosures, and fire hydrant installations. Details W-1-400, W-1-400-3, W-1-400-4, and W-1-400-5.

Unless otherwise specified on the construction drawings, water mains will be located under the asphalt of streets in a location where water valve boxes and manholes will not be in the direct wheel path of vehicular traffic.

Water valves will be spaced not more than five hundred feet (500') in commercial districts and not more than eight hundred feet (800') in other districts. Variations between eight-hundred feet (800') and one-thousand feet (1,000') are typical for transmission mains or special applications, however final quantity and locations are determined by the District.

Fire hydrants on principal and minor arterial roads will be per 2018 International Fire Code, Appendix C, Table C102.1b. Fire hydrants on major and minor collector roads will be per 2018 International Fire Code, Appendix C, Table C102.1b. Fire hydrants on local streets will not be more than five-hundred feet (500'). The maximum distance from a fire hydrant to the end of a dead-end street will not exceed two-hundred feet (200') (2018 IFC C102.1d). W-1-400, W-1-400-5, and W-1-602.

Installations of water main carrier casing will be per Standard Detail W-1-300.

Tracer Wire and Warning Tape are to be installed on all mains, tees, crosses, ells and fire hydrant laterals. They will not be installed on service lines. The tracer wire will be installed on the water main 45 degrees (45°) from the vertical centerline of the pipe and will be taped to the fittings directly and on the main every 10 feet using a maximum 10 mil vinyl tape. The tracer wire will be placed between the valve riser and box with a minimum of 12-inches (12") of wire inside. The warning tape will be installed a minimum of two feet (2') below the surface, being measured from final grade, directly over the center of the pipe. Any splices in the tracer wire will be joined using waterproof connectors. Any splices in the warning tape will be joined using minimum 10 mil vinyl tape. The tracer wire will be tested for continuity after backfill and compaction, but before paving. Any detected damages to the wire will be repaired before paving will be allowed. Details W-1-200 and W-1-201.

Electronic Marker Balls ("Markers") are to be installed at all bends, both vertical and horizontal, all tees, crosses, dead-ends, each end of any steel carrier casing, tapping sleeves, water main repairs, on all straight water main runs every 100-foot maximum, at all utility, railroad, and wash crossings, and changes in pipe diameter. The Markers will be installed directly above the pipe, but below the warning tape. Maximum depth of install of a Marker is 48-inches, measured from finished grade. Color: Blue for potable water, Purple for non-potable water. Detail W-1-202.

6. BACKFILL OF WATER MAIN TRENCHES

Backfill of any excavation will conform to the requirements of any of the governmental agencies having jurisdiction over the location. If no governmental agency having such jurisdiction specifies backfill or compaction requirements, and no special requirements are shown on the Construction Drawings, the procedure set forth in this section will apply for water line trenches.

The bedding material above the pipe and backfill material will be compacted to a minimum of 70% compaction within a utility easement and 80% compaction within a right-of-way as determined by AASHTO T-99 method A and T-191. If water settling is used for compaction, it is the responsibility of the Contractor to prevent the pipe from floating.

The bedding material will be imported material which conforms to M.A.G. specifications for A.B.C. or Type-B select materials. Bedding material will be used below and around the pipe and a minimum of twelve inches (12") above the pipe. Shade and bedding material to be mechanically compacted prior to remainder of trench back-fill.

The remainder of the trench will be back filled with native or imported material which will be of sound earthen material free from organics, brick, cobbles, broken concrete, broken pavement, wood, or other unsuitable substances. Except as otherwise specified, back fill may be material containing no pieces larger than 3 inches (3") in greatest dimension.

Where settlement occurs, additional material will be placed and compacted and the trench will be brought to final grade.

7. HYDROSTATIC TESTING OF COMPLETED PIPELINES

Hydrostatic testing of water pipelines will be completed before the new system is connected into the existing water system so that all testing can be done against all new materials.

The completed section of water pipeline to be tested will be slowly filled with water with care being taken to expel all air from the pipe. If necessary, the pipe will be tapped at high points to vent air.

The Contractor will provide all equipment and labor necessary to accomplish this testing and the price will be included in the unit prices. The Contractor will notify the District in advance of the testing so that the District can schedule a duly authorized representative to be at the site during testing. The Contractor, at its own expense, will make any necessary repairs to the system being tested in order to cause the section being tested to meet the test limits set below. The Contractor may request authorization of the District to connect the new pipelines to the existing system prior to completion of pressure testing when, in the District's sole opinion and judgement, conditions warrant such connection.

The Contractor will assume all responsibility to complete pressure testing to the District's specifications after such connection, including, but not limited to, isolation of the new pipelines from the existing system, if necessary.

Connections prior to completion of pressure testing will not be made unless prior District authorization has been obtained, and any extra expenses resulting from such connections will be the sole responsibility of the Contractor.

Leakage tests will be for a period of two hours at 200 ± 5 psi at the point of lowest elevation; leakage may not exceed 0.1 gallons per hour per on thousand feet (1,000') of pipe per inch of diameter. If dry utilities are not installed, a second pressure test is required.

8. STERILIZATION AND FLUSHING OF COMPLETED WATER PIPELINES

Sterilization and flushing will conform to recommendations of Arizona State Department of Health Services Engineering Bulletin Number 8, latest edition, or any future Arizona Department of Environmental Quality bulletins. Contractor to follow all conditions of discharge permit.

9. NO OTHER UTILITIES ALLOWED IN OR NEAR WATER PIPELINE TRENCHES

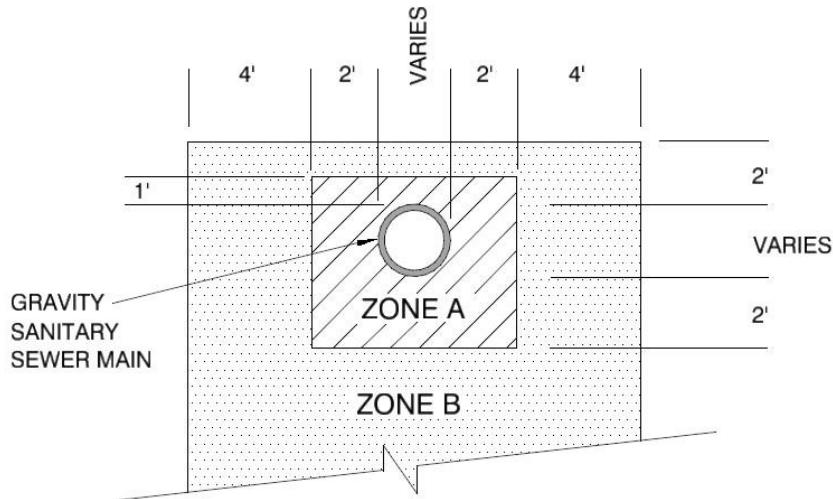
No other utility installations will be permitted in the water pipeline trench or within five feet (5') of the District's water pipeline or pipelines when running parallel with the water pipeline(s).

10. PROTECTION OF WATER MAINS NEAR SEWERS

In order to protect water mains from contamination by sewers, the installation of the water mains must conform to the following requirements:

- a. Horizontal – When water lines and sewers are laid parallel with each other, the horizontal distance between them will not be less than six feet (6'). Each line will be laid on undisturbed or bedded material in a separate trench. Where conditions prevent the minimum horizontal separation set forth above, extra protection will be required. Extra protection will consist of constructing the sewer main with mechanical joint ductile iron pipe or with slip-joint ductile iron pipe and joint restraint.

The Construction Drawings will indicate the installation requirements. The drawings showing these exceptions will have been approved by the appropriate state and/or county health department. Refer to the diagram below for clarification.



GRAVITY SANITARY SEWER

ZONE A: NO WATER LINES ALLOWED/MINIMUM SEPARATION.
ZONE B: EXTRA PROTECTION REQUIRED FOR WATER LINES.

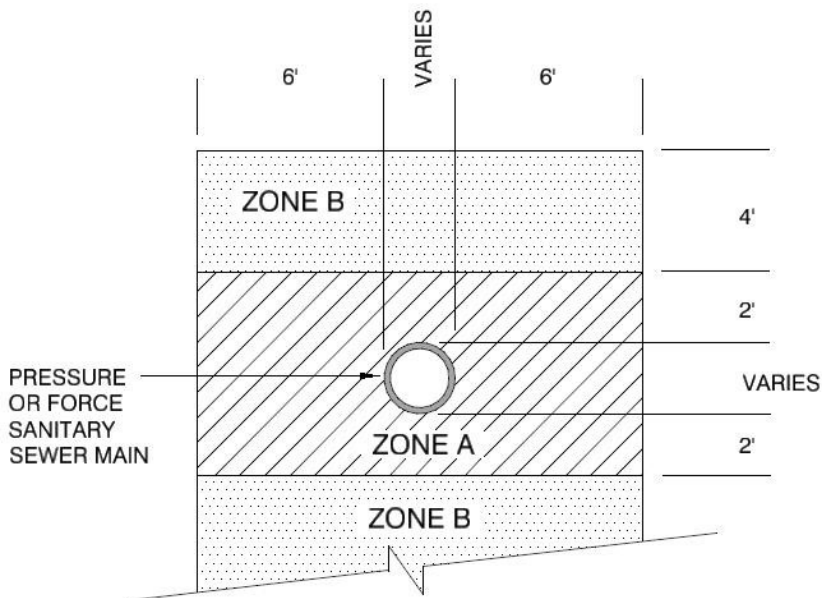
Under no circumstances will the horizontal separation between sewer mains and water mains be less than two feet (2'). All distances are to be measured from the outside of the sewer main to the outside of the water main.

- b. Vertical – When a water main is parallel with or crossing a sewer main within two feet (2') above the sewer or greater than two feet (2') below the sewer, extra protection will be required. Extra protection will consist of constructing the sewer main with mechanical joint ductile iron pipe or with slip-joint ductile iron pipe and joint restraint.

The Construction Drawings will indicate the installation requirements. The drawings showing these exceptions will have been approved by the appropriate state and/or county health department.

Under no circumstances will the vertical separation of a sewer main installed above a water main be less than two feet (2'). All distances are to be measured from the outside of the sewer main to the outside of the water main. Refer to the diagram above for clarification.

- c. When unusual conditions such as, but not limited to, highway or bridge crossings prevent the water and sewer main separations required from being met, the appropriate state and/or county health department will review and may approve requests for authorization to use alternate construction techniques, materials and joints on a case-by-case basis.
- d. No water pipe will pass through or come into contact with any part of a sewer manhole. The minimum horizontal separation between water mains and manholes will be six feet (6'), measured from the center of the manhole.
- e. The minimum separation between force mains or pressure sewers and water mains will be two feet (2') vertically and six feet (6') horizontally under all conditions. Where a sewer force main crosses above, or less than six feet (6') below a water line, the sewer main will be constructed with mechanical joint ductile iron pipe or with slip-joint ductile iron pipe and joint restraint.



PRESSURIZED SANITARY SEWER

ZONE A: NO WATER LINES ALLOWED/MINIMUM SEPARATION.
 ZONE B: EXTRA PROTECTION REQUIRED FOR WATER LINES.

- f. Sewer mains (gravity, pressure, force) will be kept a minimum of fifty feet (50') from drinking water wells, unless the following conditions are met:
 - 1. Water main pipe, pressure tested in place to 50 psi without excessive leakage, may be used for gravity sewers at distances greater than twenty feet (20') from drinking water wells.
 - 2. Water main pipe, pressure tested in place to 150 psi without excessive leakage, may be used for pressure sewers and force mains at distances greater than twenty feet (20') from drinking water wells.
- g. No septic tank/disposal field will be constructed within one hundred feet (100') of a drinking water well.
- h. All distances are measured perpendicularly from the outside of the sewer main to the outside of the water main. These separation requirements do not apply to building, plumbing or individual house service connections.
- i. Use Mechanical Joint ("MJ") ductile iron pipe with joint restraints a minimum of six (6') feet on each side of a sewer or storm drain crossing. Detail W-1-505.

11. COMPACTION

When crossing existing water mains, a minimum of 95% compaction is required to the bottom of existing mains.

Apache Junction Water District requires that no slurry be permitted to contact existing cement/asbestos or ductile iron pipes, unless authorized by the District. Slurry may be poured in the bottom of the sewer trench stopping three inches (3") below the existing water main or mains. The backfill used around the main or mains should be AB in sufficient depth to prevent slurry from contacting the existing main or mains.

12. WATER MAIN MATERIAL SPECIFICATIONS

Push On ("PO") and Mechanical Joint ("MJ") ductile iron pipe will be minimum pressure class 350 for 6-inch thru 12-inch pipe, pressure class 250 for 14-inch thru 20-inch pipe, and Pressure Class 200 for 24-inch through 36-inch pipe. All pipes will be cement mortar lined and meet or exceed ANSI/AWWA A21.5/C150 and A21.51/C151 specifications, with laying lengths of 18 or 20-feet.

Push On C909 PVC pipe will be minimum pressure class 235 (DR-18) for 6-inch thru 30-inch pipe. Ductile iron pipe outside diameter. Designed to meet or exceed AWWA C909 specifications, with a laying length of 20 feet. Color = Purple. Use for all non-potable water applications. When purple colored pipe cannot be obtained, the main and all related fittings and appurtenances will be encased in purple Polywrap. Detail W-1-301.

All main line valves will conform to AWWA C500 with a minimum working pressure of 200 psi.

All ductile iron fittings to be cement mortar lined in accordance with AWWA C104 and will conform to AWWA C110 with a minimum working pressure of 250 psi.

Maximum joint deflection for 6-inch mechanical joint ductile iron pipe is seven degrees, seven minutes (7° 7') or twenty-seven inches (27") per eighteen-foot (18') length pipe, for a maximum curve of one hundred forty-five feet (145').

Maximum joint deflection for 8-inch and 12-inch mechanical joint ductile iron pipe is five degrees, twenty-one minutes (5° 21') or twenty inches (20") per eighteen-foot (18') length pipe, for a maximum curve of one hundred ninety-five feet (195').

Maximum joint deflection for 6-inch, 8-inch, and 12-inch push-on joint ductile iron pipe is five degrees (5°) or nineteen inches (19") per eighteen-foot (18') length pipe, for a maximum curve of two hundred five feet (205').

13. STANDARD DETAILS

Standard details included in the appendix are supplemental to the text of these specifications and show the District's minimum requirements for the construction of certain standard components.

In case of conflicts between the text of the written specifications and the standard details, the more stringent, as determined by the District, will apply. Where these specifications, standards, and details are silent, Maricopa Association of Governments (MAG) standard specifications and details, Arizona Department of Environmental Quality (ADEQ) Bulletins No. 8 and No. 10, and American Water Works Association (AWWA) standards will govern.

All applicable standard details will be included on the construction drawings.

END