I. II. Water System Improvements

A. General

This section pertains to general design requirements for water distribution system construction in the City of Roanoke. All water lines shall be sized and designed in accordance with the City of Roanoke Water Distribution System Master Plan or as determined by the Director of Public Works or a designated representative. Other pertinent requirements for water connections, over sizing, main extension, backflow, cross connections, water restrictions, conservation, impact fee and other water related fees are included in the City Code. In the absence of specific standards, all water supply, distribution, pumping, and storage improvements shall be designed in accordance with the most current standards of the American Water Works Association, the Standard Specifications for Public Works Construction of the North Central Texas Council of Governments, and criteria adopted by the Texas Commission on Environmental Quality, Chapter 290, "Water Hygiene". Deviations from the City of Roanoke Texas requirements, standards and criteria must be approved by the City of Roanoke's Director of Public Works or his/her representative.

B. Water Lines

1. Standard water line sizes are 6", 8", 12", 16", 20", 24", and 30" diameter. Other sizes must be approved by the Director of Public Works or a designated representative.

2. All water lines shall be a minimum of 8" in diameter. All water lines shall be looped except in cul-de-sacs. Dead-end lines shall not exceed 600 feet, unless approved by the Director of Public Works or a designated representative.

3. 8" through 12" water lines shall be located in the parkway, with a minimum cover of 48" over the 8" line and 60" of cover over the 12" line. 16" and larger water lines shall be located in the parkway, with a minimum cover of 60". Water lines shall be located on the north and east side of the roadway. Along State Highways, water lines are required to be constructed on both sides of the roadway. All water lines shall be located 5½ feet behind the curb (See Detail W-1), or 3 feet from the edge of pavement for streets without curb and gutter, unless approved by the Director of Public Works or a designated representative. New water lines crossing existing streets shall be installed by boring. Open cut excavation will not be allowed for crossing existing streets unless approved by the Director of Public Works.

4. Easements for water main construction shall meet the following requirements:

    a. Refer to Part B Technical Standards

    b. Fire hydrants are required to be located within a right-of-way.

5. Water lines for multi-family, commercial and industrial fire protection lines shall be in an easement dedicated to the City, unless the system is isolated from the City system by detector check valves. All water lines shall be 8" minimum diameter and looped when possible. Dead end lines shall not exceed 50 feet on multi-family, commercial, or industrial sites. Larger easements may be required by the Director of Public Works or a designated representative to provide adequate space for maintenance. Water lines shall not be located under paved surfaces where possible.

6. All piping with mechanical couplings, push-on, or similar joints subject to internal pressure shall be designed with blocking, anchors, and restraining harnesses to preclude separation of joints.

7. Materials

    a. Polyvinyl Chloride (PVC) Pipe

        i. PVC pipe shall be designed, manufactured, and tested in accordance with the applicable requirements of AWWA C-900 (6"-12" water pipe) AWWA C-905 (16" - 30" water pipe), and AWWA M-23.

        ii. All PVC water pipe shall be blue in color.

        iii. 8" through 16" water pipe shall be pressure class 150, DR 18. Pressure class 200, DR 14 pipe may be required by the Director of Public Works or a designated representative in areas of high distribution system pressure.

        iv. Pipe in sizes 20" and larger will only be allowed when approved by the Director of Public Works or a designated representative.

        v. Fittings shall be ductile iron in accordance with AWWA C110 or AWWA C153.

        vi. Fittings: ANSI/AWWA C111/A21.11, except gaskets shall be neoprene or other synthetic rubber. Natural rubber will not be accepted.

        vii. All buried metal shall be wrapped in polyethylene Tube Wrap: ANSI/AWWA C105/A21.5

    b. Pre-Tensioned Concrete Cylinder Pipe (PCCP)

        i. PCCP shall be designed, manufactured, and tested in accordance with the applicable requirements of AWWA C-303 and AWWA M-9, and the following minimum design parameters:

            1) Unit Weight of Fill (w) = 130pcf
            2) Live Load = AASHTO HS 20

3) Trench Depth = 5’ minimum, or as indicated on construction plans
4) Coefficient Ku’ = 0.150
5) Minimum Trench Width (Bd) = 36” minimum
6) Bedding Conditions
7) Minimum Soil Reaction Modulus (E’) = 700 Maximum
8) Coefficient k = 0.090
9) Minimum Pressure Class = 150 psi minimum working Class
10) Minimum Surge Pressure = 150 psi plus working pressure

ii. Trench depth indicated shall be verified after existing utilities are located. Vertical alignment changes required because of existing utility or other conflicts shall be accommodated by an appropriate change in pipe design depth. In no case shall pipe be installed deeper than its design allows.

iii. Joint Wrappers: joint wrappers shall be similar and equal to those manufactured by Mar-Mac Manufacturing Company.

iv. Flexible Joint Couplings: flexible joint couplings shall be equal to Smith-Blair Style 441, or approved equal.

v. Pipe Ends: the standard pipe end shall include steel joint ring and a continuous solid rubber ring gasket as per AWWA Manual M-9.

vi. Flanges: Flanges shall conform with AWWA Standard C-207 with laying dimensions and drilling in accordance with ANSI B 16.1, Class 125, unless otherwise specified. Drilling shall match class of valves or appurtenances which are attached. Nuts and bolts shall conform to ASTM A-307, Grade B.

c. Ductile Iron Pipe

i. Ductile iron pipe will only be allowed in non-corrosive soils, when approved by the Director of Public Works or a designated representative.

ii. Pipe: American National Standard for ductile iron AWWA Standard C151 (ANSI A21.51).

iii. Fittings: ANSI/AWWA C111/A21.11, except gaskets shall be neoprene or other synthetic rubber. Natural rubber will not be acceptable.

iv. Fittings shall be ductile iron in accordance with AWWA C110.

v. Flanged Joint: ANSI/AWWA C115/21.15.

vi. All bolts and nuts shall be ASTM A325 Type III Enhanced Corrosion Resistant steel, or stainless steel Grade 304 or 316.

vii. All buried metal shall be wrapped in polyethylene Tube Wrap: ANSI/AWWA C105/A21.5

8. Installation

   a. General

      i. All installations shall conform to the latest NCTCOG Specifications, as amended by these standards.

      ii. Backfill shall be installed and compacted in 8" lifts, loose measurement. Refer to Detail W-2A and W-2B for standard backfill requirements. Density tests shall be taken every 200 feet every other lift. Results shall be given to the Director of Public Works.

      iii. The amount of trench excavation shall not exceed 200 (two hundred) feet from the end of the pipe laying operations, and no more than 300 (three hundred) feet of total open trench will be allowed. At the end of each workday, all trench excavation shall be backfilled to the end of the pipe laying operation. Barricades and lights will be required around any open trench left overnight.

      iv. A pressure type test plug shall be installed in the exposed end of line at the end of each working day. If contractor fails to install the plug, the Director of Public Works or a designated representative may require that the entire water line be swabbed prior to hydrostatic testing.

      v. All connections to existing water mains shall be made under pressure unless dry connections will not cause any loss of service. Under special conditions connections that cause an interruption of service may be performed with approval of the Director of Public Works

      vi. Water jetting of water utility trenches will not be allowed.

   b. PVC Water Pipe

      i. PVC water pipe, and appurtenances shall be installed as specified in AWWA Manual M-23 and in accordance with the pipe manufacturer's recommendations.

      ii. When PVC pipe is used, blue tracer tape shall be installed in the backfill material no more than twelve-inches (12") above the top of the pipe in accordance with the manufacturer's recommendations and located as specified by the City.

9. Manufacturers

   a. PVC Pipe

      i. John Mansfield (JM)
      ii. Extrusion Technologies (ETI)

iii. Certain Teed

b. Ductile Iron Pipe

i. U.S. Pipe
ii. American
iii. Clow

c. Ductile Iron Fittings

i. U.S. Pipe
ii. American
iii. Tyler
iv. Clow
v. Mueller

C. Fire Hydrants

1. The centerline of the hydrants shall be located in the parkway, 2'6" behind the back of curb.

2. Fire hydrant lead shall have a gate valve at the connection to the main. Fire hydrants in commercial and industrial areas shall generally be at street intersections and so located that there will be a fire hydrant every three hundred (300) feet. Fire hydrants in a residential area shall be generally located on street intersections and not over five hundred (500) feet apart. Fire hydrants in a multi-family complex shall be generally located on street intersections and not over three hundred (300) feet apart.

3. Materials

   a. Fire hydrants shall be manufactured in accordance with AWWA C-502, Dry-Barrel Fire Hydrants.

   b. Hydrants shall be manufactured such that all maintenance and adjustments can be performed without excavation and such that hydrants may be faced in any direction in relation to base.

   c. Each fire hydrant shall have one (1) 4 1/2" pumper connection and two (2) 2 1/2" hose connections. Threads for hose connections shall be National Standard Threads. The hydrant shall open counter clockwise.

   d. All fire hydrants shall be equipped with a Hydra-Storz adapter

   e. Painting

i. The fire hydrant shall be painted by the developer. The following colors are in accordance with Federal Standard 595.

The fire hydrant shall be painted a Safety Red #11120.

ii. Private fire hydrants shall be painted by the developer. The following colors are in accordance with Federal Standard 595

The fire hydrant shall be painted Black.

4. Installation

a. General

i. Installation shall be in accordance with AWWA M-17. The use of a 90° anchor or flange fittings shall be required unless otherwise approved by the Director of Public Works or a designated representative. Refer to Detail W-3

ii. Fire hydrants shall have a maximum buried depth of 7' including extension.

iii. Fire hydrants must have a minimum of 7 cubic yards of 1" crushed stone to permit free drainage of the hydrant.

b. Location Markers

i. The location marker shall be placed in the center of the roadway opposite the fire hydrant. The installation of this reflector shall be in accordance with the manufactures recommendation. Location markers shall be Stemsonite 1-88-55A or approved equal.

5. Manufacturers

a. Approved fire hydrants manufacturers are as follows:

i. Mueller (Super Centerion 200)

ii. American Darling (B-84-B)

iii. Clow (Medallion)

b. Approved paint manufacturers are as follows:

i. Glidden (ICI Dulux); alkyd industrial series 4308, primer series 4160

ii. Tnemec; series 4338, primer series 4

iii. Sherwin Williams

D. Valves

1. Resilient seated gate valves shall be used for 6" through 12" water lines. Butterfly valves shall be used for 16" and larger water lines when approved by the Director of Public Works or a designated representative.

2. Valves of approved design shall be installed at the intersections of all water mains so as to provide for proper maintenance and operation of the system and to provide a means of shutting off the supply to portions of the system for repairs. Valves shall be spaced such that only one fire hydrant is out of service at any one time. Four valves shall be used on a four way water line intersection and three valves shall be used on a three way intersection.

3. Materials

   a. Resilient Seated Gate Valves

      i. Resilient seated gate valves 6" through 12" shall meet or exceed the latest revisions of AWWA C509 and shall meet or exceed the requirements of these standards.

      ii. The valve body shall be cast iron or ductile iron. The valve body for valves 16” and larger shall be constructed of ductile iron. Flanged ends shall be furnished in accordance with ANSI/AWWA C115/A21.15 Standard Flanged Drilling. Mechanical Joints furnished shall be furnished with outlets which conform to ANSI/AWWA C111/A21.11 Mechanical Joint requirements.

      iii. The disc shall be fully encapsulated in rubber. No iron shall be exposed on the disc.

      iv. Bolt, hex head and nut shall be Steel ASTM A307 Gr. B, Zinc Plat per ASTM B633, SC3 for non-buried service and for 4" through 12" valves. Bolt, hex head and nut shall be 316 Stainless Steel for buried service for valves 16-inch through 24-inch.

      v. T-Bolts shall be high strength low alloy Cor-Ten or approved equal.

      vi. Resilient seated gate valves for buried service shall be furnished with a square 2" operating nut. The valve box shall be by American Flow Control series or approved equal. The valve box lid shall be painted safety blue. The paint shall be Glidden or approved equal.

      vii. Valves 20” and larger than 24" shall be approved by the Director of Public Works or a designated representative.

b. Butterfly Valves

i. Butterfly valves 16" and larger shall meet or exceed the latest revision of AWWA Standard C504 for Class 150B butterfly valves and shall meet or exceed the requirements of this specification. All valve components shall conform to Underwriters Laboratories classification in accordance with ANSI/NSF Standard 61.

ii. Valve bodies shall be of cast iron per ASTM A 126 Class B. Flanged end valves shall be of the short body design with 125 lb. flanged ends faced and drilled per ANSI B16.1 standard for cast iron flanges. Mechanical joint end valves shall meet the requirements of AWWA C111/ANSI21.11.

iii. Discs shall be cast iron per ASTM A48 Class 40C. The disc seating edge shall be solid 316 stainless steel. The disc shall be securely attached to the valve shaft utilizing a field removable/replaceable 304 stainless steel torque screw or a tangential pin locked in place with a set screw.

iv. Valve shaft shall be type 304 stainless steel. Valve shaft seals shall be self-compensating V-type packing with a minimum of 4 sealing rings. One-piece molded shaft seals and O-ring shaft seals are not acceptable.

v. The seat shall be a Buna-N for water to 180°F, or EPDM for air to 29°F, and shall be molded in and vulcanized to the valve body. The seat shall contain an integral shaft seal protecting the valve bearings and packing from any line debris. Seats vulcanized to cartridge inserts in the valve body and seats on the disc are not acceptable.

vi. Valve shaft bearings shall be non-metallic and permanently lubricated.

vii. Unless otherwise specified, exterior and interior metallic surfaces of each valve shall be shop painted per the latest revision of AWWA C504.

viii. Bolt, hex head and nut shall be Steel ASTM A307 Gr. B, Zinc Plat per ASTM B633, SC3 for non-buried service and for 4" through 12" valves. Bolt, hex head and nut shall be 316 Stainless Steel for buried service for valves 16-inch and larger. If a standard valve box is used with buried service, the valve box lid shall be painted safety blue. The paint shall be Glidden or approved equal.

ix. T-Bolts shall be high strength low alloy Cor-Ten or approved equal.

x. Valves larger than 24" shall be approved by the Director of Public Works or designated representative.

4. Installation

a. General

i. Valves shall be furnished with extensions, such that the working nut is a maximum of 48" below grade.

ii. Adjustable valve boxes shall be furnished and set on each valve in accordance with these standards. Valves that are deeper than 48", AWWA C900 PVC pipe shall be used for stacks, as long as the adjustable valve box is used at the top.

iii. After the final clean-up and alignment has been complete, the contractor shall cast in place a concrete block, 24" x 24" x 6" around all valve box tops at the finish grade.

iv. Valves located within a right-of-way shall be indicated on the face of the curb, or where curbs do not exist, on a conspicuous location adjacent to the valve location. Markings are to be the saw cutting of a four (4) inch high letter "V" with the point of the "V" pointing towards the valve location.

v. Valve markers shall be provided in rural areas.

5. Manufacturers

a. Approved manufacturers of 6" through 12" resilient seated gate valves are as follows:

i. Mueller
ii. Kennedy
iii. American Flow Control
iv. Clow
v. M & H
vi. U.S. Pipe

b. Approved manufacturers of 16", 20" and 24" resilient seated gate valves are as follows:

i. Mueller
ii. U.S. Pipe
iii. M & H
iv. American Flow Control

c. Approved manufacturers of 16" and larger butterfly valves are as follows:

i. Dezurik
ii. Clow
iii. Keystone

E. Air Release and Flushing Valves

1. Adequate fire hydrants, air release, and flushing valves shall be provided for flushing, disinfection, daily operation requirements, and repairs when required by the Director of Public Works or designated representative.

2. All dead end lines shall have a fire hydrant installed for flushing purposes. If installation of a fire hydrant is not possible, a flushing valve is required.

3. A fire hydrant shall be required at high points on 12" and smaller water lines for air relief and flushing.

4. Materials

   Air release valves and air/vacuum shall meet or exceed the latest revision of AWWA C512.

F. Tapping Sleeve

A tapping sleeve and valve shall be used when connecting a new water line to an existing line. A resilient seated gate shall be flanged to the tapping sleeve. The tapping sleeve shall be a Smith-Blair type 664-665 stainless steel tapping sleeve, or approved equal. Coupon must be furnished to the Public Works Department.

G. Water Service

1. The water meter box shall be placed a minimum of 6" behind the back of curb, and the water service shall be no more than 12" deep, covered with a meter box place at grade. If no curb is present, the water service shall be located at the property line, no more than 12" deep, covered with a meter box in place at grade. .3" minimum of fined crushed stone item IV.1.B shall be installed under the meter box. Along roadways without a curb the water service line shall be constructed at a minimum of 18" below the ditch flow line. 3" minimum of fined crushed stone item IV.1.B shall be installed under the meter box.

2. Meter and service sizes will be determined by the design engineer prior to requesting service with the City of Roanoke. The minimum water service size between the water main and the meter shall be 1-inch and the minimum meter size shall be 5/8-inch.

3. Commercial water meters will be located in a utility easement and clear of high traffic areas. Water meter vaults shall be sized according to the size of the water meter. Minimum water meter vault sizes are as follows:

   3" meter - 6'x8'
   4" meter - 6'x8'
   6" meter - 8'x10'
   8" meter - 8'x12'

Requests for meters larger than those indicated above should be submitted with an installation detail specifying dimensions, materials and location of the water meter vault for review and approval by the Director of Public Works or designated representative.

4. Installation of commercial meters will include two mainline valves, one bypass valve with chain and lock, a strainer, and bypass line, all located inside the vault. Clearances between fasteners on valves, strainers and meters to interior surfaces shall provide adequate room maintenance.

5. Materials

   a. Service Saddle

      Service saddle shall be double strap bronze with brass body or stainless steel double bolt wide straps with stainless steel body. Minimum size tap shall be 1-inch diameter using a stainless steel single strap with a minimum 2" band width.

   b. Service Line

      Service lines shall be 1-inch minimum diameter, black polyethylene tubing in accordance with ANSI/AWWA C901-08 Standards Polyethylene Pressure Pipe and Tubing.

   c. Corporation and Curb (angle) Stops.

      i. Corporation stop shall be 1" ball type with compression outlet fitting, designed for a minimum working pressure of 200 psi.

      ii. Curb stop shall be angle set with compression inlet fitting and lock ring.

   d. Meter box for meters 2" and smaller.

      Meter boxes shall be "DFWB12C" or approved equal with one.

6. Installation

   a. General

      i. All water service shall be installed in accordance with these standards. Water service lines crossing under roadways or driveways shall be compacted to 95% density.

ii. Each individual service location shall be sawcut into the face of the curb with a four (4) inch high blue "W" by the Contractor. If no curb exists, a similar mark should be placed in the pavement near the edge of the roadway.

b. Residential Meters

All meters will be purchased through the City of Roanoke and shall be installed by a utility contractor or plumber.

c. Commercial Meters (3" and larger)

3” and larger meters can be purchased throughout the City. The meter shall be installed by a utility contractor or plumber. All meters in this size class are required to have a strainer prior to the meter.

7. Acceptable Manufacturers for Corporation Stops, Curb Stops, and Service Saddles:

a. Ford
b. Mueller
c. Cambridge

H. Flushing Valves

1. Materials

a. Corporation stop shall be 2" ball type with compression outlet fitting, designed for a minimum working pressure of 200 psi.

b. 2" curb stop shall be ball type with compression inlet fitting with tee head shut off.

c. Pipe shall be 2-inch diameter, Type K copper as specified in ASTM B88.

I. Water Line Bore

1. Minimum casing thickness shall be 1/4 inch. Casings shall be required under major and minor arterials, highway crossings, and railroad crossings. Casings may also be required where deemed necessary by the Director of Public Works or designated representative. The construction bore pit shall be located at a minimum distance of 4' behind the back of curb or edge of pavement where no curb is present.

2. The design engineer shall design the water line pipe casing for the following loading conditions and applicable combinations thereof:

a. Cooper's E-80 Railway loading or AASHTO HS20 loading as applicable
b. Earth loading with the height of fill above the casing as shown on the plans
c. Loads applied during jacking, including axial load from jacking
d. All other applicable loading conditions, including loads applied during transportation and handling.

3. Materials

a. Steel Casing Pipe

Steel casing pipe shall be new (or used if approved by the Director of Public Works) and suitable for the purpose intended and shall have minimum yield strength of 35,000 psi. Casing shall meet ASTM A-36, ASTM A-570, ASTM A-135, ASTM A-139, or approved equal. Pipe shall be coated with coal tar epoxy (15 mils min.) in accordance with AWWA C-210. Pipe joints shall be welded in accordance with AWWA C-206. After pipe is welded, coating shall be repaired.

b. Cement mortar

Cement mortar shall consist of one (1) part cement to two (2) parts clean sand with sufficient water to make a thick, workable mix.

c. Pressure Grout Mix

Grout shall be comprised of 1 cubic foot of cement and 3.5 cubic feet of clean fine sand with sufficient water added to provide a free flowing thick slurry. If desired to maintain solids in the mixture in suspension, one cubic foot of commercial grade bentonite may be added to each twelve to fifteen cubic feet of the slurry.

d. Casing Insulators (Chocks)

Use casing insulators for any type of carrier pipe. Insulators shall be high-density polyethylene. Insulators shall fit snug over the carrier pipe and position the carrier pipe approximately in the center of the casing pipe to provide adequate clearance between the carrier pipe bell and the casing pipe. Insulators shall be manufactured by "Recon" and be Raci Type or approved equal.

4. Excavation and Backfill of Access Pits

a. Do not allow excavation over the limits of the bore or tunnel as specified. Trench walls of access pits adjacent to the bore or tunnel face shall be truly vertical. Shore the trench walls as necessary to protect workmen, the public, structures, roadways, and other improvements.

b. Excavations within the right-of-way and not under surfacing shall be backfilled and consolidated by mechanical methods as specified in these standards for compaction of

trenches under roadways. Surplus material shall be removed from the right-of-way and the excavation finished to original grades. Backfill pits immediately after the installation of the carrier pipe is completed. If carrier pipe is not installed immediately after casing pipe installation, the right-of-way Owner may require the access pits be temporarily backfilled until installation of carrier pipe.

c. Where seeding or sodding is disturbed by excavation or backfilling operations, such areas shall be replaced by seeding or sodding as specified elsewhere.

5. All bores are to be done by a directional boring machine. Other alternatives for bores may be submitted, in writing, to the Director of Public Works or designated representative for consideration. The Director of Public Works or designated representative, may grant approval of the requested alternative only when a directional bore has been determined to be unfeasible.

J. Test Procedures

1. Water Line

a. All water lines will be hydrostatically tested in accordance with AWWA C 605.

b. The Contractor shall sterilize the installed pipe system in accordance with AWWA C 651 by the injection of a chlorine solution of such a strength to obtain a chlorine solution to water ratio of 50 parts per million throughout the installed pipe system.

c. After the system has been flushed and pressure tested a designated City official shall take water samples. These samples normally will be at each end of the project with additional samples at each dead end or as deemed necessary by the Director of Public Works or designated representative. The samples shall be delivered to a City approved testing laboratory by the City. This laboratory shall provide tests as required by state health codes pertaining to potable water. If these tests indicate that the samples provided are not acceptable for potable water (coliform organisms, silt, etc.), the Contractor shall flush and/or re-sterilize the underground piping system. Re-sampling shall be required. The cost of all laboratory testing will be paid by the Contractor. It shall be the sole responsibility of contractor to place facilities into operation under the supervision of a designated City official.

END OF SECTION