

# Canyon Lake Water Service Company



## Design Guidelines and Specifications



April 1, 2017

## Table of Contents

<b>Section 1</b>	<b>Introduction.....</b>	<b>1</b>
1a.	Cross-Connection Control and Backflow Prevention .....	1
1a1.	Standby Service Lines (Fire Service Line) .....	1
1a2.	Lots with existing water wells .....	1
<b>Section 2</b>	<b>Plan Preparation .....</b>	<b>2</b>
2a.	Plan Review.....	2
2b.	Mandatory Pre-Construction Meeting.....	2
2c.	Final Inspection .....	3
2d.	Record Drawings.....	3
2e.	Warranty Period .....	3
<b>Section 3</b>	<b>System Design and Flow Criteria .....</b>	<b>3</b>
3a.	Line Sizing Criteria .....	3
3b.	Minimum Line Size.....	3
3c.	Water Line Routing.....	3
3d.	Depth of Cover .....	4
<b>Section 4</b>	<b>Fire Protection Standards .....</b>	<b>4</b>
4a.	Fire Flow .....	4
4b.	Fire Hydrant Spacing .....	5
4b1.	Residential Areas .....	5
4b2.	Commercial and Apartment Areas.....	5
4b3.	Manufacturing and Industrial Areas .....	5
4b4.	Other Areas .....	5
4c.	Fire Hydrants.....	5
4d.	Standby Service Lines (Fire Lines).....	6
<b>Section 5</b>	<b>Line Separation .....</b>	<b>6</b>
5a.	Horizontal Separation.....	6
5b.	Vertical Separation.....	6
<b>Section 6</b>	<b>Tie Ins.....</b>	<b>7</b>
6a.	Connection to Existing Water Mains .....	7
<b>Section 7</b>	<b>Testing.....</b>	<b>7</b>
7a.	Hydrostatic and Leakage Test .....	7
7b.	Disinfecting Water Systems .....	7

<b>Section 8</b>	<b>Water Mains</b> .....	<b>8</b>
8a.	Pipe, Fittings, and Appurtenances .....	8
8a1.	Pipe Materials .....	8
8a2.	Steel Pipe .....	8
8a3.	Air Release Valve Assembly .....	8
8a4.	Valve Box .....	9
8a5.	Dead End Mains.....	9
8b.	Ductile Iron Pipe and Fittings .....	9
8b1.	Fittings .....	9
8b2.	Mechanical Joints.....	9
8b3.	Restrained Joints .....	9
8b4.	Gaskets .....	10
8c.	(PVC) Pipe and Fittings and (PVC0) Pipe and Fittings (Ultra Blue).....	10
8c1.	Tracer Wire .....	10
8c2.	Water Pipe.....	10
8c3.	Fittings .....	10
8c4.	Joints .....	10
8c5.	Restrained Joints .....	10
<b>Section 9</b>	<b>Valves</b> .....	<b>11</b>
9a.	Gate Valves .....	11
9b.	Pressure Reducing Valves (PRV) .....	11
9c.	PRV Vaults.....	11
9d.	Tapping Valves .....	11
9e.	Valve Location .....	11
<b>Section 10</b>	<b>Services</b> .....	<b>11</b>
10a.	Installation .....	12
10b.	Main Connection .....	12
10c.	Service Run .....	12
10d.	Service Sleeves .....	12
10e.	Meter Boxes .....	12
10f.	Tapping Sleeves .....	12
10g.	Service Saddles.....	13
<b>Section 11</b>	<b>Trench Excavation, Pipe Cutting, Laying, and Backfilling</b> .....	<b>13</b>
11a.	Trench Excavation.....	13

11b. Dewatering.....	14
11c. Pipe Laying .....	14
11c1. Laying PVC and PVCO Pipe.....	14
11c2. Laying DICL Pipe.....	14
11d. Bedding and Compaction .....	14
<b>Section 12 Underground Installation.....</b>	<b>15</b>
12a. Vaults .....	15
<b>Section 13 Urban Type Development</b>	
13a. Typical Section showing all Utilities	
13b Tracer Wire	
13c. Storm Sewer Crossings	

**CANYON LAKE WATER SERVICE COMPANY  
SPECIFICATIONS FOR DRINKING WATER  
DISTRIBUTION SYSTEMS DESIGN**

**Section 1            Introduction**

Construction of domestic water pipelines and appurtenances are subject to inspection and approval by Canyon Lake Water Service Company (CLWSC) and shall be in accordance with the requirements of this document and CLWSC's Standard Drawings. Items not specifically referred to herein shall comply with the latest edition of the Standards of the American Water Works Association and shall be subject to approval by CLWSC. Construction methods, material and disposal of products shall also be subject to current standards established by the Texas Commission on Environmental Quality (TCEQ) and any other local, state or federal agencies having authority in their respective jurisdictions. Information contained in this document is subject to change without notice. Design Engineers are encouraged to submit plans for review prior to issuing any plans for bidding purposes.

**1a.    Cross-Connection Control and Backflow Prevention**

Backflow prevention devices shall be installed on all lines where the possibility exists for water from any other source to enter the public water supply system or on standby service lines (fire lines). Annual inspection, maintenance, and repair of any back flow prevention device shall be the responsibility of the customer. The requirements for backflow prevention devices can be found in 30 TAC 290.47(i) Appendix I: Assessment of Hazards and Selection of Assemblies. Some of the more common applications and required devices are listed below:

**1a1.   Standby Service Lines (Fire Service Line)**

In accordance with local Fire Code requirements, some commercial buildings and remodeling of existing structures may require a fire sprinkler system. The fire line leading to the building shall be designed to include the appropriate back flow prevention device and flow detection device. The back flow prevention device with flow detection shall be installed on the line as close as possible to where the fire line crosses the property line. Backflow devices may be installed either above or below ground. Below ground installations require a vault that meets the standards outlined in Section 12. All proposed backflow prevention devices shall be submitted for review and approval by CLWSC staff prior to construction.

**1a2.   Lots with existing water wells**

A lot owner may continue to use his/her water well after requesting water service from CLWSC so long as proper back flow prevention measures are taken. This can be accomplished using one of the following methods:

- a. If the well is connected directly to a line sharing service with water provided by CLWSC, a Reduced Pressure Principle Back Flow Preventer (RPPZ) must be installed on the customer service line just beyond the meter to meet proper backflow prevention criteria.

- b. If CLWSC water and well water are pumped into a common holding tank, the potable water source (CLWSC) line must have an “air gap” flowing into the tank. An air gap means that water is discharged into the tank from the top of the tank with line that is at least 1 foot above the overflow level of the tank.

For situations not covered above, contact the CLWSC Engineering Department for further guidance on backflow requirements per the Canyon Lake Water Service Company Cross-Connection Control and Backflow Prevention Program.

## **Section 2            Plan Preparation**

All water distribution systems, water main extensions, and all appurtenant items shall be designed in accordance with these standards, CLWSC Standard Details and TCEQ Title 30 Chapter 290 Standards, whichever is most stringent. Consult CLWSC for clarification of specific items.

CLWSC shall own and maintain all portions of the water system up to and including the water meter. The water distribution system or water main extension or any portion thereof, which is to become the property and sole responsibility of CLWSC, shall be designed by a Registered Professional Engineer and constructed within a public right-of-way and/or easement.

Please consult the CLWSC website for specific plan preparation guideline, standard notes that must be included in all sets of plans, and standard details.

### **2a.    Plan Review**

For subdivision or site development, the Developer or Customer shall submit an electronic copy of plans in .pdf format to the Engineering Manager, including on-site and off-site improvements, and irrigation plans for review, and approval by the CLWSC Engineering Department. Building plans are not needed. Once plans have been reviewed and approved by CLWSC, the plans shall be stamped by CLWSC as “Approved for Construction.” An electronic copy (.pdf) of the approved plans shall be returned to the design engineer. One set of the "Approved for Construction" plans must be on site at all times during construction.

Any changes to the plans during construction must be documented. Minor changes may be reviewed and approved on site by a representative of CLWSC and the changes annotated on the As-built plans. All major changes shall be submitted in writing to the CLWSC Engineering Department for formal review and approval. Determination as to whether or not a formal submittal is required shall be determined on a case by case basis by CLWSC personnel.

After plans are approved and construction is complete, the Developer’s Engineer of Record will stamp the plans as “Record Drawings” for submission to CLWSC. One full size paper copy of the As-built drawings shall be submitted along with one copy in .pdf format file submitted to the Engineering Manager. Compliance with this submittal requirement is not complete until final review and approval by CLWSC.

### **2b.    Mandatory Pre-Construction Meeting**

No later than one week prior to commencing work, the Contractor shall conduct a pre-construction meeting with CLWSC, at a location mutually determined. The purpose of the Pre-Construction meeting is to review project status and coordinate scheduled activities.

## **2c. Final Inspection**

CLWSC will require a final inspection on all main line construction projects. CLWSC will verify operation of valves, hydrants and services. Meter boxes, valve boxes and vaults, must be set to grade and work site must be free of debris, excess material, etc. Bacteriological test samples must have returned from the designated lab free from coli form bacteria and meet the same standards as the source water. See Section 7b for further guidance on disinfection requirements. This must be noted on the CLWSC acceptance form by a Water Quality Technician. Inspector will then provide three acceptance forms to be signed by the Engineer, Contractor and CLWSC inspector. Each party shall receive a dated copy of the form.

For pressure testing requirements, See Section 7.

## **2d. Record Drawings**

Acceptance of facilities by CLWSC will not be authorized until receipt of an approved set of record drawings. See Item 2a for definition of approval of record drawings.

## **2e. Warranty Period**

The warranty period for all work completed shall begin upon written acceptance of facilities by CLWSC. The warranty period and requirements for bonding shall be outlined in the contract.

# **Section 3 System Design and Flow Criteria**

## **3a. Line Sizing Criteria**

The pipe sizing design criteria for water distribution systems shall as a minimum provide for at least 100% of the combined maximum day demand rate plus fire flow. The allowable minimum service pressure under said design condition shall not be less than 20 psi (fire flow conditions) or 35 psi at the highest elevation served within the scope of the Project (peak or 1.5 times the average day conditions) in a transmission or distribution line. Line sizing shall be reviewed and approved by CLWSC staff.

Oversizing may be required in certain areas based on the CLWSC Water Master Plan. Oversizing determination shall be made by CLWSC and compensation for any oversizing completed by the developer determined as part of the Developer Water Service Agreement.

## **3b. Minimum Line Size**

The minimum pipe size for distribution mains shall be 4 inches, unless otherwise authorized by CLWSC. The minimum size for distribution mains serving fire hydrants and fire hydrant branches shall be 6 inches in diameter.

## **3c. Water Line Routing**

Water Lines for the water distribution system for a residential or commercial subdivision shall be routed

outside road rights-of-way, within a 15' utility easement that is dedicated to CLWSC (exclusive or non-exclusive) unless otherwise approved. With CLWSC approval, water lines may be routed 3' – 5' within a public right-of-way. Multiple points of connection may be required in order to minimize service outage during, repairs, etc., and to improve fire protection and water quality. Mains shall be looped whenever possible to avoid dead end mains. When looping is not feasible, auto flush hydrants must be installed at all dead-ends.

### 3d. Depth of Cover

Cover as measured from finished grade to top of the pipeline shall be a minimum of 30 inches for pipe diameters up to and including 12 inches. Depth of cover for pipes 14 inches or greater in diameter shall be a minimum of 36 inches. Exceptions must be approved by CLWSC and may require 4 inches of concrete above the piping in areas where minimum cover cannot be obtained. Depth of cover and trench width requirements can be found in the Standard Detail for trench construction.

## Section 4 Fire Protection Standards

In cases where County Fire Marshall or municipal requirements contradict the guidelines listed below, the more stringent of the requirements shall apply. **The Comal County Fire Marshal is responsible for implementing current fire code requirements adopted by the county within the county. Municipal codes may also apply for developments within the city limits of a municipality. All plans for new commercial developments as well as remodeling of existing developments for commercial use shall require a review and approval by the county fire marshal and/or municipal code enforcement officials. This review is separate from any review completed by CLWSC.** In areas where existing CLWSC waterlines were not designed for and do not meet pressure and flow requirements as specified by the county fire marshal or municipal code, the developer shall be responsible for infrastructure improvements needed to meet the demands created by the developer's project.

### 4a. Fire Flow

Fire flow requirements shall be calculated by CLWSC in accordance with the fire flow requirements specified by Insurance Services Office (ISO) based on population, density, and hazardous features of the proposed construction. The minimum residual pressure at peak hour, maximum day demand condition, plus fire demand shall not be less than 35 psi for transmission mains and 35 psi for distribution mains anywhere in the system.

Minimum requirements for 1 and 2 family dwellings not exceeding 2 stories in height shall be as follows:

Distance Between Buildings	Min. Fire Flow
More than 100'	500 gpm
31' - 100'	750 gpm
11' - 30'	1,000 gpm
10' or Less	1,500 gpm

For all other structures and uses, the minimum fire flow shall be 1,500 gpm unless otherwise determined by CLWSC. Sites storing large quantities of combustible materials may have much higher requirements, up to 3,500 gpm.



In areas where local municipal codes are enforced for development, and conflict with this information, the more stringent requirement shall apply.

## **4b. Fire Hydrant Spacing**

### **4b1. Residential Areas**

Fire hydrants shall be placed a maximum of 1,000 feet apart measured along the rights-of-way with a maximum of 500 feet to the last lot. In areas where local municipal codes are enforced for development, and conflict with this information, the more stringent requirement shall apply.

### **4b2. Commercial and Apartment Areas**

Fire hydrants shall be placed every 500 feet along the rights-of-way with a maximum of 250 feet to the last lot. The minimum flow from each hydrant shall be 1500 gpm, individually, or simultaneously with other hydrants, as required, to provide fire flow. The required fire flow shall be determined by CLWSC, or local agency requirement, whichever is greater.

### **4b3. Manufacturing and Industrial Areas**

Fire hydrants shall be placed every 300 feet along the rights-of-way with a maximum of 150 feet to the last lot. The required fire flow shall be determined by CLWSC, or local agency requirement, whichever is greater.

### **4b4. Other Areas**

Fire hydrants shall be placed a maximum of 1000 feet apart, along the rights-of-way of rural roads or other areas as approved by CLWSC. Hydrant spacing and placement along lines that travel cross country shall be determined on a case by case basis.

#### Other Locations Criteria:

- a. Hydrants shall typically be located within one foot of the side lot lines, between adjacent properties in residential areas, or in front of commercial and industrial properties as required.
- b. Hydrants shall be a minimum of 2 feet from edge of rights-of-way or curb in areas without sidewalks and shall not obstruct sidewalks.
- c. The location of new fire hydrants shall be identified with a blue reflective pavement marker installed on the roadway. The reflective marker shall be located perpendicular to the hydrant, in the center of the lane closest to the hydrant.

## **4c. Fire Hydrants**

Fire hydrants shall be of the dry barrel, compression type and shall comply with AWWA C502 "Standard for Dry-Barrel Fire Hydrants" and be Mueller Centurion 200 to 250 class or Clow Medallion fire hydrants. Use EPDM for O-rings and seats (rubbers).

Gaskets shall be furnished in all outlet caps. The barrel length shall be as required to accommodate the depth of the main.

Hydrants shall be installed at locations shown on the drawings. If one or more hydrants cannot be installed as shown because of obstructions, driveways, or changes, new locations shall be requested of CLWSC or the Fire Department having jurisdiction.

Each hydrant shall stand plumb, with steamer connection facing street and the 2.5” nozzles on each side at a 90 degree angle to the street. The hydrant shall be placed so the flange joining the upper and lower sections of the barrel shall be at least 3 inches but not more than 6 inches above the finished line of the curb or grade. The interior of the hydrant shall be thoroughly inspected and cleaned of all foreign matter before being set in place.

#### **4d. Standby Service Lines (Fire Lines)**

Any commercial building required by the Comal County Fire Marshall to have a Standby Service Line (Fire Line) installed shall have the line designed in accordance with these specifications. In addition to receiving plan review approval from CLWSC, It shall be the responsibility of the commercial developer to have all fire line plans reviewed and approved by the Comal County Fire Marshall to ensure they meet current County Fire Code Requirements.

Standby Service Lines (Fire Lines) shall be designed with adequate cross-connection and backflow prevention measures as well as a method for determining water flow. See the Cross-Connection Control and Backflow Prevention Program for more information. It is not necessary to install a meter on a Standby Service Line. A detector check is required. An efficient way to meet both cross connection and backflow prevention requirements with one device is to install a Double Check Detector Assembly (DCDA) on the Standby Service Line. The DCDA shall be installed as close as possible to the location of connection to the public main and shall be accessible by CLWSC personnel. The DCDA may be installed above or below ground in a vault and shall be constructed per CLWSC standard details.

## **Section 5 Line Separation**

### **5a. Horizontal Separation**

Water mains shall be installed to provide a minimum horizontal separation of 9 feet (per TCEQ regulations) from any existing or proposed wastewater line (gravity or force main). The distance shall be measured from outside of pipe to outside of pipe. In cases where it is not practical to maintain the 9 foot minimum separation, this separation may be lowered to 5 feet upon approval of CLWSC.

Separation to all other facilities including gas, telephone, storm and electric shall be a minimum of 5 feet. **Joint trenches of water with other utilities such as electrical, telecom, natural gas, fiber optic or cable lines are not permitted.**

### **5b. Vertical Separation**

Water mains crossing other pipelines shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the storm water, reclaimed water, wastewater line, conduit or other facility. Water main crossings below other pipelines or conduits should be avoided whenever possible. At crossings, one full length of water pipe shall be located so both joints will be as far from the other pipelines as possible. All water lines crossing wastewater lines shall follow 30 TAC Chapter 290 Subchapter D §290.44(e) thru §290.44(e) (5) whichever may be applicable.

Natural or propane gas lines shall be encased in concrete which shall extend 12” above and below the gas line and shall have a minimum separation of 18” from outside of pipe to outside of pipe. **All other utilities shall be located below water mains unless otherwise approved by CLWSC. This includes service lines for all other utilities.**

## **Section 6            Tie Ins**

### **6a.    Connection to Existing Water Mains**

All taps 4" and large to existing water mains shall be made by CLWSC.

Water mains shall be tapped in such a manner as to avoid disturbance or disruption to the operation of the main in service and to protect the potable water supply from contamination.

Valves on existing mains shall only be operated by CLWSC personnel.

When service must be interrupted to existing customers during construction of a tap or addition of appurtenances:

1. The Contractor shall provide 3 days' notice to CLWSC.
2. The Contractor or Developer shall be required to notify existing customers as directed by CLWSC.

## **Section 7            Testing**

### **7a.    Hydrostatic and Leakage Test**

Water mains shall be tested as a whole or in sections between valves. The total length of pipe for any single test shall not exceed 2,000 feet. The mains shall be tested in accordance with Section 4, Hydrostatic Testing, AWWA C600 (latest revision) under an average hydrostatic pressure of not less than 175 psi, when installing C909 Class 200 300 psi gauge, for a minimum of 30 minutes. When installing C909 Class 150 testing shall be not less than 150psi using a 300 psi gauge for 30 minutes. All valves shall be tested for secure closure.

All pumps, gauges and measuring devices shall be furnished, installed and operated by the Contractor and all such equipment and devices and their installation, shall be approved by CLWSC. All water for testing and flushing shall be potable water provided by CLWSC, at the Contractor's expense.

The quantity of water used for testing, which shall be compared to the allowable quantity, shall be measured by pumping from a calibrated container or certified water meter, that meets CLWSC approval. All restrained sections of the buried main shall be completely backfilled before such sections are tested. The entire pressure and leakage process shall be done in the presence of a CLWSC Inspector.

When leakage occurs in excess of the specified amount, defective pipe, pipe joints or other appurtenances shall be located and repaired at the expense of the Contractor. If the defective portions cannot be located, the Contractor, at his own expense, shall remove and reconstruct as much of the original work as necessary to obtain a water main within the allowable leakage limits upon retesting.

### **7b.    Disinfecting Water Systems**

The Contractor shall disinfect all pipe and fittings installed in the system and receive the required

approvals and clearances prior to placing the system in service. The disinfection shall be accomplished in accordance with the applicable provisions of AWWA C 651-99, "Disinfecting Water Mains," and all appropriate approval agencies. Care shall be taken to provide disinfection of the entire system. After disinfection, the Contractor will thoroughly flush the line until water samples show a chlorine content equal to or greater than existing system and bacteriological tests are satisfactory.

## Section 8 Water Mains

**All Water Mains and associated appurtenances shall be constructed in accordance with current CLWSC Standard Details regardless of when plan review and approval was completed.**

### 8a. Pipe, Fittings, and Appurtenances

All 4" pipe shall be either polyvinyl chloride (PVC) or ductile iron cement lined (DICL) pipe; Pipe sizes 6 inches through 12 inches shall be either molecularly oriented polyvinyl chloride (PVCO) or DICL pipe; pipes larger than 12 inches shall be DICL pipe. Pipe larger than 24 inches in diameter shall be approved on a case-by-case basis. All pipe, regardless of size, that will ultimately be covered by an asphaltic or concrete surface shall be DICL unless installed within a casing. These areas include but are not limited to: private driveways, county roads, parking lots, or service roads. All pipes on bridges, under bodies of water, under railroad tracks, in or crossing state roadways shall be DICL or steel within either a steel casing or a HDPE casing. The casing must be at least 12 inches larger in diameter than the carrier pipe with appropriate skids and end caps sized for water main and casing. All lines requiring casing shall be constructed in accordance with the CLWSC Standard Detail for casing. Any deviation from this standard shall be subject to review and approval by CLWSC Engineering staff.

#### 8a1. Pipe Materials

The following table lists the allowable pipe materials for various sizes of potable water main pipe unless otherwise approved:

Water Main Pipe		
Diameter	Material	General Specifications
4"	PVC	SDR-21 ASTM D-2241 Class 200
6" to 12"	PVCO	AWWA C909 PVCO PC235
4 to 24"	DICL	NSI/AWWA A21.51/C151 Class 350

\*HDPE pipe may be approved on a case by case basis for directional drill applications such as "slick boring" under and around existing trees.

#### 8a2. Steel Pipe

Steel pipe shall be dipped coated cement lined (DCCL) welded steel pipe (0.375-inch wall thickness). ASTM A53 grade B steel (minimum), U.S. Steel or Pacific Pipe. The coating shall be factory primed with a 3-mil organic zinc rich coating (Carboline 893 primer or approved equal) and the finish coat shall be factory applied Flexxide Acrylic Elastomer or approved equal. Above grade steel pipe color shall be Carboline number CWS D395 "Grouse Tan".

#### 8a3. Air Release Valve Assembly

Air release valves shall be of the type that will release air from the line when pressurized and

keep air from entering the line when not pressurized. Air release valves shall be located at high elevation points on the pipeline and operate automatically. Air release valves shall be ½" Apco #55 or equivalent subject to approval by CLWSC. Larger air valves may be required for mains 12" and larger. Air release valves shall be housed in an 18"x24" or larger concrete meter box with a cast iron ring and lid with the word WATER cast into the lid. Air Release valve assemblies shall be constructed in accordance with CLWSC standard details.

#### **8a4. Valve Box**

Valve boxes for all valves installed below ground shall consist of a PVC riser, and a cast iron "Lincoln Hat" box and lid. They shall be designed so as to prevent the transmission of surface loads directly to the valve or piping. Valve box extensions shall be installed to reserve a minimum of 50% of the adjustment for a future extension.

The operating nut should not exceed 36 inches below finished grade. However, if conditions require that the operating nut exceeds 36 inches, then an extension, mechanically attached to the valve, shall be added, and the top of the extension shall not exceed 12 inches below finished grade.

#### **8a5. Dead End Mains**

The designing of systems with dead end mains shall be avoided to the maximum extent possible. If a dead end main is necessary, an auto flush hydrant must be installed at the end of the line. See standard details for an example of an auto flush hydrant.

### **8b. Ductile Iron Pipe and Fittings**

Pipe shall have an exterior bituminous coating in accordance with ANSI A21.51. Pipe interior shall have a cement mortar lining with an asphaltic seal coat conforming to ANSI/AWWA A21.4/C104.

#### **8b1. Fittings**

All ductile fittings shall be mechanical joint with a minimum pressure rating of 350 psi, and shall conform to the requirements of ANSI/AWWA A21.10/C110 or A21.53/C153. All fittings shall be coated and lined as specified above for ductile iron pipe.

#### **8b2. Mechanical Joints**

Mechanical joints consisting of bell, socket, gland, gasket, bolt and nuts shall conform to ANSI A21.11.

#### **8b3. Restrained Joints**

Restrained joints shall be installed at all valve fittings and locations as required by CLWSC. All tee's, cross's and elbows must have a concrete thrust block support. The concrete must be poured with adequate containment in place to avoid loss of concrete from under and at the point of thrust on the fitting. The use of rocks, bricks, and dry bagged cement are not considered as adequate thrust blocking and are not permitted. Thrust blocking shall be constructed in accordance with CLWSC standard details. As an alternative to thrust blocking, joint restraints may be used. The length of pipe to be restrained shall be calculated as required, and subject to review and approval by CLWSC staff. Where minimum restrained length is not met, thrust blocks shall be used.

#### **8b4. Gaskets**

Pipe and fitting gaskets, conforming to ANSI A21.11, shall be made of EPDM (ethylene propylene diene monomer) or SBR (styrene-butadiene rubber). U.S. Pipe Field Lok gaskets or CLWSC approved equivalent shall be used for restraining DICL pipe up to 24”.

#### **8c. (PVC) Pipe and Fittings and (PVCO) Pipe and Fittings (Ultra Blue)**

All Polyvinyl Chloride PVC and Molecularly Oriented Polyvinyl Chloride PVCO water mains shall have a suitable electronic locator tape buried over the water main approximately one foot below grade. The tape shall be continuous between valves and secured to each valve. The tape shall be at least 4.5 mils thick, 6 inch minimum width and made with an aluminum material sandwiched between 2 layers of polyethylene. It shall have imprinted in permanent black ink with 1 inch letters "CAUTION WATER MAIN BURIED BELOW" on blue background.

##### **8c1. Tracer Wire**

For all non-metallic pipes within private easements or in cross-country routes, there shall be a tracer wire attached to the pipe. See standard details for proper emplacement of tracer wire. All PVC and PVCO pipe and fittings shall bear the approval seal of the National Sanitation Foundation (NSF) that will remain legible during normal handling, storage, and installation.

##### **8c2. Water Pipe**

All PVC and PVCO pipe (6” and larger) shall have the same O.D. as ductile iron pipe and be compatible for use with ductile iron fittings. PIPE COLOR SHALL BE BLUE FOR POTABLE WATER MAINS.

##### **8c3. Fittings**

Fittings for PVC and PVCO pipe (6 inches through 12 inches) shall be ductile iron mechanical joint with a minimum pressure rating of 250 psi and shall conform to the requirements of ANSI/AWWA A21.10/C110 or A21.53/C153.

##### **8c4. Joints**

PVC and PVCO pipe shall have provisions for expansion and contraction provided in the joints. All joints shall be designed for push-on makeup connection. A push-on joint may be an elastomeric gasket ball end coupling manufactured as an integral part of the pipe barrel consisting of a thickened section with an expanded bell with a groove to retain a rubber sealing ring of uniform cross-section.

##### **8c5. Restrained Joints**

All PVC and PVCO pipe shall be restrained per manufacturer’s recommendation.

## **Section 9            Valves**

### **9a.    Gate Valves**

Valves 4” – 16” shall be gate valves. Underground gate valves shall be of the resilient seat type meeting the requirements of AWWA C509, and coated per AWWA C550 as manufactured by the Mueller or Clow Company. These valves shall have non-rising stems, shall be furnished with 2 inch square AWWA operating nuts, and shall open when the nut is turned counterclockwise. Valves shall have mechanical joint ends and shall be furnished complete with joint accessories. Exposed or above-ground gate valves shall be outside screw and yoke (OS&Y) flanged joint type.

### **9b.    Pressure Reducing Valves (PRV)**

CLWSC requires PRV’s to be installed with oil filled pressure gauges on both sides of the PRV to record incoming flow- pressure and outgoing flow pressure. Steel braided lines from PRV to regulator must be installed on the pilot system. The PRV is to be installed as a bypass of the main and can be one standard size smaller than the main. All main line PRV’s shall have an additional PRV bypass for low flows. The bypass can be as much as 2 standard sizes smaller than the main line PRV. Gate valves with a 2” operating nut must be installed in order to isolate PRV on main line and PRV on the bypass. PRV’s shall be Singer Valve Company or equivalent subject to review and approval by CLWSC.

### **9c.    PRV Vaults**

Vaults are sized in order to house PRV, bypass and gate valves. Vault shall meet the requirements as listed in Section 12.

### **9d.    Tapping Valves**

Tapping valves shall be mechanical joint outlet, non-rising stem, resilient seat gate valves meeting the applicable requirements of AWWA C509 and C550. Tapping valves shall be specifically designed for pressure tapping with sufficient seat opening to allow full diameter taps to be made.

### **9e.    Valve Location**

Inline valves shall be placed so that the maximum allowable length of water main required to be shut down for repair work shall be minimized as determined by CLWSC. The maximum spacing shall be 1000,’ and at each hydrant or fire service. All CLWSC cross-country main line valves will have a 2” x 54” marker post installed 12” behind the valve box, buried and concreted into place 18” deep and painted blue. 2” marker pipe must be filled with concrete.

Whenever possible, valves shall be located in turfed areas. If it is not possible to attain this, valves shall be located within the roadway. As a last resort, valves may be located under sidewalks.

Where pipes interconnect at a tee, a three way valve bank shall be installed unless otherwise approved by CLWSC staff.

## **Section 10           Services**

Service Installation shall include the complete installation from the connection at the main to the meter.

The Contractor shall furnish all labor and material required to install the services. The meter will be furnished and installed by CLWSC. The Contractor shall leave the proper space between the angle meter stop or valve in the meter box and consumer's piping so the meter may be easily installed in the space provided.

### **10a. Installation**

Service Installation shall be made in accordance with the latest revision of CLWSC's Standard Details for the appropriate service connections. All materials shall be as indicated on the detail drawings.

### **10b. Main Connection**

All service taps 2" and smaller shall be made at a 45 degree angle upward from the main. A minimum amount of cement coating shall be removed from cement coated main prior to applying the service clamp or the welded coupling as designated in the Standard Details. When placing a service clamp on wrapped pipe the coating is not to be removed. Care shall be exercised to avoid tearing or scuffing of pipe coating.

When a service requires making a tap on a line located under asphalt or other paved surfaces, a 2" square nut gate valve shall be installed at the tap with a valve box.

### **10c. Service Run**

Service lines from the main shall have a minimum cover of 24 inches from the final grade. The service pipe shall first make a 90 degree angle bend upwards for connection to the angle meter stop. The angle meter stop shall be installed in a vertical position with the outlet horizontal to the grade and perpendicular to a curb line.

### **10d. Service Sleeves**

All service lines crossing any public or private roadway shall be sleeved. A 2" sleeve shall be used for a 1" water service and a 4" sleeve would be used for dual 1" services. Service sleeves that will carry larger than 1" service lines must be approved by CLWSC Engineering Staff prior to the start of construction. Services must be sleeved 5' past the edge of pavement or face of curb.

### **10e. Meter Boxes**

Meter boxes shall, where possible, be set square and level 2" above the finished grade of the surrounding area in order to avoid run-off water. They shall be in a line parallel to and 6" from the back of the curb or sidewalk. Where no curb or sidewalk exists, the meter boxes shall be set at the location indicated on the drawings or as directed by the Engineer; meter boxes will be placed at property lines in most cases. When possible, meter boxes for adjacent lots shall be placed side by side on either side of the property line dividing the two lots. The boxes, rectangular in shape, shall be set with the long side perpendicular to the center line of the street or rights-of-way, with the notched end toward consumer piping.

Traffic bearing meter boxes shall be used in any paved area where vehicle traffic is anticipated.

### **10f. Tapping Sleeves**



Tapping sleeves for size-on-size connections are not allowed. For less than size-on-size connections, tapping sleeves shall be fabricated steel units with a fusion-bonded epoxy coating and shall be pressure rated as above. The Contractor shall determine the outside diameter of the existing main before ordering the sleeve. Tapping sleeves shall have an outlet flange per ANSI B16.1.

### 10g. Service Saddles

Service saddles shall have a brass body, hinged, be suitable for wet or dry installation, and of the size and application specified. Material shall be in accordance with ASTM B62 and B584 (85-5-5-5) requirements and fabricated to ANCI/AWWA C800, latest revision. Saddles for PVC pipe shall be performed to AWWA C900 and C905 or C909 outside diameter dimensions and so stamped or otherwise identified by a permanent inked marking that will not smear or wash off on the body of the saddle. Saddles for Ductile Iron pipe shall be stamped or otherwise identified in a similar manner. The sealing gasket shall be the O-ring type suitable for the applicable service. Outlet flange shall be ANSI B16.1. Double tie strap type service saddles are not allowed in PVC or PVCO pipe.

## Section 11 Trench Excavation, Pipe Cutting, Laying, and Backfilling

**Bedding of all Water Mains shall adhere to the Standard Bedding details based on both current and proposed usage of the area above the pipe, whichever is more stringent.**

### 11a. Trench Excavation

All excavations shall be open cut, with banks of trenches kept as nearly vertical as possible. Water mains may be offset to one side of a trench but a minimum of 6” clearance must be maintained between the trench wall and the water main.

Trenching Requirements		
Pipe Diameter (inches)	Minimum Trench Width	Minimum Trench Depth
2”	16”	36”
3”	16”	36”
4”	16”	36”
6”	24”	42”
8”	24”	44”
12”	30”	52”
16”	36”	56”
>16”	Diameter + 24”	Diameter + 40”

The trench floor shall provide a uniform bearing for each full length of pipe section. Excavate bell holes after the trench has been graded. Perform all excavations of whatever substance encountered to the depths shown or indicated on the drawings. Pipe shall be bedded with a minimum of 6” of the same ¾ to dust bedding material or approved screened excavated material. Trench walls should be near vertical even when working in an area that is sloped. When appropriate, CLWSC will allow cut or fill techniques to be used to level an area for excavation. **Contractors are responsible for all safety requirements (OSHA and any other agencies that apply) associated with trench construction and shall be required to have a trench safety plan prepared by an approved professional. Unless otherwise noted in the construction documents, there is no separate pay item for this requirement for projects completed on behalf of CLWSC.**

## **11b. Dewatering**

The Contractor shall provide and maintain at all times during construction ample means and devices to promptly remove and dispose of all water from any source entering trench excavations or other parts of the work.

Dewatering shall be performed by methods that will maintain a dry excavation, preservation of the final lines and grades and to protect all utilities. If flooding of the trench does occur, the Contractor shall immediately dewater and restore the trench. Damage or altered pipeline appurtenances or trench materials shall be repaired as directed CLWSC. Water will be disposed in such a manner as will not cause injury to public or private property, nor is a menace to the public. Other methods of water control, other than dewatering, shall be subject to the approval of CLWSC.

## **11c. Pipe Laying**

Pipe shall be constructed of materials specified and as shown on the drawings. Each section of pipe shall rest upon the pipe bed for the full-length barrel, with recesses excavated to accommodate bells and joints. Any pipe which has a grade or joint disturbed after lying shall be taken up and re-laid. No pipe shall be laid when the trench conditions or the weather is unsuitable for such work, except by permission of CLWSC. Any section of pipe already laid which is found to be defective or damaged shall be replaced with new pipe without additional cost to CLWSC. Excavation, trenching and backfilling shall be in accordance with the requirements of the applicable portions of these specifications.

### **11c1. Laying PVC and PVC0 Pipe**

All PVC and PVC0 pipe shall be installed in accordance with standards set forth in the UNI-BELL "Handbook of PVC pipe design and construction" unless such standards conflict with this manual in which case this manual shall apply.

### **11c2. Laying DICL Pipe**

All DICL pipe shall be installed in accordance with standards set forth in the DIPRA "Installation Guide for Ductile Iron Pipe" unless such standards conflicts with this manual in which case this manual shall apply. Contractor shall cut pipe only as necessary to comply with alignment shown on the drawings.

### **11c3. HDPE Pipe**

Contact CLWSC Engineering Department for further details.

## **11d. Bedding and Compaction**

Backfill shall not be placed until the pipeline has been inspected by CLWSC. Backfill material shall not be dropped directly upon the pipeline. The backfill material shall be deposited from one end of the trench uniformly on both sides of the pipe. Minimum 6" bedding below water mains and a minimum 12" cover over the top of water mains.

For all water lines crossing county or state roadways, the provisions for trench compaction and backfill as established by these agencies shall be met. Where these provisions and this specification are in conflict, the more stringent standard shall apply.

All bedding material placed within 6" of the pipe shall be ¾" to dust base or 3/8" to 5/8" river stone or crushed limestone material. When, in the opinion of CLWSC, material excavated from the trench is unsuitable backfill or when it is required by the jurisdictional agency, suitable backfill shall be furnished and placed by the Contractor. Screening of excavated trench material for bedding may be allowed using a 1" or 1 1/4" screen under no circumstance will rocks larger than 2" be allowed in bedding.

Backfill for hand tamping shall be deposited in layers not to exceed 4" thickness and for mechanical tamping not to exceed 6". Care shall be taken not to injure the pipe while ensuring thorough consolidation. Where appropriate, excess material shall be heaped over the trench to allow for settlement.

At locations outside of streets, backfill of selected material from the ground surface to the depth of one foot shall be compacted to produce compaction equal to or greater than that of the original ground, or to produce no less than 85% relative compaction. The Contractor will perform both field and laboratory test and inspection as required by CLWSC.

All streets are to be restored to their original condition with at least the same amount of properly compacted sub grade and pavement.

Final grading of the area surrounding the trench excavation site shall not interrupt the natural drainage course of the site. The area shall be relatively free of large rocks and other debris that is greater than that of original conditions.

All unsuitable material and excess backfill shall be removed and disposed of by the Contractor concurrently with the installation of the main.

## **Section 12            Underground Installation**

Double Check Valves, Double Check Detector Assemblies, Reduced Pressure Principle Backflow Preventers, and other appurtenances if installed underground must have a vault. All underground installations must be reviewed and approved by CLWSC.

### **12a. Vaults**

Vaults shall be constructed of concrete with double spring loaded, skid resistant, steel door with automatic hold open feature. Vaults shall be sized in order to house the appurtenance with adequate spacing around it for routine maintenance and inspection. Vaults shall be set 2" above finished grade - but should not exceed 6" above finished grade without CLWSC Engineering staff approval. Each end of the vault shall have a circular opening 2" larger in diameter than the pipe to allow for pipe penetration. These openings shall be sealed with cement slurry upon insertion of the piping. The vault floor shall consist of 1"-1 1/2" washed rock 12" thick. This same washed rock will serve as the foundation and the bottom 18" of backfill for the vault. All vaults and vault doors placed in areas where traffic may cross over it must meet H-20 load standards. Contractor shall provide CLWSC engineering staff with specific information on any vault for review and approval prior to installation.

## **Section 13            Urban Type Development**

Urban type development is becoming more common in Comal County. And urban type development for the purposes of these specifications is defined as any development in which roadways contain a curb and gutter cross section with or without a storm sewer collection system and with or without sidewalks. Additional design requirements shall apply to these types of developments.

### **13a. Typical Section showing all Utilities**

A typical section shall be provided showing the location and depth of all utilities located inside the right of way and in easement area adjacent to the right of way. The section shall show all utilities running parallel to the roadway, as well as detail showing any service crossings running perpendicular to the roadway. When crossing the roadway with a service, all other utilities shall pass below the water main. It is the responsibility of the design engineer to ensure there are no utility conflicts. The design engineer shall coordinate with all utilities on locations prior to receiving approval of the plans.

### **13b. Tracer Wire**

Tracer wire shall be installed on all water mains located within any urban type development regardless of pipe size. See standard details for installation requirements.

### **13c. Storm Sewer Crossings**

All areas where water mains cross storm sewer system piping shall be detailed to ensure contractors understand whether the water main must go above or below the storm sewer pipe. Minimum cover requirements shall be maintained when crossing over storm sewer system piping.