

## PART I

### **WATER SYSTEM STANDARD SPECIFICATIONS**

#### Chapter 1 - General

- 1.01 Authority. These Specifications are promulgated by the Cherokee Metropolitan District. The interpretation, enforcement, and revision of these Specifications is hereby delegated to the General Manager of the District.
- 1.02 Effective Date of Specifications. These Specifications shall be in effect fifteen (15) calendar days after adoption by the District Board and shall supersede all former standard specifications for installation of water mains within the Cherokee Metropolitan District.
- 1.03 Revisions, Amendments or Additions. These Specifications may be revised, amended or added to. Such revisions, amendments and additions shall be binding and in full force and effect when adopted in the manner set forth in Section 1.02.
- 1.04 District Control. These Specifications will apply to the installation, operation and maintenance of all distribution facilities under the control of the Cherokee Metropolitan District.
- 1.05 Organization and Interpretation of Specifications. These Specifications are composed of written Standards of Engineering Practice, Material Specifications and Standard Drawings. The interpretation of any section or of differences between sections, when appropriate, shall be made by the General Manager of the District and his/her interpretation shall be binding and controlling in its application.
- 1.06 Definitions. As used in these Specifications, or in any of the drawings where these Specifications govern, unless the context shall otherwise require, the following words defined shall have the meanings herein ascribed:
- a. Cherokee Metropolitan District. The Cherokee Metropolitan District, organized and operated under the statutes of the State of Colorado is a Special District providing public water and wastewater service within its service area.
  - b. General Manager. The General Manager of the District or his/her designated representative.
  - c. Engineer. The Engineer or consultant of the District, acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties entrusted to them.
  - d. Distribution System. Mains, together with all appurtenant and necessary valves, hydrants, taps, meters, service pipes, and associated materials, property and equipment distributing potable water to individual customers and users.

- e. Water Main or Distribution Main. That portion of the water supply system which transmits and distributes water of the District from treatment or storage facilities to users, excluding service lines.
- f. Service Line. The water line extending from the premises up to and including the connection to the distribution main.
- g. Applicant for System Extension. Any person, association, corporation, entity, or government agency desiring water service for premises under their control, often a subdivider, a developer or an owner.
- h. Main Extension. Extensions to the existing water distribution network.
- i. Contractor. In the context of these Specifications a person or persons, co-partnership or corporation employed by an applicant for the purpose of installing water system extensions or replacements.
- j. Inspector. The authorized representative of the District assigned to the project.
- k. Standard Drawings. District Standard Drawings are a part of these Specifications.

1.07 Abbreviations. All references to documents or specifications shall be the latest edition or revision thereof:

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|----|------|--|
| a. | ASTM | American Society for Testing and Materials |
| b. | AWWA | American Water Works Association           |
| c. | ANSI | American National Standards Institute      |
| d. | NSF  | National Sanitation Foundation             |
| e. | OSHA | Occupational Safety and Health Act         |
| f. | USGS | United States Geological Survey            |
| g. | CIP  | Cast Iron Pipe                             |
| h. | DIP  | Ductile Iron Pipe                          |
| i. | PVC  | Polyvinyl Chloride Plastic Pipe            |
| j. | psi  | Pounds per Square Inch                     |
| k. | PPM  | Parts per Million                          |
| l. | PRV  | Pressure Reducing Valve                    |

# WATER SYSTEM STANDARD SPECIFICATIONS

## Chapter 2 - Main Extensions

2.01 Extensions Defined. Distribution system extensions within the Cherokee Metropolitan District are referred to as "Main Extensions." "Main Extensions" shall further be defined as "District Mains" and "Private Mains."

- a. District Mains. Main extensions as designated by the District to be located within public rights-of-way and/or easements as determined by the District. These mains and appurtenances shall be owned and maintained by the Cherokee Metropolitan District.
- b. Private Mains. Main extensions as designated by the District to be located outside of public rights-of-way and/or easements. These mains shall be owned and maintained by an individual, property owner(s), corporation, homeowner's association or partnership.

Private mains shall be limited to mains required for fire protection unless determined otherwise by the District. See Section 3.04 of these Specifications.

2.02 Standard Specifications to Apply. These Standard Specifications shall apply uniformly to both "District Main" and "Private Main" extensions subject only to some appurtenance and procedural variations.

2.03 Responsibility for Main Extensions. All water main extensions within the Cherokee Metropolitan District and El Paso County or total service areas shall be made at the expense of the developer or owner. Extensions shall be made from the nearest adequate source to a point or points of the property line, farthest from the existing distribution main, on the frontage of the applicant's property or to a point of tie-in to an existing main as designated by the District. The District shall determine the size of main, location and required appurtenances, and the District's determination of size, location, appurtenances and point(s) of extension of water mains shall be final. See Sections 3.03 and 7.02 of these Specifications.

2.04 Application Procedure. All inquiries, applications and submission of plans for water main installations shall be initiated through the Cherokee Metropolitan District, General Manager of the District, 6250 Palmer Park Blvd, Colorado Springs, CO 80915.

The District has established a development review process which shall run parallel to, and in conjunction with, the design, review, approval and construction process for main extensions and other water service projects. The development review process shall be initiated prior to submission of construction plans for review. Contact the General Manager to initiate this process.

The District will establish, and may amend from time to time, procedures to be followed by applicants for "Private Mains." These procedures shall include all requirements for paperwork, submittals, engineering design, construction and acceptance. The engineering

design and water plan portions of the extension applications shall include the following considerations:

For "District Main" Extensions Only. An initial submittal by the applicant including an overall or master plan showing the area to be developed and any other adjoining proposed developments by the Owner/Developer. Large or difficult areas may require extensive study and analysis.

The District will return to the applicant its requirements for:

- a. Points of connection to existing facilities.
- b. Size of mains to be installed.
- c. Locations of mains to be installed.
- d. Special features such as pressure regulating valves, blow offs, relief valves, booster pumps, etc.
- e. Acceptable materials.

For Both "District Main" Extensions and "Private Main" Extensions. The applicant shall submit final plans prepared by a Professional Engineer in three copies for checking by the District. This submittal shall contain all of the items enumerated in the procedures as established in Section 2.05 of these Specifications.

The District shall check all submittals for conformance with these Standard Specifications and other applicable rules and regulations and either approve the submittal or return it to the applicant for correction.

All final plans shall be approved by the Owner and/or Developer prior to submittal to the District.

2.05 Plan Requirements for Water System Extensions. Detailed plans for system extensions shall be prepared for approval with the submittal to the District. All plans submitted shall be in strict compliance with the Standards contained herein and shall meet special conditions that may be reasonably required.

The design and installation of all facilities shall ensure development of an integrated water system. No work shall commence on any facilities until the plans for construction are approved in writing by the General Manager.

When a District water main is to be installed outside of the public street right-of-way, within an easement or right-of-way dedicated for water main installations, the Owner/Developer shall be responsible to provide restoration and landscaping adequate to prevent erosion caused by surface run-off. Landscaping and restoration construction shall be designed in such a manner that minimum future maintenance will be required. A landscaping and restoration design plan shall be submitted with the water plan for approval and will be subject to the same guarantee as described in Section 2.13 of these Specifications.

All proposed District water mains to be installed within a dedicated water line easement or right-of-way will require plan and profile drawings to be prepared by the Owner/Developer's engineer and approved by the District. At the District's discretion, certain water main installations less than 12 inches in diameter may not require complete profile drawings.

Regardless of the complete profile requirement, all pertinent design information shall be given in profile view for critical vertical design locations, such as water line lowerings, utility crossings, significant changes in vertical design, etc.

Tests for corrosive soil conditions may be required by the District. If so required, said tests shall:

- a. Be required prior to all proposed water line installations.
- b. Be performed by the Applicant.
- c. Require that the area of water main installation be graded to subgrade prior to testing.
- d. Determine if protection of water installations will be required in conformance with Section 5.26 of these Specifications.

Final plans should not be submitted for work that will not be installed within twelve months of the approval date. All final plans shall contain, but are not limited to, the following information: See Standard Drawings No. W-2 and W-3.

Plan view containing or showing:

- a. A recorded plat showing location and dimensions of dedicated street, alleys, rights-of-way and easements.
- b. Lots and blocks.
- c. All existing and proposed curb and gutter.
- d. Sidewalk locations with respect to property lines.
- e. All existing or proposed utilities which may conflict with water installations to include size, type and horizontal and vertical location.
- f. All existing or proposed obstructions such as vaults, catch basins, traffic islands, etc.
- g. The proposed alignment and size of the water lines to include the location of all proposed facilities such as valves, hydrants, fittings, etc.
- h. Private service taps larger than 2 inches to include location and size.

Additionally, all plans shall:

- a. Be made from actual field surveys referenced to land corners or other official survey control points and be of sufficient accuracy so that the facilities can be accurately staked for installation and can be readily located after installation for maintenance, tapping and control.
- b. Be of suitable scale to show all necessary information. Larger scales shall be used when necessary to adequately show specific details of mains, connections and other installations.
- c. Show sufficient adjacent area to give the relationship of new facilities to existing facilities.
- d. Be neat, orderly and legible. Sloppy, smeared, or nonconforming plans shall be rejected. See Standard Drawings No. W-2 and W-3.
- e. Require the following statements and signature blocks for "District" and "Private" main extensions.

DISTRICT MAIN EXTENSIONS

Water Statement

The undersigned Owner/Developer agrees that the installation of these proposed water facilities will be made in accordance with Cherokee Metropolitan District Specifications and shall provide a minimum of 5 feet and a maximum of 6 feet of cover over the water main(s). Any changes required to meet the above stipulations shall be at the expense of the Owner/Developer. Cover in excess of 8 feet shall be supported by plan and profile drawings approved by the District.

Signed \_\_\_\_\_ Date \_\_\_\_\_  
Owner/Developer

DBA \_\_\_\_\_

Address \_\_\_\_\_

All hydrants shall be installed according to the District's Specifications.

Water Installation Corrosion Control Requirements

None required

Required, described as follows:

Water Plan Approval

Signed \_\_\_\_\_ Date \_\_\_\_\_  
Cherokee Metropolitan District

Approval expires one year from the date above and resubmittal of these plans for review and approval is required if construction does not begin during this period.

PRIVATE MAIN EXTENSIONS

Water Statement

The undersigned Owner/Developer agrees that the installation of these proposed water facilities will be made in accordance with Cherokee Metropolitan District Specifications and shall provide a minimum of 5 feet and a maximum of 6 feet of cover over the water main(s). The undersigned understands that all water mains, fire hydrants and appurtenances as indicated on this water installation plan shall remain the property of the Owner and shall be maintained by the Owner.

Signed \_\_\_\_\_ Date \_\_\_\_\_  
Owner/Developer

DBA \_\_\_\_\_

Address \_\_\_\_\_

All fire hydrants shall be installed according to the District's Specifications.

Water Installation Corrosion Control Requirements

None required

Required, described as follows:

Water Plan Approval

Signed \_\_\_\_\_ Date \_\_\_\_\_  
Cherokee Metropolitan District

Approval expires one year from the date above and resubmittal of these plans for review and approval is required if construction does not begin during this period.

- 2.06 Plan and Profile Drawings. Plan and profile drawings shall be provided for all 12-inch and larger water mains and for water mains less than 12-inch when deemed necessary by the District. All plan and profile drawings for water mains shall be prepared at the expense of the Owner and/or Developer.

Plan and profile drawings for 12-inch and larger mains prepared by a consulting firm or individual shall bear the name and registration number of a Registered Professional Engineer in the State of Colorado.

The scale for all plan and profile drawings shall be no larger than 1" = 50' horizontal and either 1" = 5' or 1" = 10' vertical.

Additional specifications added to plan and profile drawings by the design professional of record or requested by the District shall be in addition to, and shall supersede, these Specifications.

Three (3) copies of all plans and specifications for facilities to be installed under these rules and regulations shall be furnished to the District. One (1) copy will be returned to the applicant when approved by the District and bear evidence of such approval or comments requiring correction.

Design Information Required. Prior to beginning a plan and profile design for a water main 12-inch or larger, the Developer or his/her agent shall be required to submit the following information to the District:

- Approved Water Plan
- Recorded Subdivision Plat
- Approved Storm Drain and Street Plan
- Approved Wastewater Plan

Along with the above shall be included:

- Horizontal and vertical location of all existing and proposed utilities and structures which may conflict
- Curve Data
- USGS elevations and bench marks with a location and description
- Sidewalk and curb information
- All dimensions
- Manhole invert and rim elevations
- Original and proposed ground line
- Control line with stations
- Easement and/or right-of-way information to include the recorded book and page numbers, or any other data which could conflict with or require deviations in the design of the water main.

Any revisions, amendments or additions made to the original submitted information once the water design is initiated, shall be applied to the original submitted information by the applicant's Engineer and signed by same.



2.07 Conflicts Between Plans and Specifications. When a conflict occurs between or within standards, specifications and drawings, an interpretation shall be made by the General Manager, pursuant to Section 1.05 of these Specifications.

- a. Addenda and modifications to the drawings and specifications take precedence over the original documents.
- b. Should there be a conflict within the Specifications or on the drawings, the General Manager shall decide which stipulation will provide the best installation and his/her decision shall be final.
- c. In the drawings, calculated dimensions shall take precedence over scaled dimensions and noted material over graphic indication.

2.08 Construction Procedure. Following final approval of the plan(s), completion of a pre-construction conference and obtaining approval of shop submittals for materials incorporated into the project, the applicant may proceed with construction. In addition to all construction requirements contained in other portions of these Specifications, the applicant and his/her Contractor shall observe the following:

- a. Prior to commencing work on the project site, the Developer and his/her contractor shall participate in a pre-construction conference with District representatives which shall be held a minimum of two (2) weeks prior to initiating work.
- b. Construction shall commence within twelve (12) months of the approval date shown on the plans or the plans must be resubmitted for review and approval. If construction on the main installation is halted for more than six months, plans must be resubmitted for review and approval.
- c. The applicant shall secure and pay for all licenses and permits required for the system extension.
- d. Shop submittals for all materials that are proposed for use in the project must be submitted to the District for review and approval prior to incorporation into the project.
- e. All materials needed to complete the work shall be on hand so that the project may proceed without delay.
- f. Adequate provisions for notification of customers who may suffer outages must be developed. Outages shall be kept to a minimum in compliance with Section 5.25.d of these specifications.
- g. Mains shall not be installed unless they can be extended from an approved permanent water source which can supply sufficient water for chlorinating and flushing.
- h. Mains shall be chlorinated in accordance with Section 5.27 of these specifications.
- i. The contractor shall be responsible for arranging for or making all taps for main extensions on both public and private water mains. Mains shall only be tapped for service lines after having been installed, chlorinated, tested and flushed to the

satisfaction of the Inspector. No tapping of dry mains shall be allowed. See Section 5.25.b of these Specifications.

- 2.09 Surveying. Line and grade for all water mains and appurtenances shall be established by a Professional Engineer or by a Land Surveyor, licensed to practice in the State of Colorado or his/her authorized representative. All work shall be done in a professional manner. Correct alignment and grade of the water mains shall be the responsibility of the owner or developer's Engineer. Approval of the staked alignment and elevations by the Inspector does not relieve the Engineer in any manner from the responsibility for field errors. Sufficient line shall be staked to ensure continual work progress. Under no circumstances shall pipe be installed without line and grade stakes set by the Engineer or Surveyor and approved by the Inspector.

Exception - If a main less than 12-inch diameter is to be extended in an existing street and if the Engineer who prepared the plans can provide evidence that the finish grade of the street is to remain unchanged, no grade stakes need be set. The main shall be installed with a minimum of 5 feet and a maximum of 6 feet of cover.

- 2.10 Placing Survey Lines. Hubs and stakes shall be set on an offset line to mark the location of the center line of the water main. Center line hubs and stakes may be used in addition to the offset hubs and stakes; however, they may not be set in place of the offset hubs and stakes. Normal practice is to set offset hubs and stakes 5 feet to 10 feet off the center line of the water main.

Survey points shall be set a maximum distance of 50 feet apart. All valves, crosses, tees, horizontal and vertical bends and hydrants shall be staked for location and grade. Points of curvature and points of tangency of curves, as well as points on the curve, shall be staked. All stakes shall be flagged to increase their visibility.

Fire hydrants shall be set so that the elevation of the center of the traffic flange is 4 inches above the finish grade of the ground or top of the curb and/or sidewalk. See Section 5.18 and Standard Drawings No. W-4 and W-5.

- 2.11 Notice of Field Staking and Construction by the Developer. Notice of and preparation for staking for line and grade for water mains shall be provided by the Developer.

It shall be the Developer's responsibility to notify the District a minimum of five (5) working days prior to his/her intent to begin construction. It shall also be the Developer's responsibility to see that the area of construction is free of debris, material, equipment or any other obstacles which may obstruct the placement of stakes or access to reference points.

- 2.12 Inspection.

- a. New installation or replacement of any existing facilities in the water distribution system shall be inspected and approved by a District Inspector.

The Inspector shall ensure that the provisions of the Standard Specifications are carefully complied with especially with regard to the quality of workmanship and materials. Problems which may require sound field judgment, in lieu of strict

interpretation of the Standard Specifications, shall be resolved by the Contractor to the satisfaction of the Inspector.

All work shall be performed in accordance with accepted workmanship practices and these Standard Specifications. Any work not accepted by the Inspector shall be redone until compliance with these Standard Specifications is achieved.

All appropriate permits and approved water plans shall be kept on the job site and shall be checked by the Inspector before starting construction. All such documents shall remain on the job site throughout the construction of the project.

The Inspector shall not supervise nor set out work or give line and grade stakes. A responsible representative for the Contractor, designated by the Contractor, shall be at the project site at all times that construction is in progress. The Inspector shall discuss the work with the Representative or his/her Supervisors only. Any directions given to the workmen will be given to them by the Representative. If at any time during construction it is found that no Representative for the Contractor is at the project site, then such a situation shall be cause for the Inspector to stop work until a Representative is present at the project.

- b. All materials used shall be subject to the inspection and approval of the Inspector at all times. The Inspector has the right to perform any testing deemed necessary to insure compliance of the material with these Specifications. No material shall be used before being inspected and approved by the Inspector. Failure or neglect on the part of the Inspector to condemn or reject inferior materials, or work, shall not be construed to imply their acceptance should their inferiority become evident at any time prior to completion of the two year warranty period. See Section 2.13 of these Specifications. Materials rejected by the Inspector shall be immediately removed from the job site.
- c. The District standard working hours are 8:00 AM to 5:00 PM Monday through Friday. Inspections or other direct involvement by District personnel outside of these normal working hours shall be scheduled with the District office during normal working hours. It is required that at least a 24 hour notice be given should any direct involvement by District personnel be required outside of normal working hours. There may be a charge by the District to the contractor for direct involvement by District personnel outside of normal working hours.

2.13 Performance Agreement and Bill of Sale. The Developer shall furnish to the District a guarantee for the satisfactory repair or replacement where required, or the cost thereof, of all work, material, services and equipment which becomes defective as a result of faulty materials, faulty installation, or improper handling of material and equipment installed by the Contractor. Such guarantee shall be for a period of two (2) year from the date of acceptance of all work performed. This date shall be the approval date as recorded on the Performance Agreement and Bill of Sale form.

The Performance Agreement and Bill of Sale form shall be provided to the Developer by the District. The Developer shall complete the form and return it to the District for final approval.

A copy of the final approved form will be sent to the Developer.

2.14 Special Conditions. When applying for a main extension, special conditions that involve another agency, such as crossing a railroad or highway, may exist. All conditions of the other agency must be satisfied. All designs, drawings and calculations submitted to another agency shall also be submitted in duplicate to the District for approval. Should a conflict in the plans and specifications occur between the District and the other agency, the more stringent plans and specifications yielding a higher quality product shall prevail.

# WATER SYSTEM STANDARD SPECIFICATIONS

## Chapter 3 - Distribution System Design and Layout

- 3.01 General. The purpose of this chapter is to provide information for the design and layout of a water distribution system acceptable to the District. All water distribution system designs and layouts shall conform to the Colorado Department of Public Health and Environment's regulations and requirements.
- 3.02 Quality of the Distribution System. The purpose of these Standard Specifications is to ensure that only proven high quality materials are installed using first class workmanship. Determination of the best materials and construction methods are based upon lowest life cycle costs, not necessarily the lowest initial costs. Sizing and layout of the system are parts of the total consideration of design, operation and maintenance of a water supply system that yields optimum quality service at the lowest total cost to the customer.
- 3.03 Sizing of Distribution Mains. All mains shall be sized large enough to provide for domestic, irrigation, and fire protection flows to the area requesting service and shall meet the following requirements:

The District reserves the right to size mains to provide service for projected future needs. See Section 2.03 of these Specifications.

In business and industrial areas main sizes may need to be increased in adherence to the recommendations of the Insurance Services Organization to provide adequate fire flows.

Planned Building Groups may be treated the same as Industrial and Business areas because of the high fire risk. These areas generally require "Private Mains." See Sections 2.01 and 2.04 of these Specifications.

- 3.04 Fire Protection.
- a. Fire Hydrants. The number and location of fire hydrants in a given area is determined by the District. Normal practice is to install fire hydrants on the corners of street intersections. If fire hydrants are to be installed at locations other than street intersections, they shall be located on lines which are established by extending property lot sidelines into the streets. Any other proposed location must be approved by the District. See Standard Drawing No. W-4.

Fire hydrant branch lines shall be set at right angles to street mains. The hydrant shall be set at the end of the branch line and shall face the branch line. No horizontal or vertical bends or offsets shall be used in installing fire hydrant branch lines unless approved by the District. Under no circumstances shall any size or manner of tap be made on a fire hydrant branch line between the hydrant and hydrant valve.

- b. Private Mains. When required in business, industrial and building group areas where increased fire protection is necessary, private fire mains and hydrants may be needed. Location of these facilities to be determined and approved by the District.

Private mains shall be treated as large service lines and will require valves to be installed at the connection point to the "District Main" and at the property line. Domestic service, irrigation and/or fire sprinkler lines may be extended to the buildings and area providing all service line and meter installation requirements are complied with.

All private main extensions shall be limited to single platted lots. Extensions will not be allowed to cross lot lines for the purpose of serving two or more platted lots and building complexes. Responsibility for a private main must remain with one property and one ownership. See Sections 2.01 and 2.04 of these Specifications.

Private main extensions, to include fire hydrants, shall be installed in accordance with these Specifications and shall be inspected by the District. See Section 2.12 of these Specifications.

- 3.05 Distribution Regulation Installations. Regulating installations are required to control pressure, provide pressure relief and separate pump and gravity zones throughout the water distribution system. When main extension plans are submitted for review, the need for regulating installations will be determined by the District, based on existing and proposed pressure zones, booster pump areas and the existing distribution system piping. Presently, regulating installations shall be categorized as follows:

- Pressure Regulating Station
- Pressure Relief Station
- Check Valve Station

All regulation installations will be designed by the Applicant and installed by the Owner/Developer subject to District review and approval.

- a. All required piping, regulators, fittings, valves, etc., to be installed within the confines of a station shall be furnished by the Owner/Developer. Upon completion and acceptance of the station, the station shall become the property of the District.
- b. All required concrete pits, concrete, reinforcing steel, manhole assemblies, and the total installation shall be provided by the Owner/Developer in accordance with Standard Drawings No. W-29 through W-35 and District Standard Specifications. Any proposed deviations or changes from these drawings will require engineering plans and specifications, to be provided by the Owner/Developer, and approved by the District. See Section 5.20 of these Specifications.
- c. Responsibility and requirements for installation of regulating stations, to be incorporated with pipelines of 12-inch diameter and larger, will be specified on the plan and profile drawings.
- d. Clear access ways must be provided to all structures and equipment. All weather surfacing shall be installed for the access way providing a minimum of 12" wide drive

surface sloped to properly drain. Where aggregate surfacing is installed, a minimum thickness of 6 inches shall be provided.

- 3.06 Pumping Facilities. Booster pumping facilities may be allowed on mains supplying water from the District Distribution System only where specifically authorized by the District. The District will prohibit the installation of pumping facilities where, in its opinion, such installations would be injurious to the operation, or future operation, of the District's system.

All proposed booster pumping facilities shall be considered as a special feature and will be dealt with on an individual case basis. This may include pressure testing of the total installation when determined necessary by the District.

- 3.07 Storage Facilities. Water storage reservoirs are required throughout the distribution system to maintain adequate supply during peak demand periods. Storage reservoirs may also be required adjacent to and on the suction side of pumping facilities. The size, location and type of storage reservoirs shall be determined by the District.

All proposed storage facilities shall be considered a special feature and will be dealt with on a case by case basis.

- 3.08 Layout of the Distribution System.

Width Requirements for District Installations. All District mains shall be installed in dedicated public streets of 50 feet minimum width. When the District determines it is not possible or feasible for an installation to be made in a dedicated street, the installation shall be made in a right-of-way or easement. The conditions under which such an exception will be allowed will be determined for each individual case, and only rights-of-way and easements which conform to the requirements of the District will be accepted. The minimum width right-of-way or easement which will be accepted by the District is a twenty foot (20') exclusive or a forty foot (40') non-exclusive right-of-way or easement. If at the determination of the District, it is not feasible to meet the above requirements, installations may be made in streets, alleys, rights-of-way or easements of other widths when authorized by the General Manager.

Dedicated Streets. Pipe alignment shall be parallel to property lines. Normal practice is to lay the pipe on the south side or the west side of the street, 11 feet from the center line of the street. In any case, pipe alignment shall always be within an established roadway, between the limits of the curb and gutter. Minimum clearance for the edge from the gutter pan to the edge of pipe shall be 4 feet in all cases. Water main installations paralleling sanitary or storm sewer mains must maintain a minimum clear separation of 10' from outside of pipe to outside of pipe. See Standard Drawing No. W-1.

Fire Hydrants. All fire hydrants will be installed within dedicated streets or in the rights-of-way or easements as herein above defined. See Standard Drawing No. W-4.

Fire hydrants shall be installed only at locations designated by the District.

Looping Requirements. All water mains and main extensions shall include adequate design provisions to provide complete looping of distribution system components. Dead end installations of water mains is not acceptable. Main extensions shall include a



minimum of two (2) connections to the distribution system for complete system looping in order to provide the best assurance of maintaining water quality and system reliability. Projects of larger scope may require more than two connections to the distribution system, as well as internal looping and interconnections, to maintain that assurance. In addition, sizing of water mains may be required to increase above that required solely for a particular project should the District deem it necessary to maintain proper water quality and service throughout its distribution system to existing and future service areas.

Sampling Stations. The District may require the installation of sample stations on the distribution system of certain projects in order to accomplish their required sampling and testing protocols. Such sample stations will require a typical water service line installation to be accomplished as part of the project. The District will install the extension, as required, of the Contractor installed service line to and including the sample station. Coordination on the sample station location(s) will occur during the construction drawing review process.

- 3.09 Line Valves. Line valves are required approximately every 250 feet in the distribution system. Where blocks exceed 250 feet in length, one or more line valves may be required between intersections in order to limit the number of service taps between line valves to no more than 10 taps. Street and other intersections require a full complement of valves in all directions. All cross installations require four (4) valves, one in each direction. All tee installations will require three (3) line valves, one in each direction. Where necessary, the Inspector shall require the installation of additional line valves in order to avoid exposing existing customers to high chlorine residual during disinfection of pipelines. See Standard Drawing No. W-7.
- 3.10 Connections to Mains for Fire Sprinkler Lines. Sprinkler heads found in hotels, motels, public assembly places, warehouses, commercial and industrial sites, etc. are supplied by a fire line. The fire line shall be a separate service line installed apart from the domestic service line for non-residential customers. The fire line shall be sized by the persons responsible for the structure it protects. The District will not size fire lines.
- 3.11 Clearance and Encasement Design for Sanitary and Storm Sewer Crossings. Normal design and construction practice shall provide for at least 18 inches of vertical separation between the crown of a sewer pipe and the bottom of the water main where the water main is laid over or above a building sewer (service line), sanitary sewer or storm sewer.

Where a sewer (building sewer, sanitary sewer or storm sewer) passes over or is less than 18 inches under a water main, one of the following design and construction procedures shall be followed:

- a. Shall be installed in accordance with the requirements of the Colorado Department of Public Health and Environment (CDPHE).
- b. Either the sewer main or the water main shall be installed in a pipe casing extending no less than 9 feet each side of the other pipe's centerline. The casing shall be a single section of steel or ductile iron pipe. The design shall include means to support the higher elevation pipe, to prevent settlement and permit maintenance of either pipe without undue damage to the other. See Standard Drawing No. W-20 and W-21.
- c. Reinforced concrete encasement shall be installed around either the sewer pipe or the

water pipe. The encasement shall be in accordance with Standard Drawing Nos. W-19. In general, the encasement shall be a minimum of 12 inches thick and extend a distance of 10 feet either side of the center of the other pipe. Where the water main passes beneath a storm sewer pipe or an open drainage channel, the water main shall be encased in reinforced concrete in accordance with Standard Drawing No. W-19.

- d. If the minimum clearances cannot be satisfied, and the above methods are not practical, the District will consider alternative designs on a case-by-case basis.

Where water mains pass under sewers (building sewer, sanitary sewer or storm sewer), in addition to one of the two items above, the following shall be accomplished to provide protection:

- a. A vertical separation of at least 18 inches between the invert of the sewer and the top or crown of the water main.
- b. Adequate structural support for the sewer pipe to prevent excessive deflection of joints and settling on and breaking the water main. Such structural support shall be in accordance with Standard Drawing No. W-20 and W-21 or approved modifications thereto.

As previously stated in these Specifications, parallel installations of water mains with sanitary sewer, storm sewer or sewer manholes shall provide for a 10-foot horizontal clear separation from outside of pipe to outside of pipe. Where special conditions exist which prohibit a horizontal clear separation of 10 feet, the District may consider alternate designs on a case by case basis. In such cases, minimum design requirements for a water main to be laid closer to a storm or sanitary sewer will include:

- a. It is constructed in a separate trench with undisturbed soil material between the water main and the sewer main.
- b. The elevation of the crown of the sewer is at least 18 inches below the bottom of the water main pipe. Such separation shall be undisturbed or compacted soil material.
- c. Where a minimum of 18-inch vertical separation cannot be obtained, the sewer shall be constructed of materials and with joints that are equivalent to water main standards of construction.

# WATER SYSTEM STANDARD SPECIFICATIONS

## Chapter 4 - Materials

4.01 Materials and Testing. Detailed technical specifications for purchase or approval of materials are included in this chapter. All materials shall conform to this Specification and to all limitations on acceptable makes and styles.

All materials furnished shall be new and undamaged. Everything necessary to complete all installations in accordance with the Standards of the District shall be furnished and installed whether shown on approved drawings or not; and all installations shall be completed as fully operable, functioning parts of the District's system.

Acceptance of materials, or the waiving of inspection thereof, shall in no way relieve the applicant of the responsibility for furnishing materials meeting the requirements of the Specifications.

New novel water industry products or materials will be tested, if it is the opinion of the District that the product or material has some merit. The District will establish the criteria for testing or evaluating the product. The District reserves the right to accept or reject any product or material regardless of the test results.

4.02 Size of Mains. The size of mains shall be in accordance with Section 3.03 of these Specifications.

4.03 Distribution System Piping. The District has established minimum design safety factors and materials for system piping. The following minimum AWWA pressure classes for acceptable types of pipe are required:

PIPE	PRESSURE CLASS/RATING
Ductile Iron Pipe	Class 51, all system pressures
Polyvinyl Chloride Pipe (PVC)	AWWA C900 DR14, all system pressures

a. Ductile Iron Pipe

1. General. All ductile iron pipe shall be manufactured in accordance with AWWA Standard C151 and ANSI A21.51 "Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids," with the following additional requirements or exceptions.
2. Size of Pipe. This specification shall cover ductile iron pipe in 4-inch, 6-inch, 8-inch, 10-inch, 12-inch, 16-inch, 20-inch and 24-inch nominal diameters.
3. Joint Type. "Push-on single gasket" type conforming with applicable requirements of AWWA Standard C111, "Rubber-Gasket Joints for Ductile-Iron and Cast-Iron Pressure Pipe and Fittings."

4. Class and Type. Pipe furnished under this specification shall conform to the following thickness classes as a minimum:

4" - 24" Diameter: Class 51

5. Pipe Length. Pipe furnished under this specification shall have normal laying lengths of either 18 feet or 20 feet. Random lengths are not acceptable.
6. Material Strength. Iron used in the manufacture of pipe furnished under this specification shall have 60/42/10 physicals.
7. Cement Mortar Lining. Pipe furnished under this specification shall have standard thickness cement mortar linings in accordance with AWWA Standard C104, "Cement-Mortar Lining For Ductile-Iron Pipe and Fittings for Water."

b. Polyvinyl Chloride Pipe

1. General. All polyvinyl pipe shall be manufactured in accordance with AWWA Standard C900, "Polyvinyl Chloride (PVC) Pressure Pipe, 4-Inch Through 12-Inch, For Water," with the following additional requirements or exceptions.
2. Size of Pipe. This specification shall cover polyvinyl chloride pipe in 4-inch, 6-inch, 8-inch, 10-inch and 12-inch nominal diameters with ductile iron equivalent outside diameters.
3. Joint Type. Pipe joints shall be made using an integral bell with an elastomeric gasket push-on type joint.
4. Pipe Length. Each length of pipe will be a standard laying length of 20 feet. Random lengths shall not be acceptable.

- 4.04 Pipe Fittings. All ductile iron fittings used in the District's water distribution system shall meet the latest AWWA Standard C110 and ANSI A21.10 or AWWA Standard C153 and ANSI A21.53.

All fittings shall be furnished with mechanical joint ends and shall conform to the following:

- a. General. All ductile iron fittings shall be manufactured in accordance with the following AWWA Standards: C104, "Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water"; C110, "Ductile Iron and Gray Iron Fittings, 3-Inch Through 48-Inch for Water and Other Liquids"; C111, "Rubber-Gasket Joints for Ductile-Iron and Cast-Iron Pressure Pipe and Fittings"; C153, "Ductile-Iron Compact Fittings, 3 In. Through 16 In., for Water and Other Liquids"; with the following additional requirements or exceptions.
- b. Cement Mortar Lining. All sizes of ductile iron fittings shall be furnished with a cement-mortar lining of standard thickness as defined in referenced specifications and given a seal coat of bituminous material.

- c. Type of Joint. All fittings shall be furnished with mechanical joint ends conforming to referenced specifications.
- d. Thickness Class. All fittings shall have a 350 psi pressure rating and shall conform to the dimensions and weights shown in the tables of referenced specifications.
- e. Material. All fittings shall be made from ductile iron.
- f. High deflection couplings are not allowed.

4.05 Steel Pipe and Fittings. Steel pipe and fittings, when required, shall conform to the following:

- a. General. All steel pipe, fittings and specials shall be fabricated in accordance with AWWA Standard C200, "Steel Water Pipe 6-Inches and Larger," AWWA M-11 Steel Pipe Manual and the requirements on the drawings.

Complete shop drawings shall be submitted to the District for approval prior to any fabrication.

- b. Material. All material used shall be acceptable under the "Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates of Structural Quality," ASTM Designation A283, Grade C or D.

Steel pipe, fittings, and specials shall be fabricated to the sizes, dimensions, and shapes as indicated on the drawings. Specified pipe shall be the nominal outside diameter of the pipe. All pipe shall have a wall thickness of at least 1/4 inch.

All flanges shall be forged steel slip-on hub type fabricated in accordance with AWWA Standard C207, minimum Class E.

All fittings shall be fabricated from tested pipe and dye checked in accordance with AWWA Standard C208.

Built-up ends and harness lugs shall be a part of the fabrication as indicated on the drawings.

- c. Protective Coating. All steel pipe, fittings, and specials shall be prepared, primed, lined, coated, painted or wrapped as hereinafter specified.
  - (1) Exterior Surfaces in Interior Locations. Exterior surfaces of all pipe, fittings, specials, flanges and accessories exposed in interior locations shall be thoroughly cleaned by sandblasting and given a prime coat of primer in accordance with AWWA Standard C203.
  - (2) Exterior Surfaces Underground. Exterior surfaces of all pipe, fittings, and specials which are to be installed underground shall be cleaned by sandblasting, primed and coated with tape coating systems in accordance with AWWA Standard C214. Coating shall be held back 12 inches from ends to be

mechanically coupled. Such uncoated areas shall be primed and coated during construction in accordance with the requirements of AWWA Standard C209.

- (3) Interior Surfaces. The interior of all steel pipe fittings and specials shall be cleaned and then lined with cement mortar in accordance with AWWA C205, or lined with liquid epoxy according to AWWA Standard C210.

4.06 Gate Valves. Gate valves shall be the same size as the main. Valves shall open to the left (counterclockwise). Gate valves shall conform to the following:

- a. General. All valves shall be manufactured in accordance with AWWA Standard C509/C515 with the following additional requirements or exceptions.
- b. Valve Description. Valves shall be resilient wedge, ductile iron body, fully bronze-mounted, with non-rising stem, resilient seat and epoxy lined.
- c. Service. All valves shall be suitable for frequent operation as well as service involving long periods of inactivity. The operating pressure for all sizes shall be 200 psi with testing pressure of 400 psi.
- d. Valve Stems. Valve stems shall be threaded so that the valve can be opened by turning to the left (counterclockwise). The stem shall be non-rising and be sealed with "O" ring packing. All valves shall be equipped with a 2-inch square wrench nut.
- e. Extension Stems. Provide wherever operating nuts are 5 feet or more below grade. The stems shall consist of solid steel shafting with O.D. not less than O.D. of valve stem or Schedule 40 galvanized steel pipe with I.D. not less than O.D. of valve stem. Connect to valve by flexible socket coupling bolted through the extension and operating nut on the valve.
- f. Types of End Connections. All valves shall have a mechanical joint end with gasket, gland and fasteners conforming to AWWA Standard C111, "Rubber-Gasket Joints for Ductile-Iron and Cast-Iron Pressure Pipe and Fittings". Plain rubber gaskets shall be used except that in certain conditions, the District may require the use of special rubber gaskets.
- g. Manufacturer. Because of the problems associated with stocking repair parts for all makes of valves, only the following makes are acceptable for use in the District's distribution system:

American AVK  
Mueller Co.  
Kennedy Valve

4.07 Valve Boxes. All buried valves shall be provided with a 6-inch cast iron valve box, slip type. The valve box shall be of a design which will not transmit shock or stress to the valve and shall have enough extension capability to be raised to final street grade. Valve boxes shall conform to the following:

- a. General. The manufacturer of valve box components shall be experienced in their

design and construction, shall be regularly engaged in their manufacture and shall have produced valve boxes which have given successful service for a period of at least five (5) years.

- b. Materials. Valve box parts shall be made of gray cast iron.

Use of an aluminum alloy as a casting material is not acceptable.

- c. Approved Patterns. Valve boxes shall be the three-piece adjustable slip type and only the following pattern acceptable:

Tyler Slip Type 6-Inch Cast Iron Valve Box Assembly Series 6855 or equal.

- d. Coating. Box, cover and base coated by dipping in asphalt varnish.

- e. Cover. Deep socket type with the word "WATER" cast in top for water applications.

- 4.08 Fire Hydrants. Within the District's distribution system where maintenance, repair, replacement, and parts stocking is the responsibility of the District, hydrant must conform to the following:

- a. General. All fire hydrants shall be designed and manufactured in strict compliance with AWWA Standard C502, "AWWA Standard for Dry-Barrel Fire Hydrants." All references made in this specification are to the above standard unless otherwise noted.

- b. Acceptable Brands:

American AVK  
Mueller Co.  
Kennedy Valve

- c. Size of Hydrant. Hydrants shall have a main valve opening size of 5-1/4 inches and shall be ordered for a 6-foot 6-inch bury unless otherwise approved by the District or designated otherwise on the drawings.

Hydrant bury will be measured from the bottom of the hydrant lateral pipe to finish grade line. Hydrant bury shall be adjusted to provide the minimum required cover on all portions of the hydrant lateral piping.

- d. Type of Hydrant. All hydrants shall be the traffic model type. Hydrants shall be the three-way type with one (1) pumper nozzle and two (2) hose nozzles all located on the same horizontal plane. All hydrants shall be open **right** convention.

- e. Inlet Connection. Hydrant base shall be provided with a mechanical joint inlet to accommodate 6-inch diameter ductile iron pipe, all in accordance with ANSI A21.11 (AWWA Standard C111, "Rubber Gasket Joints for Ductile-Iron and Cast Iron Pressure Pipe and Fittings"). Incorporated into the base shall be two (2) lugs for rodding or strapping of pipe.

- f. Main valve Assembly. The main valve of the hydrant shall be 5-1/4-inch diameter compression type which closes with the water pressure.

Gasket for valve shall be a replaceable type fabricated of a resilient material, with a threaded bottom plate or nut, complete with seal to prevent leakage of the hydrant shaft.

The valve assembly shall include one or more drain valves which will work automatically with the main valve and drain the barrel when the main valve is in the closed position.

All parts of the main valve assembly shall be so designed that removal of the assembly from the barrel is accomplished without excavation in accordance with Part III of these specifications.

- g. Operating Shaft Nut. The operating nut shall have a pentagon cross section. See Standard Drawing No. W-6. Bushings in the bonnet shall be so constructed that it will prevent the operating nut from traveling during opening or closing operation; the bushing shall house a gasket or seal to prevent moisture or foreign material from entering the lubricant reservoir.

The hydrant shall open by turning the operating nut to the right in a clockwise direction and shall have an arrow on top of the bonnet to designate the direction of opening.

- h. Pumper Nozzle and Cap. The pumper nozzle shall be 4-1/2 inch nominal diameter with four threads per inch (National Standard). Threads shall be right-hand. See Standard Drawing No. W-6.

Nozzle cap shall be furnished with a synthetic rubber gasket installed in a retaining groove and the dimensions and shape of the nozzle cap nut shall be the same as the operating shaft nut.

Nozzle caps shall be furnished with security chains with one end of each securely attached to the upper barrel section of the hydrant.

All nozzle caps shall be removed by turning counterclockwise.

- i. Hose Nozzles and Caps. The two hose nozzles shall be 2-1/2 inch nominal diameter with seven and one-half threads per inch (National Standard). Threads shall be right-hand. See Standard Drawing No. 6. Each hose nozzle shall include a nozzle cap with nut, security chain and shall be removed by turning counterclockwise.

- j. Color. Fire hydrants must be painted, blue caps and bonnets; white barrel sections. Color codes are as follows: Cherokee blue, product number 58155; Cherokee white, product number 58101, both gloss oil base exterior Devoe-Barox. Can be purchased at the Paint Spot, 5849 Palmer Park Boulevard, Colorado Springs, Colorado 80915, or equal brand.

- 4.09 Corrosion Protection Systems. The testing of the corrosiveness of the soil which a water main passes through may be required by the District. If so required, the testing shall be



accomplished by the Applicant. The need for protection will be determined by the District

based on the information submitted by the Applicant and/or other information available to the District.

a. Polyethylene Encasement Material. If determined by the District as a requirement, the pipe, fittings, rods, and appurtenances shall be wrapped in polyethylene in accordance with Section 5.26 and Sheet W-9 of the Standard Drawings. Polyethylene Material shall conform to the following:

(1) General. A polyethylene encasement material shall be manufactured in accordance with AWWA Standard C105, "Polyethylene Encasement For Gray and Ductile Cast-iron Piping For Water And Other Liquids," with the following additional requirements or exceptions.

(2) Materials. The raw material used to manufacture polyethylene film shall be Type 1, Class A, Grade E-1, in accordance with A.S.T.M. Standard Designation D-1248.

Tensile Strength	1200 PSI minimum
Elongation	300% minimum
Dielectric Strength	800 V/Mil Thickness minimum
Thickness	0.008" (8 mils) minimum Nominal with minus tolerance not exceeding 10% of nominal
Melt Index	0.4 maximum

4.10 Concrete Thrust Blocks, Anchors and Structures. Concrete thrust blocks and anchors shall be sized for the internal pipe pressure and soil bearing capacity. Standard sizes and shapes of thrust blocks and anchors are shown on Sheets W-13, W-14 and W-18 of the Standard Drawings.

Thrust reaction blocking shall be concrete of a mix not leaner than 1 part cement to 2-1/2 parts sand and 5 parts stone, and having a compressive strength of not less than 3000 psi after 28 days. See Section 5.20 of these Specifications. The concrete and any required reinforcement shall meet the following criteria:

a. Materials:

Cement. All cement used shall be Portland Cement acceptable under the "Standard Specifications and Tests for Portland Cement," ASTM Designation C150 of the American Society for Testing and Materials. Cement used shall be Type II.

Aggregates. All the fine and coarse aggregates shall meet soundness requirements, deleterious substance limits and grading limits as set forth in the latest edition of "Standard Specifications for Concrete Aggregates" ASTM Designation C33. The limits for deleterious substances and physical property requirements of the course

aggregates shall be selected for the applicable class designation from those listed under severe weathering regions, Table 3, ASTM Designation C33. The maximum size aggregate that is practical for the structure design and placing conditions shall be used in the concrete.

Water. The water used in all concrete shall be free from objectionable quantities of silt, organic matter, alkali, salts, and other impurities.

Admixtures. An air-entraining agent shall be used in all concrete. The agent used shall conform to "Standard Specification for Air-Entraining Admixtures for Concrete," ASTM Designation C260. The amount of air-entraining agent used shall be such as will affect the entrainment of  $5\% \pm 1\%$  of volume of the concrete.

A water-reducing admixture (WRA) may be used unless otherwise noted by the District. The admixture shall conform to ASTM Designation C494 for Type A or Type D chemical admixture, shall contain no calcium chloride, and shall be compatible with the cement being used.

The Contractor shall be responsible for any difficulties arising or damages occurring as a result of the selection and use of any admixture such as a delay or difficulty in concrete placing or damage to concrete during form removal.

- b. Concrete Quality. All Concrete shall have a minimum 28-day compressive strength of 3,000 psi and a maximum slump of 4 inches.
- c. Testing. When determined necessary by the District, field control tests consisting of aggregate gradation tests, slump tests, air content tests, and making compression test cylinders, shall be performed by qualified personnel in the presence of the Inspector.
- d. Concrete Reinforcement. Reinforcements shall be accurately formed and shall be free from loose rust, scale and contaminants which reduce bond. Unless otherwise shown on the drawings or specified herein, all requirements shall conform to the latest ACI Standard 318 and the Uniform Building Codes.

Reinforcements shall be accurately positioned on supports, spacers, hangers, or other reinforcements and shall be secured in place with wire ties or suitable clips.

- e. Reinforcement Material. All deformed reinforcing bars shall conform to ASTM Standard A615, Grade 60.

4.11 Mechanical Joint Restraint. Mechanical joint pipe restraints may be used for restraining and/or connecting fittings, valves and hydrants to reduce the installation of concrete reverse anchors, thrust reaction blocks and/or steel tie rods; however, anchors, thrust blocks and/or tie rods will still be required where indicated on plans and standard drawings.

- a. When mechanical joint pipe restraints are installed on ductile iron pipe, the length of pipe to be restrained shall be determined in accordance with the "Ductile Iron Pipe Research Association" (DIPRA) Recommendations, "Thrust Restraint Design for Ductile Iron Pipe." See Standard Drawings Nos. W-27 and W-28.

Ductile iron pipe shall be restrained with Series 1100 mechanical joint ductile iron retainer glands manufactured by EBAA Iron Sales, Inc. or an approved equivalent.

- b. Polyvinyl chloride (PVC) pipe may be restrained with the use of mechanical joint restraints subject to approval of the District. Refer to Standard Drawings for typical installation details.

PVC pipe mechanical joint restraints shall be series 2000 PV Megalug Retainer Glands manufactured by EBAA Iron Sales, Inc. or an approved equivalent.

- c. Ultra-compact MJ restraint fittings may be used when connecting and restraining fire hydrants, valves or other MJ fittings directly to the tee with bolt-through connection. Design basis is based upon INFAC T CORPORATION Foster Adaptor, Flex T-2 and Flex T-3 fittings.

4.12 Casing Pipe. Installation of mains through rights-of-way or easements of others, such as highways, railroads, etc., may require casing pipes for bores. The type of casing material and its properties will be specified by the agency granting permission to cross. Such crossing shall be subject to approval by the District to avoid conflicts in requirements or standards between the District and the persons or agency granting permission to cross. See Section 5.24 of these Specifications.

4.13 Tracer Wire. All pipes shall have a tracer wire attached to its top during construction. The tracer wire shall be #12 AWG copper clad steel, insulated wire with mechanical type connectors and shall be permanently affixed to the top of the pipe using tape at 4' internals. The tracer wire shall also be permanently connected to all fire hydrant tee, metallic pipe bends, main valve and other metallic fittings and appurtenances. All points of connection shall be protected from corrosion by an epoxy or silicon coating. Route tracer wires to surface at all valve boxes per standard drawings.

4.14 Responsibility for Materials.

- a. Material Furnished by Contractor. The Contractor shall be responsible for all material furnished by him/her and shall replace at his/her own expense all such material found defective or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all material and labor required for the replacement of installed material discovered defective prior to final acceptance of the work and materials found defective during the warranty period.

- b. Responsibility for Safe Storage. The Contractor shall be responsible for the safe storage of material furnished by or to him/her, and accepted by him/her and intended for the work, until it has been incorporated in the completed project. The interior of all pipe, fittings, and other accessories shall be kept free from dirt and foreign matter at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage by freezing.

4.15 Handling of Materials.

- a. Hauling of Materials. All materials furnished by the Contractor or to the Contractor shall be delivered and distributed at the job site by the Contractor.

All pipe, valves, fittings, hydrants and accessories shall be loaded and unloaded by lifting so as to avoid shock or damage. Under no circumstances shall materials be dropped. Pipe shall not be skidded or rolled against pipe already unloaded.

- b. Unloading at the Site of Work. When distributing the material at the site of work, each piece shall be unloaded opposite or near the place where it is to be installed in the trench.
- c. Care of Coatings and Linings. All materials shall be so handled that the coating and lining will not be damaged. If, however, any part of the coating or lining is damaged, the replacement or repair of the damaged material shall be done to the satisfaction of the District. All material handling equipment and material handling methods shall be approved by the District.

4.16 Pressure Regulation Valves and Accessories.

- a. Pressure Reducing and Pressure Sustaining Valves.

- 1. Application: Reduce downstream pressure and sustain a minimum upstream pressure
- 2. Type: CLA-VAL Model 92-01 series  
Hydraulically operated, pilot controlled, diaphragm type with flow clean strainer; open and closing speed controls; pilot system shut-off cocks
- 3. Body: Cast iron, ASTM A48, globe body
- 4. Valve trim: Stainless steel
- 5. Accessories: Pressure gauges on inlet and outlet piping
- 6. Size: As shown on approved plans
- 7. Pressure rating: Class 250
- 8. Adjustment Ranges: Downstream: As shown on approved plans  
Upstream: As shown on approved plans

- b. Pressure Gauges.

- 1. Type: Dial, liquid filled
- 2. Range: Downstream: 0 to 150 psi  
Upstream: 0 to 300 psi
- 3. Accuracy: 3% full scale range
- 4. Dial size: 3-1/2" diameter
- 5. Accessories: Isolation ball valve on nipple; snubbers on nipple
- 6. Design basis: U.S. Gauge P580L-1000

# WATER SYSTEM STANDARD SPECIFICATIONS

## Chapter 5 - Pipe Installation

5.01 Approval by the District. Throughout these Specifications many handling and installation procedures, tools, equipment, and materials will require approval by the District. Approval by the District shall in no manner render the District liable for any injuries suffered or equipment damaged. Approval by the District is used solely as a means to ensure quality control and safety.

Safety of workers shall be provided as required by the Occupational Safety and Health Act (OSHA). The Contractor is solely responsible for job safety.

- a. A pre-construction meeting must be arranged by the contractor and/or the developer's representative and held prior to the start of any work. The District representatives and/or District Engineer, Contractor, and Owner or Owner's Engineer must be represented at this meeting, which shall be held at the office of the District.
- b. All contractors must notify the District at least 48 hours prior to start of construction.
- c. Approved plans and a copy of these specifications must be kept on the job site by the contractor at all times.

5.02 Handling of Materials. Pipe and fittings shall be loaded and unloaded by lifting so as to avoid shock or damage. Under no circumstances shall such material be dropped. If, however, any part of the coating or lining is damaged, the replacement or repair of the damaged pipe shall be done to the satisfaction of the District. Any pipe or fittings that are not acceptable to the District shall be removed from the job site immediately. All pipe handling equipment and pipe handling methods shall be approved by the District in conjunction with the methods and equipment recommended by the manufacturer.

5.03 Inspection and Preparation of Pipe and Fittings. Before placing pipe in the trench, each pipe or fitting shall be thoroughly cleaned of all foreign material, kept clean at all times thereafter, and carefully examined for cracks and other defects before installation. Bell ends and spigot ends are to be examined with particular care. Defective pipe or fittings shall be laid aside for inspection by the District Inspector who will prescribe corrective repairs or rejection.

All lumps, blisters and excess coating shall be removed from the bell-and-spigot end of each pipe and fitting, and the outside of the spigot and the inside of the bell shall be wire brushed and wiped clean, dry and free from oil and grease before the pipe or fitting is installed. Dirt and any other material must be removed from the barrel of the pipe before installation.

5.04 Cutting and Fitting of Pipe. Pipe shall be cut, whenever necessary, to conform to location

of fittings, line or grade. All cuts shall be straight and true, and in a workmanlike manner so as to leave a smooth end without damaging the pipe or its cement lining. All burrs shall be removed from the ends of cut pipe, and the end lightly rasped or filed. All tools used in cutting pipe shall be approved by the District. See Standard Drawing No. W-17.

5.05 Pipe Joint Lubrication. Joint lubricant shall be supplied by the pipe manufacturer, and approved by the District. Joint lubricant shall be non-toxic, food grade, water soluble and NSF certified for use in drinking water systems.

5.06 Pipe Alignment and Grade. In laying pipe, the intent is to lay to a set line and grade within a tolerance of 3 inches plus or minus horizontal and 0.02 feet plus or minus vertical. On slopes of zero grade, the intent is to lay to grade. Fittings, valves and hydrants shall be installed at staked locations and elevations; spigots centered in bells; and all valve and hydrant stems shall be plumb.

In new developments, street right-of-way and/or property line and lot corner points must be set and in visible evidence before water installations can proceed. In existing areas sufficient right-of-way, property or easement delineation must be recovered or established before water installation can proceed. Offset stakes for alignment and grade shall be set by the Contractor's, Owner's or Developer's engineer. Any replacement of stakes shall be at the expense of the Contractor, Owner or Developer.

When laying pipe on curves, the intent is to lay to the staked alignment. The pipe shall be kept in alignment by placing all deflecting joints or bends on the curve. Short lengths shall be used as necessary to accomplish the curvature without exceeding individual deflections specified by the District. See Standard Drawing No. W-16. Bends shall be used whenever individual deflections exceed those specified by the District. Use of high deflection couplings is permitted.

For pipes with an internal diameter of 10 inches or less, the depth of fill over the pipe measured from the proposed finish grade over the pipeline to the top of the pipe shall be a minimum of 5 feet and maximum of 6 feet unless otherwise specified. All pipes with an internal diameter of 12 inches or more shall be installed to the depth shown on the required plan and profile drawings.

If difficulties arise when crossing an interference and where specifically approved by the District or its Inspector, deviations from the above minimum and maximum depths of cover may be permitted. See Standard Drawing No. W-20.

Any changes in alignment and grade must be authorized by the Inspector and shall be accomplished by the installation of additional fittings. "Breaking" of joints is permitted only when installing pipe on horizontal or vertical curves.

Pipe shall be laid with the bell ends facing in the direction of laying, unless directed otherwise by the District. Where pipe is to be installed on a grade of ten percent (10%) or greater, the laying shall start at the bottom and shall proceed upward with the bell ends of the pipe upgrade.

5.07 Deviation From Alignment and Grade Occasioned by Other Structures. Whenever

obstructions not shown on the plans interfere to such an extent that alteration in the plans is required, the District shall have the authority to determine the best method of correction. The District may order a deviation from the line and grade of the structures and/or removal, relocation and reconstruction of the obstructions. See Standard Drawing No. W-20.

- 5.08 Temporary Bulkheads. Whenever the pipe is left unattended, temporary plugs shall be installed at all openings. Temporary plugs shall be of such design as to prevent water, debris, children and animals from entering the pipe. All temporary plugs shall be provided by the Contractor and approved by the Inspector.
- 5.09 Frost. No pipe or appurtenant structure shall be installed upon a foundation into which frost has penetrated, or at any time when the Inspector deems there is danger of ice formation or frost penetration at the bottom of the excavation. No pipe or appurtenant structure shall be installed unless backfilling can be completed before the formation of ice and frost.
- 5.10 Excavation, Bedding and Backfill. See Part III of these Specifications for all earthwork.
- 5.11 Lowering of Material Into the Trench. Proper implements, tools and facilities satisfactory to the District shall be provided and used by the Contractor for the safe and convenient performance of the work. All pipe, fittings, valves and hydrants shall be carefully lowered into the trench piece by piece by means of a derrick, ropes, or other suitable tools or equipment, in such a manner as to prevent damage to water main materials and their protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench.

If damage occurs to any pipe, fitting, valve, hydrants or water main accessories in handling, the damage shall be immediately brought to the attention of the Inspector. The Inspector shall prescribe corrective repairs or rejection of the damaged items.

- 5.12 Laying of Pipe. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. If the pipe laying crew cannot put the pipe into the trench and in place without getting earth into it, the Inspector may require that before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size shall be placed over each end and left there until the connection is to be made to the adjacent pipe. During laying operations, no debris, tools, clothing or other materials shall be placed in the pipe.

As each length of pipe is placed in the trench, the spigot end shall be centered in the bell and the pipe forced home with a slow steady pressure without jerky or jolting movements and brought to correct line and grade. The pipe shall be secured in place with approved backfill material tamped under it except at the bells. Precautions shall be taken to prevent dirt from entering the joint space. No wooden blocking shall be left at any point under the pipeline.

No pipe shall be laid when, in the opinion of the District, trench conditions are unsuitable.

- 5.13 Ductile Iron Pipe. There is only one nominal dimension of the spigot outside diameter and



the bell inside diameter for each size of push-on joint pipe. In some existing older pipelines, some variation in outside spigot diameter may exist. When connecting to an existing line, care should be exercised to ensure that the outside diameter of the existing line is the same as the outside diameter of the push-on joint or mechanical joint pipe being installed, otherwise a special adapter to join the two lines may be necessary.

- a. Push-On Joint. Immediately before joining two lengths of ductile iron pipe, the inside of the bell, and the outside of the spigot end, and the rubber gasket shall be thoroughly cleaned to remove oil, grit, excess coating and other foreign matter. The rubber shall be flexed inward and inserted in the gasket recess of the bell socket. Since different manufactured brands of pipe require different types of gaskets, the Contractor shall exercise caution to ensure that the correct type of gasket is used.

A thin film of approved gasket lubricant shall be applied to either the inside face of the gasket, or the spigot end of the pipe, or both.

The spigot end of the pipe shall be placed in the bell end with care to prevent the joint from contacting the ground. Pipe furnished without a depth mark on the spigot end shall be marked before assembly to assure insertion to full depth of the joint. The pipe shall be kept in straight alignment and the joint shall be completed by pushing the pipe home with a slow, steady pressure without jerky or jolting movements by using a forked tool or jack-type tool or other device approved by the District. If pipe is pushed home with a backhoe bucket, a wooden shield must be placed between the backhoe bucket and the end of the pipe. The spigot end of field cut pipe lengths shall be filed, or ground to resemble the spigot end of such pipe as manufactured.

Upon completion of joining push-on joint pipe, an inspection shall be made to assure that the gasket is correctly aligned in the gasket recess of the bell socket and not twisted or turned.

Whenever it is necessary to deflect push-on joint pipe, the amount of deflection shall not exceed the maximum deflections specified by the District. See Standard Drawing No. W-16.

- b. Mechanical Joint Pipe. Before joining mechanical joint cast or ductile iron fittings to ductile iron pipe, the outside of the spigot, the inside of the bell and the rubber gasket shall be thoroughly cleaned to remove oil, grit, excess coating, and other foreign matter.

Normal practice is to lubricate the joint with a soap solution; however, in cold weather the joint may be assembled dry if approved by the Inspector. Extreme care should be exercised in making dry joints.

The cast iron gland shall be slipped on the spigot end of the pipe with the lip extension of the gland toward the socket, or bell end. The rubber gasket shall be placed on the spigot end with the thick edge toward the gland.

The pipe shall be pushed in until the spigot end fully penetrates the bell. The gasket shall then be pressed into place within the bell evenly around the entire joint. The cast iron gland shall be moved along the pipe into position for bolting; the bolts inserted and the nuts screwed finger tight, then tightened with a torque limiting wrench. Torques for the various sizes of bolts shall be as follows, unless otherwise recommended by the manufacturer:

<u>Bolt Size</u>	<u>Ft. Lbs.</u>
5/8 inch	45-60
3/4 inch	75-90
1 inch	85-100
1-1/4 inch	105-120

Nuts spaced 180 degrees apart shall be tightened alternately in order to produce equal pressure on all parts of the gland.

Whenever it is necessary to deflect mechanical joint pipe, the amount of deflection shall not exceed the maximum deflections specified by the District. See Standard Drawing No. W-16.

#### 5.14 Polyvinyl Chloride Pressure Pipe.

- a. Elastomeric Gasket Joint. Immediately before joining two lengths of PVC pipe, the inside of the bell or coupling, the outside of the spigot and the elastomeric gasket shall be thoroughly cleaned to remove all foreign material.

Lubrication of the joint and rubber gasket shall be done in accordance with the pipe manufacturer's specifications.

Care shall be taken that only the correct elastomeric gasket, compatible with the annular groove of the bell, is used. Insertion of the elastomeric gasket in the annular groove of the bell or coupling must be in accordance with the manufacturer's recommendations. Pipe that is not furnished with a depth mark shall be marked before assembly to assure that the spigot end is inserted to the full depth of the joint.

The spigot and bell or coupling shall be aligned and pushed until the reference line on the spigot is flush with the end of the bell or coupling. Pushing shall be done in a smooth, steady motion. Upon completion of joining the pipe, an inspection shall be made to assure that the gasket is correctly aligned in the gasket recess of the bell socket and not twisted or turned.

Deflection at the joints of PVC pipe shall be in accordance with manufacturer's recommendations. Where deflections greater than the manufacturer's recommendations are required, bend fittings shall be utilized.

Installation of PVC pipe will be in accordance with the manufacturer's recommendation. A tracer wire will be attached to all PVC pipe for the purpose of future location. See Standard Drawing No. W-12.

- b. Pipe Storage. Pipe stored outside, and exposed to sunlight for more than thirty (30) days shall be covered with an opaque material such as canvas. Clear plastic sheets shall not be used to cover pipe. Air circulation shall be provided under the covering.
- c. Handling of Pipe in Cold Weather. PVC pipe has reduced flexibility and impact resistance as temperatures approach and drop below freezing. Extra care should be used in handling and installing PVC pipe during cold weather.

5.15 Installation of Valves. Valves shall be handled in such a manner as to prevent any injury or damage. All joints shall be thoroughly cleaned before installation.

Valves shall be located at the points on the main as indicated on Standard Drawing No. W-7, unless specified otherwise by the District.

Valves shall be set and joined to the pipe in the manner previously specified for cleaning, laying and joining push-on and mechanical joint pipe. Valves shall be set in such a manner that the valve stems are plumb. If necessary to provide a firm subgrade or surface on which to install a valve, solid precast concrete blocks or a cast-in-place concrete pad may be placed beneath the valve body. If cast-in-place concrete is used, extreme care shall be taken to assure that flange bolts are not constrained by the concrete. No wood blocking will be allowed.

Valves shall be operated prior to installation to ensure good operating condition.

Where necessary, the Inspector shall require the installation of additional valves not shown on the plans. See Section 3.09 of these Specifications.

5.16 Valve Boxes.

- a. Installation. A valve box shall be provided for every valve. The valve box shall not transmit shock or stress to the valve, and shall be centered and plumb over the operating nut of the valve, with the box cover set to the required elevation. It will be the responsibility of the Developer to ensure that valve boxes are plumb and raised to the proper elevation.

Paving of any street requires that all existing valve boxes be located and prepared for final raising to the finish street surface as shown on Standard Drawing No. W-8.

- b. Inspection. Prior to paving, a final inspection is required and can be arranged by contacting the District. Inspections should be requested twenty-four (24) hours in advance of need.

5.17 Installation of Fittings. All fittings in the District's Water Distribution system shall be mechanical joint in compliance with the material specification. Fittings shall be set and joined in the manner described in Section 5.13.b of these Specifications.

The use of "wyes" in main extensions or private pipe extensions is strictly prohibited except in special installations as directed by the District.

## 5.18 Fire Hydrants.

- a. Installation. All hydrants shall be staked for location and grade. Final location and grade shall be in accordance with the approved drawings. Offset stakes not further than 12 feet from the fire hydrant are acceptable. All hydrants shall stand plumb and be installed as indicated on Standard Drawing No. W-5.

Each hydrant shall be connected to the main by a 6-inch branch line. An independent 6-inch gate valve shall be installed on each fire hydrant branch.

No service line connections shall be installed between the fire hydrant and the fire hydrant control valve.

- b. Anchorage. The bowl of each hydrant shall be well braced against the unexcavated earth at the end of the trench with a concrete thrust block. The bottom of the hydrant bowl and the hydrant valve shall be supported with eighteen by eighteen by four inch (18"x18"x4") pre-cast concrete blocking slabs. The hydrant shall be tied to the hydrant valve and the hydrant valve tied to the tee with anchor pipe or with two, 3/4-inch all thread galvanized rods as shown on Standard Drawing No. W-5.

Mechanical joint pipe restraints in conformance with Section 4.11 of these Specifications may be used in lieu of all-thread rods.

Whenever a fire hydrant is installed at the termination point of a main extension (such as in a cul-de-sac), then tie rods and concrete reverse anchors will be required for both the fire hydrant valve (which in this case is also a line valve on the main) and the fire hydrant lateral or branch line connected to the fire hydrant. See Standard Drawing No. 5. Additional concrete anchors or tie rods may be required at the direction of the Inspector.

If bends are needed to bring a hydrant to a desired horizontal or vertical position, special concrete reverse anchors, anchor pipe, mechanical joint pipe restraints or all thread tie back rods, or a combination of all these along with a riser may be required. In any case, a riser no longer than 2 feet will be acceptable and it will be the Contractor's responsibility to set the safety flange at the proper grade.

- c. Drainage. Whenever a hydrant is set, drainage shall be provided at the base of the hydrant by placing rock from the bottom of the trench, to at least 12 inches above the barrel flange of the hydrant, and to a distance of 12 inches around the elbow. The minimum distance from the bottom of the trench to the bottom of the hydrant elbow shall be 6 inches. The minimum of rock placed shall be 1/3 cubic yard. The rock shall be a well-graded gravel, cobble, or crushed rock, free of dirt, and encapsulated in filter fabric.
- d. Hydrant Protection in Corrosive Soils. In areas where soil resistivity requires corrosion protection, all ductile iron branch lines and hydrants shall be protected. All pipe, rods and fittings, from finished ground level on the hydrant barrel up to and including the tee, shall be encased in polyethylene wrap. The type of polyethylene and manner in

which it is to be installed shall conform to Section 5.26 of these Specifications. Bedding material shall be as specified in Part III of these Specifications.

- 5.19 Dead Ends and Blow Offs. All dead ends on new mains shall be closed with cast iron plugs or caps; such dead ends shall be equipped with suitable concrete anchors and blow off facilities.

The Contractor shall furnish, install or remove temporary blow offs at locations shown on the drawings or designated by the District. See Standard Drawing No. W-22.

The Contractor shall install permanent blow offs where indicated on the drawings. A permanent blow off is defined as one which will be left in place at the completion of all proposed installations. Refer to Standard Drawing No. W-22.

- 5.20 Thrust Blocks and Anchors.

- a. Installation. Thrust blocks and/or anchors shall be constructed at all bends, tees, plugs and fittings which require reaction support due to unbalanced line thrust. Care shall be taken not to block outlets or to cover bolts, nuts, clamps or other fittings or to make them inaccessible. The Standard Drawings Sheets W-13 and W-18, show size and shape of thrust blocks and anchors. Bearing surface areas are minimum areas to bear against the undisturbed trench wall. If in the opinion of the District, the soil bearing capacity is not sufficient to provide adequate restraint based on minimum bearing areas shown on the Standard Drawings, then the minimum bearing area shall be increased to a size that will ensure adequate restraint. In every instance, the thrust block or anchor shall bear against undisturbed earth. When it is impossible, through over excavation or other cause, to pour a thrust block or anchor against undisturbed earth, harness rods or mechanical joint pipe restraints shall be required to anchor the fittings to the main.

Thrust blocks will be required on large taps regardless of whether a tapping sleeve or tapping saddle is used. Refer to Standard Drawing No. 14 for tap and main size combinations requiring thrust block installation.

All debris, water or ice shall be removed from the place to be occupied by the concrete. Concrete shall not be placed on frozen subgrade. Concrete shall be placed in the presence of the Inspector unless inspection has been waived prior to the placement.

- b. Form Work for Thrust Blocks and Anchors. All forming for concrete thrust blocks and anchors will be done by bulkheading around the shape of the thrust block or anchor with burlap or reinforced paper sacks filled with sand or earth. Sacks shall be of a size easily handled when full, and shall be left in place in the trench. Wood forms may be used in some cases; however, all wood will be removed before backfilling.

No horizontal struts or braces required for trench shoring shall remain in the concrete thrust blocks. Prior to placing concrete, the forms and ditch bank shall be inspected and approved by the Inspector.

- c. Concrete and Curing Time. Thrust blocks shall be concrete of a mix not leaner than 1 part cement to 2-1/2 parts sand and 5 parts stone, and having a compressive strength of not less than 3,000 psi after 28 days.

Minimum curing time for concrete thrust blocks regardless of additives shall be thirty-six (36) hours for anchors containing 2 cubic yards or less, forty-eight (48) hours for anchors containing more than 2 cubic yards but less than 6 cubic yards, and seventy-two (72) hours for anchors containing more than 6 cubic yards but less than 12 cubic yards. Anchors containing more than 12 cubic yards will be cured as directed by the District Inspector. Curing time for anchors having flanged rods or other accessories embedded in them for the purpose of tying pipe and/or fittings directly to the anchor will require approximately twenty-five percent (25%) additional curing time.

No water main will be charged or pressurized without the approval of the Inspector. All thrust blocks and anchors must meet the minimum curing time unless, under certain circumstances, the Inspector may elect to shorten or extend the time of curing.

- d. Compaction of Fill Over Thrust Blocks and Anchors. Backfill may be placed over thrust blocks and anchors once the surface has set sufficiently to resist the weight of the backfill. However, no tamping or compacting shall be allowed above the thrust block or anchor for a minimum of thirty-six (36) hours after placement or as directed by the Inspector.

- 5.21 Vaults. Vaults may be precast or poured-in-place and shall be constructed in accordance with these Standard Specifications. Precast vaults shall be so designed that all joints and corners are waterproof. Precast and poured-in-place vaults shall be made waterproof after construction by use of sealants, epoxies or other approved methods. All dimensions, locations and elevations shall be coordinated by the Developer and Contractor and meet the requirements of the District.

Concrete footers shall be required as indicated on the drawings.

All vaults shall be constructed to meet H.S. 20-44 traffic loading conditions and 300 psf surcharge load.

All manhole rings and covers, ladder rungs, pipe arches, sleeves, etc., shall conform to the drawings. See Standard Drawing No. W-34 and W-35. Rings and covers shall be circular; square configurations are not acceptable.

- 5.22 Harness Rods. Harness rods and lugs shall be used at all bends and fittings where thrust blocks cannot be used due to existing field conditions or where harness rods and lugs are specifically required by these Specifications, installation plans, or the Inspector. See Standard Drawing No. W-26.

- 5.23 Bridging and Encasement of Pipe. Under certain conditions when the water main is to be installed over or under an existing or proposed utility or structure, the District may require bridging or encasement of the pipe.

If, in the opinion of the District, there exists the possibility of settlement of the pipe being

installed over an existing utility or structure, then bridging of the pipe shall become necessary. This condition shall also apply to other underground utilities or structures being installed over existing water mains. The District shall determine the size and location of the concrete bridging. See Standard Drawing No. W-21.

Under certain conditions, the District may require the complete encasement of water mains with concrete. The District shall determine the size, length and location of these encasements. See Standard Drawing No. W-19.

5.24 Encasement or Sleeve Pipe. Wherever it is necessary to provide an encasement or sleeve for the water main, the water main shall not be inserted into the encasement or sleeve pipe without providing insulating skids for each joint of the water main. Insulating skids shall be of a type such as the "GPT Industries Ranger II" or equivalent. In addition, no encasement or sleeve pipe shall be installed without protecting the ends of the pipe with rubber end seals which will deter dirt and debris from entering, but at the same time will allow water to escape from the encasement or sleeve pipe. Encasement pipes shall be protected both inside and out with corrosion resistant materials having a bituminous base. Encasement or sleeve pipe, size, length, type, sidewall thickness coatings and linings will be determined by the District. See Section 2.14 of these Specifications.

5.25 Connections to the District's System.

- a. Connections. Connections to the District system shall be in a neat and workmanlike manner. An Inspector shall be present at all times during the construction of the connection. The connection is subject to approval by the District. Under no circumstances shall a non-disinfected main, which cannot be isolated, be connected to an existing distribution main in service.
- b. Tapping Existing Mains. The Contractor shall be responsible for making or arranging for all taps for main extensions. Permits for service taps shall only be issued to a master plumber unless otherwise approved by the District. The Contractor shall notify the District a minimum of twenty-four (24) hours prior to tapping. Once the tap is complete, the Contractor shall be responsible for protection of the tapping sleeve or saddle and the tapping valve against freezing or other damage. The Contractor shall also be responsible for all backfill, compaction, paving, curb and gutter, etc. See Standard Drawing No. W-25.
- c. Operation of Valves. In connecting to the District's system, it may be necessary to operate existing valves.

Valves on the District's system that must be operated to make a connection shall be operated by District personnel only. The Contractor shall give the Inspector forty-eight (48) hours' notice to arrange for operating valves. Both the Contractor and the Inspector shall be present when the valves are operated.

- d. Interruption of Service. Installation of a connection that will require closing existing valves may cause an interruption of water service to existing District customers. Affected customers must be notified twenty-four (24) hours in advance.

The District Inspector will arrange for all notification to both residential customers and the fire department; however, the Contractor will be responsible to furnish the Inspector all necessary information as to the date and time the interruption will begin and the total time required to complete the installation.



A normal interruption shall be a maximum of two hours. If the interruption will be greater than two hours, the work shall be done in a manner to minimize the inconvenience to customers, such as working at night in a continuous operation until service is restored. A connection which will require an interruption longer than two hours shall be subject to review by the District as to the appropriate timing of the connection.

If, in the process of installing a connection, there exists an industry or building in the area that cannot be out of water, such as a hospital or other special customer, appropriate means shall be taken to provide and convey water. The water and means of conveyance shall be approved by the District.

#### 5.26 Corrosion Protection Systems.

- a. Dissimilar Materials. Insulation shall be installed as required by the District. Particular care shall be taken to insulate between dissimilar materials.
- b. Insulating Joints. Whenever it is necessary to join pipe of dissimilar metal, or when designated by the District, a method of insulating against the passage of electrical current shall be provided. Special care shall be exercised during the installation of these joints to prevent electrical conductivity across the joints. See Section 4.09 of these Specifications and Standard Drawing No. W-11.
- c. Polyethylene Encasement Material. Whenever designated by the District, the metallic pipe, fittings and all appurtenances shall be wrapped in polyethylene. The polyethylene encasement shall prevent contact between the pipe and bedding material, but is not intended to be a completely air-tight and water-tight enclosure.

All ductile iron pipe bends, fittings, couplings, etc. of water mains shall be wrapped in polyethylene. All fire hydrant assemblies shall be wrapped in polyethylene up to 6" below finish grade.

Prolonged exposure to sunlight will eventually deteriorate polyethylene film. Exposure to sunlight shall be kept at a minimum.

The polyethylene shall have a minimum wall thickness of eight (8) mils and conform to the specification set forth in this part.

A 2-inch wide, ten-mil thickness polyethylene pressure-sensitive tape shall be used to close seams, secure to pipe or hold overlaps.

Polyethylene pipe wrap material shall be applied to encapsulate pipe in the manner shown on Standard Drawing No. W-9.

Damage to polyethylene wrapped pipe in the trench prior to and during backfill shall be repaired to the satisfaction of the District.

Before the Contractor taps a water main, the trench, pipe and polyethylene wrapping shall be in a state of readiness. The Contractor digging the trench shall repair or

replace any damaged polyethylene prior to tapping.

d. Insulating from Concrete. Areas of metal pipe and appurtenances which are to be in contact with concrete thrust blocks, bridging blocks, anchors or encasement may be required by the District to be protected against corrosion prior to installing concrete. The following types of protection systems are acceptable:

- (1) Application of cold-applied mastic coating with high electrical resistivity, similar to Roskote Mastic A-51, manufactured by Royston Laboratories.
- (2) Application of a cold-applied primer and corrosion resistant pipe wrap, similar to the primer and pipe tape manufactured by the Protecto Wrap Company.

Other proposed protection systems may be accepted following review and approval of the District.

5.27 Disinfection. The following procedure shall apply to all main extensions within the District's water service area. Pipe extensions shall be chlorinated in accordance with AWWA C651, "Disinfecting Water Mains." The Contractor shall be responsible for providing material for disinfection of all water mains and perform the disinfection process, as well as the necessary steps to dechlorinate and properly dispose of the chlorinated water.

Calcium hypochlorite granules with a minimum of 65 percent available chlorine or 5-g calcium hypochlorite tablets shall be used for disinfection. Application rates shall comply with AWWA C651. Tablets shall be adhered to the pipe wall using Permatex Clear TRV.

The following table denotes the amount of calcium hypochlorite granules to be placed at the beginning and end of the main and at 500-foot intervals to obtain disinfection.

<u>Pipe Size</u>	<u>Calcium Hypochlorite Granules (oz.)</u>
4"	0.5
6"	1.0
8"	2.0
12"	4.0

The following table denotes the number of 5-g calcium hypochlorite tablets required per 20-foot joint for dose of 25 mg/l.

<u>Pipe Size</u>	<u>No. of Tablets</u>
4"	1
6"	1
8"	2
10"	3
12"	4

After the calcium hypochlorite has been placed in the pipeline by the Contractor, disinfection must be completed within ten (10) calendar days.

After the pipe is filled with water and chlorine, and unless approved otherwise by the District, the chlorinated water shall be held in contact with the pipe for twenty-four (24) hours. At the end of the twenty-four (24) hour period, the water in the pipeline shall be tested by the District to ensure a residual chlorine content of not less than ten (10) mg/l.

The pipeline shall then be thoroughly flushed to remove the heavily chlorinated water. Care shall be taken in flushing the pipeline to prevent property damage and endangerment of the public and environment.

Samples of water will be collected for bacteriological examination and residual chlorine content testing before the pipe is put into service. Testing of residual chlorine and sampling will be done by the District, unless the Contractor receives specific approval from the District to perform the sampling and testing.

No main which has been disinfected and flushed shall stand stagnant for more than fifteen (15) days without being refushed.

- 5.28 Pressure Testing. All mains and appurtenances shall be subject to pressure testing performed by the Contractor. All mains shall be subjected to a test pressure of 1.5 times the static pressure at the lowest point in the portion of the system being constructed. The test pressure shall be placed on the pipeline and the line isolated from other water sources. After a two (2) hour period, water shall be added to the line to return the pressure to the specified test pressure. The quantity of water required to return the pressure to the specified level will be measured.

The maximum allowable leakage at the specified test pressure shall not exceed ten (10) gallons per day per inch of pipe diameter (inside diameter) per mile of pipe.

ALLOWABLE LEAKAGE

<u>Pipe Diameter</u>	<u>Allowable leakage in 2 hours, Gallons</u>			
	<u>250 ft.</u>	<u>500 ft.</u>	<u>750 ft.</u>	<u>1000 ft.</u>
6"	0.24	0.47	0.71	0.95
8"	0.32	0.63	0.95	1.26
10"	0.39	0.79	1.18	1.58
12"	0.47	0.95	1.42	1.89

- 5.29 Acceptance and Release for Taps. A new main shall be accepted by the District and released for taps when the following conditions have been met:

- a. The main and all appurtenances have been installed to the satisfaction of the Inspector and all pertinent notes and measurements have been made.
- b. Disinfection has been completed and the main has been flushed, charged and received a passing bacteriological test.

- c. Pressure testing has been completed satisfactorily.
- d. All tapping methods have been approved by the District.
- e. As constructed record drawings and other supporting information shall be furnished to the District within two weeks of the completion of construction of any pipeline segment. The District shall find the record documents satisfactory before permitting the main to be put in service and accepted for maintenance.

5.30 Acceptance of Mains and Service Lines Including Curb Stops.

- a. Preliminary Acceptance. Preliminary acceptance of mains will be granted by the District following the Developer's completion of all curbs, gutters, grading and paving, plus all curb stop and street valve boxes being set at proper grade.
- b. Final Acceptance. Approximately one year following the preliminary acceptance, the District will reinspect the curb stop and street valve boxes for centering, plumb and grade. The Contractor and Developer will be notified of any defects in materials and workmanship and these defects must be promptly corrected in accordance with these Specifications. Corrections must be made immediately. If no defects are found or corrections are made as required by the Inspector, a letter of acceptance will be issued, following receipt of proper documents giving clear title to all mains and appurtenances. Service lines beyond the corporation stop on the main are the property of the Developer and/or Owner. Preliminary and final acceptance can be granted in phases of development after all the conditions of current specifications have been met.

The Developer shall be responsible for repairing any deficiencies in the workmanship for a period of one year after preliminary acceptance. This shall include but not necessarily be limited to removal and replacement of surfacing materials (pavement, curb and gutter, sidewalk) which are damaged due to soil settlement.

- c. Repair and Maintenance prior to Final Acceptance. Repair and maintenance of mains and services prior to final acceptance by the District will be the sole responsibility of the Developer and/or Contractor. Repair and maintenance will be accomplished to the current specifications of the District.
- d. Meters. Meters will be maintained by the District from the time of installation.

5.31 Abandonment of Existing Infrastructure.

The following requirements shall be applicable where existing District infrastructure will be abandoned in place, relocated, and/or replaced as a result of proposed construction.

- a. All existing water system components being abandoned/replaced/relocated shall become the property of the owner and/or developer. The owner and/or developer shall assume full ownership and responsibility of those water system components upon their removal from service.

- b. The extents of removal and the salvaging of existing items to the District will be evaluated on a case by case basis for water system infrastructure such as line valves and valve boxes, valves and regulators, vaults and structures. In general, all exposed equipment in good working condition shall be salvaged to the District. At a minimum, the top section of valve boxes shall be removed if a buried valve is to be abandoned.
- c. The following minimum work requirements shall apply to the pipeline segments of the existing water system being abandoned/replaced/relocated. Completely remove all pipeline materials if exposed or disturbed during construction or if the pipeline material is located within a proposed right-of-way. The ends of pipe material to be abandoned in place shall be neatly cut back to undamaged and sound material and filled with a minimum 2' thick concrete plug.
- d. In the event any existing water system components being abandoned/replaced/relocated are disturbed during the excavation or construction of basements, structures, utilities or other appurtenances within the project, the disturbed material shall be completely removed in accordance with the requirements stated above. All pipes abandoned in place shall be neatly cut back to undamaged and sound material and filled with a minimum 2' thick concrete plug.
- e. Final treatment of all existing water system components being abandoned/replaced/relocated shall be the responsibility of the owner and/or developer as the owner of those system components.
- f. Construction drawings submitted to the District for review shall clearly indicate the final disposition of all existing water system components being abandoned/replaced/relocated, i.e. components to be abandoned in place, components to be completely removed, components to be partially removed and the specific work requirements for each condition.

## WATER SYSTEM STANDARD SPECIFICATIONS

### Chapter 6 - Service Lines and Meters

#### 6.01 All New Service Lines and, Where Applicable, Service Line Replacements.

- a. Required water plans (see Chapter 2) must be approved by the District and all water connection and tapping charges due must be paid before water taps will be made. All replacement water taps are subject to the water tap fee unless otherwise approved by the District.
- b. The appropriate documents required for water service taps can be obtained at the District Office located at 6250 Palmer Park Boulevard, Colorado Springs, Colorado, 80915, telephone (719) 597-5080. All tap fees must be paid for at least 24 hours prior to installation of the water meter.
- c. All service taps on water mains within the water distribution system shall be accomplished by the Contractor, who shall notify the District a minimum of 48 hours prior to tapping.
- d. No water taps shall be made unless property corners are clearly marked so measurements of taps and curb boxes can be made at the time of tapping.
- e. Excavation of the tapping hole is the responsibility of the Contractor and shall be done in accordance with these Standard Specifications.
- f. Minimum normal size tap for a water service is 1 inch. The Contractor shall be responsible for furnishing all necessary materials. For service line sizes in excess of 2 inches, the corporation shall be a tapping valve and the curb stop shall be a gate valve.
- g. Cribbing, sheeting or sloping of the banks of tapping holes is the responsibility of the Contractor and will be in accordance with the rules and regulations of the State of Colorado, District of Labor and Employment, 200 West 19th Street, Denver, Colorado 80203, and OSHA as applicable.
- h. Barricading of tapping holes is the responsibility of the Contractor and shall be in accordance with construction, installation and repair of right-of-way openings for subsurface utilities for work within the Cherokee Metropolitan District or other applicable regulatory agency.
- i. Backfilling and compaction of tapping holes shall meet the specifications of the governing body in whose jurisdiction work is being done; i.e., Cherokee Metropolitan District, El Paso County or State of Colorado.

- j. Replacement of Existing Corporation Stops: Where an existing corporation stop is to be replaced with a new corporation stop of equal or larger size, the Owner of the property shall be responsible, at his/her expense, to have the old corporation stop excavated and shall contact the District which will shut off the old corporation at no expense to the Owner. Backfill, compaction and replacing of the corporation stop following shut off by the District is the responsibility of the property Owner at his/her expense.
- k. Abandoning Existing Taps: Where an existing water tap is to be abandoned, the Owner of the property shall be responsible, at his/her expense, to have the corporation stop excavated and then contact the District which will shut off the corporation at no expense to the Owner. Backfill and compaction will be the responsibility of the property Owner at his/her expense.
- l. Multiple Service Taps: No service line within the District's water service area will serve more than one customer. Each house, building, business or customer shall have an individual tap and service line from the water main to the house, building, business, or customer and an individual meter.

6.02 Water Service Line Excavations for All New and Replacement Service Lines.

- a. Excavation, safety and backfilling to include proper compaction of water service line ditches are the responsibility of the Contractor all in accordance with the specifications of the governing body in whose jurisdiction the work is being done; i.e., Cherokee Metropolitan District, El Paso County or State of Colorado.
- b. Water service line ditches must enter the lot as near ninety degrees (90°) to the property line as is practical and not at an extreme angle unless otherwise approved.
- c. Water Service Line Ditches and Separation of Water Service and Building Sewer: Except as permitted below, the water service line and the building drain or building sewer shall be not less than 10 feet apart horizontally and shall be separated by undisturbed or compacted earth. Such a separation shall be maintained in all public rights-of-way and easements. The water service line may be placed in the same trench with the building drain or building sewer provided approval is given by the District on a case by case basis and the following conditions are met:
  - (1) The bottom of the water service line at all points shall be at least 18 inches above the top of the sewer line at its highest point. The water service line and building sewer shall be separated by a clear horizontal distance of no less than 24 inches.
  - (2) The water service line shall be placed on a solid shelf excavated at one side of the common trench.
  - (3) No joints in the water service line shall be permitted between the corporation stop and the curb stop without prior approval of the District. In no case will soldered joints be allowed.

- (4) The materials and joints of sewer and water service lines shall be installed in such a manner and shall possess the necessary strength and durability to prevent the escape of solids, liquids and gases there from under all known adverse conditions such as corrosion, strains due to temperature changes, settlement, vibrations and superimposed loads.

#### 6.03 Service Line Installation and Material for All New and Replacement Service Lines.

- a. New and existing service lines
  - 1) A horizontal expansion loop or “snaking” of the service line as shown on the Standard Drawings (1-inch through 2-inch only) must be provided in the service line where it is connected to the corporation stop at the water main to allow for expansion and contraction.
  - 2) Existing water services or taps which are not 3/4-inch or larger and do not consist of high density polyethylene (HDPE) pipe or that will not meet the specifications referred to in this section will not be permitted.
  - 3) If the existing tap has been deleted from the water system at the time of demolition, under no circumstances will the District allow a service to be reconnected. It would constitute a new tap and service.
- b. Water service lines shall conform to the following minimum diameter
  - 1) 1-inch diameter for townhomes (attached single family) and patio homes
  - 2) 1-inch diameter for single family residential
  - 3) Multi-family and commercial service lines shall be sized in accordance with the applicable local building code and subject to the review and approval of the District
  - 4) Minimum diameters described above may be increased to provide for satisfactory delivery pressures as determined by the District
- c. Water service line material
  - 1) HDPE Pipe: High Density PE 3408/3608/4710 CTS
  - 2) Conformance: ASTM D 2737; AWWA C 901
  - 3) Dimension Ratio: DR 9
  - 4) Minimum Working Pressure Rating: 250 psi
  - 5) Color: Blue
- d. Water service line joints
  - 1) HDPE pipe shall have heat fusion joining in accordance with ASTM F 2620
- e. All water service lines shall have a minimum cover of 5 feet and will be determined by the street cut and/or by the finished grade of the property.
- f. Water service lines from the corporation to the curb stop shall have a maximum cover of 6 feet unless otherwise approved.
- g. Where a 1-1/2-inch or larger water service line crosses another utility or any underground structure, the water service line shall preferably pass over the other utility or structure, but in no instance shall there be less than 6 inches clearance between the water service and the other utility or structure. The space between the water service



line and the utility or structure shall be backfilled with sand when the clearance is less than 12 inches.

Where any water service line passes under a sewer main, or over a sewer main with less than 18" vertical clearance, encasement shall be required. See section 3.11 of these specifications for encasement requirements.

- h. Tapping saddle: A tapping saddle shall be used on all service line connections to the water distribution system. Tapping saddles shall have the following characteristics:
  - (1) Double strap
  - (2) Ductile iron body
  - (3) Stainless steel straps
  - (4) AWWA tapered thread pattern (cc)
  - (5) Acceptable manufacturer: Mueller Co., DR2S Series or equal
- i. Corporation stop
  - (1) Conform to AWWA C800
  - (2) AWWA tapered thread pattern inlet (cc)
  - (3) Compression connection for P.E. tubing
  - (4) Same size inlet and outlet
  - (5) Full port ball style
  - (6) All brass components in contact with water shall conform to ASTM B584 and be identified by "NL"
  - (7) Acceptable manufacturers: A.Y. McDonald Manufacturing Co., 74101B Series or equal
- j. New service lines on single family units will be installed to enter the property 5 feet inside the lowest elevation property line as approved by the District. Where the service line crosses the curb head, the letter "W" shall be stamped in the top of the curb head.
- k. Service taps shall be spaced a minimum of 3' from other service taps or main line fittings.
- l. Copper piping is not allowed. Copper material shall not be used anywhere within the District's service area.
- m. All service line installations shall include tracer wire in accordance with Section 4.13.

#### 6.04 Curb Stop and Curb Box for All New and Replacement Service Lines.

- a. All service lines, regardless of size, must have a curb stop and curb box installed in accordance with the Standard Drawings. The curb box shall be centered over the curb stop and shall be plumb. The following location will be accepted by the District:

All curb stop boxes will be installed 5 feet behind the front lot line common with the public right-of-way line, or at the interior edge of the front lot easement line,

unless designated otherwise by the District.

- b. The curb stop supplied by the Contractor shall be installed in accordance with these Specifications.
- c. The responsibility of the Contractor for the curb box ends only when sidewalks, curbs, driveways, paving, etc. have been installed and all backfilling and compaction has been completed. They are subject to review for alignment at the end of the one-year warranty period.
- d. Curb stops:
  - (1) Conform to AWWA C800
  - (2) Compression inlet connection for P.E. tubing
  - (3) Compression outlet connection for P.E. tubing
  - (4) Same size inlet and outlet
  - (5) Full port ball style
  - (6) All brass components in contact with water shall conform to ASTM B584 and be identified by "NL"
  - (5) Acceptable manufacturers: A.Y. McDonald Manufacturing Co., 76100 Series or equal
- e. Curb boxes: Tyler series or equal. Enlarged bases required for 1-1/2-inch and 2-inch curb stops.

#### 6.05 Water Meters - General

- a. All water supplied by the District to a newly developed property must be metered except for fire lines. All water meters shall become the property of the District.
- b. Except as noted in (f) below, water meters may be supplied and installed by the Owner or customer on a case by case basis approved by the District. If repair or replacement of an Owner or customer supplied meter is necessary during the warranty period, the meter will be replaced by the District at the builder's expense. If repair or replacement is necessary after expiration of the warranty period, the District shall accomplish such repair or replacement.
- c. Acceptable locations for 1-inch water meters shall be limited to basement, utility room or utility closets unless otherwise approved. Locations for 1-1/2-inch or larger water meters shall be approved by the District prior to installation of the water meter loop.
- d. Water meter locations selected shall provide adequate protection against freezing.
- e. Water meters installed in the District shall be the Badger Meter, Inc. E-Series Ultrasonic Meter.
  - (1) Minimum size: 3/4-inch diameter
  - (2) Other sizes: As approved by District
  - (3) Engineered polymer body
  - (4) Other types or manufacturers may be utilized at the District's discretion

- f. The meter and its associated transponder equipment will be installed by the District as standard practice. Owner or customer supplied and installed meters will only be considered under special circumstances on a case by case basis. The owner/customer will be required to install all other piping and appurtenances required.

#### 6.06 Inside Water Meter Installations Only

- a. Inside residential water meter locations must be in the basement or other lowest level of the residence. When installed in a crawl space with an earth floor, a rock-filled sump, 1-1/2' deep, 1-1/2' in diameter shall be installed beneath the meter location. Where plastic pipe is used for inside installations, plastic will not be used within 3 feet of the meter loop.
- b. Inside 1-inch water meter locations shall be such that the water meter is unobstructed on one side, easily accessible for reading or servicing, with a minimum of 8 inches clearance around the remainder of the meter with a minimum of 3 feet of clearance above the meter. Meter locations shall not require stooping or crawling to gain access to the meter. Meters will not be installed in attic spaces and shall be on or near the floor. Approval prior to construction for crawl space installation may be granted by the District.
- c. Inside 1-inch water meter loop installations shall include an inlet and outlet valve as shown on Standard Drawings. Inlet and outlet valves shall be full opening water way, straight or angle body meter ball valves.
- d. Plans for inside water meter loop (to include support) installations for 1-1/2-inch and larger water meters shall be submitted to the District for approval prior to installation of the meter loop and should be similar in design to the meter loop piping and support shown on the Standard Drawings except that the bypass piping may also be extended under or over the meter and that adequate meter loop support may require a different design.
- e. Water main installations shall incorporate necessary backflow prevention devices as specified herein.
- f. All water meters shall be installed in a horizontal position.

#### 6.07 Combined Domestic and Fire Line Water Meters

- a. Residential buildings may be considered on a case by case basis by the District for installation of a combined fire and domestic water service line.
- b. Only meters approved by the National Board of Fire Underwriters shall be installed in water lines providing both domestic and fire service. Requests to install a meter in a water line providing both domestic and fire demands should be made to the District a minimum of 90 days in advance of construction.
- c. Unless otherwise approved by the District, a combined domestic and fire line meter

must be installed in a pit large enough to accommodate the meter, meter bypass and all valves and piping, all in accordance with Standard Drawings.

- d. The location of the meter pit must be approved by the District in advance of construction.
- e. Meter pits must have an approved ring and cover of sufficient size (25-1/2 inches minimum) opening for installation and removal of the meter.
- f. The meter loop (3-inch through 6-inch) must set on the floor of pit, not the riser. The maximum depth of the meter pit (inside dimension) shall be 8 feet. The minimum depth of the meter pit (inside dimension) shall be 7 feet.
- g. Water meter loops for combined domestic and fire line water meters must have both inlet and outlet valves.
- h. Water meters must have capped tee fittings with isolation valves to allow the District to install temporary bypass piping around the meter of sufficient size to supply the property while the meter is being serviced. A permanent piped bypass line is not allowed.

#### 6.08 Water Regulators

- a. A water regulator designed for 250 psi shall be installed in all domestic service lines. Refer to the Standard Drawings.
- b. One regulator must be installed upstream of the domestic water meter as well as a separate regulator upstream of a secondary meter. The customer may also install another regulator downstream of any irrigation supply branch line, downstream of the meter.
- c. A water regulator for service lines incorporating a 1-1/2-inch or larger meter, where temporary bypass connections are required similar to that described in Section 6.07, Paragraph h., shall be installed so that the water passing through the temporary bypass is also regulated into the building.
- d. Water regulators may be located either inside the building or outside the building in a pit (1-1/2-inch service or larger only), at the builder's discretion, subject to the District's approval.

#### 6.9 Inspection of Services for All New and Replacement Service Lines

- a. Water service lines shall be inspected by the District and the inspection shall include an inspection of the service line from the curb stop to the foundation and an inspection of the meter installation to include all of those items contained within Sections 6.01 through 6.10 of these Specifications. The trench backfill compaction shall meet the requirements of these Specifications.

#### 6.10 Repair and Replacement of Existing Service Lines

- a. Responsibility. The property Owner is responsible for the repair and maintenance of the water service line from the curb stop to the house or other building.
- b. Leaks occurring on a water service line between the curb stop and the house or building shall be repaired as necessary to include backfilling and restoration of property at the property owner's expense. However, the District will, if requested to do so, shut off the water service line at the curb stop. To preclude unnecessary waste of water, if repairs are not initiated within a reasonable period of time, the District may, at its discretion, shut off the water service until repairs have been effected.
- c. The property owner is responsible for all damages that may occur to other property, real or personal, including property of the District, that were caused by failure to repair and maintain the water service line, or from leaks occurring on a water service line or from bursting or other failure of the water line.
- d. Leaks occurring between the curb stop and the corporation shall be repaired by the District.
- e. When a doubt exists concerning the location of a leak, the District will determine the general location of the leak. This will be done by turning off the service at the curb stop. When this action causes the leak to stop flowing, the homeowner or property Owner will be responsible for repair of the line at a location between the curb stop and the structure served. When the leak continues to flow after being turned off, the District will be responsible for repair of the line at a location between the curb stop and the main.

#### 6.11 Service Line - General Notes

- a. All work on fabrication and installation of meter boxes shall conform to the following codes, latest edition:
  - International Building Code
  - Building Code for Reinforced Concrete (ACI)
  - American Welding Society Specifications
- b. All material or components considered defective by the District shall be rejected and immediately removed from the site at no expense to the District.
- c. The Contractor shall verify and coordinate the dimensions of all openings, meters, inserts, etc., with the District and manufacturer.
- d. Concrete: All concrete shall use Type II cement with 6% air entrainment and shall develop a minimum compressive strength of 3000 psi at 28 days.

No concrete shall be placed on frozen ground.

Soil shall be firm and capable of withstanding bearing pressures of 2500 psf DL + LL.

Concrete placed during cold weather shall be protected from freezing for a minimum of seven days.

Shoring shall be provided for slabs and walls until concrete has developed sufficient strength to withstand all imposed loads.

All surfaces shall be sprayed with a combination non-staining cure and seal compound.

All reinforcing shall conform to ASTM A615, Grade 60.

All exterior concrete surfaces shall receive two applications of asphalt waterproofing.

- e. Shop drawings and specifications shall be submitted in triplicate to the District for all concrete reinforcements (cast-in-place), anchor plates, and prefabricated boxes (bituminous fiber and waterproof).
- f. Welded steel anchor plates shall be made of A36 steel with E60 electrode and shall be welded by a certified welder. All surfaces damaged during welding and installation shall be repaired and painted to the satisfaction of the District.
- g. Grouting of concrete walls around pipes and footings as shown on drawings shall be done with non-shrink Masterflow 885 grout or equal.
- h. In the event that ground water or other unstable and unusual conditions are encountered, the Contractor shall notify the District immediately for inspection and recommendations for drains, gravel fill, additional reinforcing, etc. Approved rubber water stops shall be used in all concrete joints and exterior coal tar based dampproofing of entire concrete structure shall be required for conditions where subsurface water is encountered.
- i. Prior to construction, the Contractor shall obtain meter size and dimensions from the District. Regulators must be located in the meter pit or in the building on the supply side or upstream of the meter.
- j. The Contractor, at his/her option, may use 22 gauge galvanized corrugated metal forming for cast-in-place concrete roof slabs. Brief specifications shall be submitted to the District for approval and verification of structural capacity.
- k. A complete set of "as-built" plans showing all water mains and service lines will be furnished to the District by the Contractor within fourteen (14) calendar days after completion of each phase of development, and a separate complete set showing all phases of the development will be furnished within thirty (30) calendar days after completion of all phases of the development.

## **WATER SYSTEM STANDARD SPECIFICATIONS**

### Chapter 7 - Water Service Quality Control Regulations

- 7.01 General. This document is adopted by the Cherokee Metropolitan District to promote and sustain the high quality of drinking water furnished to the District's water customers; to protect the public potable water supply system of the District from the possibility of contamination or pollution by backflow, backsiphonage or backpressure; to promote the elimination or control of existing cross connections, actual or potential; and to provide for the maintenance of a continuing program of cross connection control.
- a. The authority to implement and maintain this program of cross connection control is contained in the following legislative actions:
- (1) Colorado District of Health Law C.R.S. 1973 Title 25-1-114.
  - (2) Colorado Primary Drinking Water Regulations Section 11.1.2 (Hazardous Cross Connection).
  - (3) Cross Connection Control, Colorado District of Health, 1983.
  - (4) Occupational Safety and Health Administration Federal Register #202 Part 2, Page 22234, Subpart J.
  - (5) U.S. Environmental Protection Agency, Cross Connection Control Manual (1973) E.P.A. - 43070-73-002 Section 3.
  - (6) Uniform Plumbing Code of the International Plumbing and Mechanical Officials, Chapter 10, Sections 1001, 1002, 1003.
  - (7) Cherokee Metropolitan District Resolution.
- b. Reference manuals adopted for guidelines on cross connection control:
- (1) Manual of Cross Connection Control, Foundation for Cross Connection Control and Hydraulic Research, University of California.
  - (2) Cross Connection Control, Colorado District of Health.
  - (3) Cross Connection Control Committee, Pacific Northwest Section AWWA Manual of Accepted Procedures and Practices.
  - (4) Recommended Practice for Backflow Prevention and Cross Connection Control AWWA Manual M-14.
  - (5) Definitions of terms used in this regulation are those contained in "Manual of Cross Connection Control," Foundation for Cross Connection Control and

Hydraulic Research, University of California.

c. General Requirements

- (1) Backflow prevention devices are to be installed in an accessible location to facilitate maintenance, testing and repair. Standard Drawings show various installations.
- (2) All backflow devices shall be installed immediately downstream of the water meter.
- (3) Before installing the backflow prevention device, pipelines should be thoroughly flushed to remove foreign material.
- (4) In no case will it be permissible to have connections or tees between the meter and service line backflow prevention device.
- (5) In no case will it be permissible to connect the relief valve discharge on reduced pressure zone devices into a sump, sewer, drainage ditch, etc.
- (6) Backflow prevention valves are not to be used for the inlet or outlet valve of the water meter. Backflow preventer test cocks should never be used as supply connections and should be plugged except when being tested.
- (7) In order to ensure that backflow prevention devices continue to operate satisfactorily, it will be necessary that they be tested at the time of installation. Testing shall be required on reduced pressure zone devices only. Such tests will be conducted in accordance with AWWA performance standards. The contractor accomplishing installation shall be responsible for initial testing of the new equipment. Reporting of testing procedures and results shall be made by the contractor to the District on forms provided by the District.

Refer to the section titled "Testing and Maintenance" in these Standard Specifications for periodic testing of reduced pressure zone backflow prevention devices.

- (8) Single-family residences and townhomes shall have a double check valve. Schools, restaurants and other commercial buildings and users shall have a reduced pressure zone device. Irrigation systems shall have a reduced pressure zone device with a pressure type vacuum breaker. Refer to Paragraph 7.02 for additional details.

d. Standards for Backflow Prevention Devices

- (1) Any backflow prevention device required herein shall be of a model and size approved by the District. The term "APPROVED BACKFLOW PREVENTION DEVICE" shall mean a device that has been manufactured in full conformance with the standards established by the American Water Works Association (AWWA) entitled:



AWWA C506-Standards for Reduced Pressure Principle and Device, current edition, and have met completely the laboratory and field performance specifications of the Foundation for Cross Connection Control and Hydraulic Research (FCCC & HR) of the University of Southern California established by:

Specifications of Backflow Prevention Devices, 7th Edition, August 1985; Revised, or the most current issue.

AWWA and FCCC & HR Standards and Specifications have been adopted by the District. Final approval shall be evidenced by a "Certificate of Approval" issued by an approved testing laboratory certifying full compliance with said AWWA Standards and FCCC & HR Specifications.

- (2) Only "Approved Backflow Prevention Devices" shall be used. In general, the District will consider acceptance of devices manufactured by the following manufacturers:

Ford Meter Box Company  
FEBCO  
Mueller Co.  
Watts

- (3) Backflow devices used on fire lines shall have OS&Y valves and be listed by the National Fire Protection Association.

e. Installation

- (1) Backflow prevention devices shall be installed in accordance with Standard Drawings.
- (2) Backflow prevention device installations shall be inspected and approved for use by the District. Inspections can be scheduled by calling the District's main telephone number.
- (3) All reduced pressure zone backflow devices shall be installed in a horizontal position. Double check valves on residential diameter services may be installed in any position acceptable with the manufacturer provided the device is accessible for maintenance, removal and replacement. Other installations shall be subject to the individual review and approval of the District.
- (4) A pressure vacuum breaker shall only be used where the device is never subjected to backpressure and installed a minimum of 12 inches above the highest piping or outlet downstream of the device in a manner to preclude backpressure.
- (5) An atmospheric vacuum breaker shall be used only where the device is:
  - (a) never subjected to continuous pressure, and
  - (b) installed on the discharge side of the last control valve and above the point of usage, and

- (c) installed with the air inlet in a level position and a minimum of 6 inches above the highest piping on outlet it is protecting.
- (6) A single check valve is not considered to be a backflow prevention device.
- (7) Double check valve assemblies may be installed in below grade vaults when these vaults are properly constructed in accordance with Standard Drawings.
- (8) Reduced pressure backflow preventers will be installed above ground. The unit should be placed at least 12 inches above the finish grade to allow clearance for the repair work. A concrete slab at finish grade is recommended. Proper drainage should be provided for the relief valve and may be piped away from the location, provided it is readily visible from above grade and the relief valve is separated from the drain line by a minimum of double the diameter of the supply line. A modified vault installation may be used if constructed with ample side clearances. Freezing is a major problem in this area. Precautions should be taken to protect above ground installations.
- (9) Reduced pressure zone backflow preventer may be installed in a basement provided with an adequate drain with an effective opening of twice the diameter of the device.

f. Testing and Maintenance

- (1) It will be the duty of the customer/user at any premises where the backflow prevention devices are installed to have certified inspections and operational tests made of the devices at least once per year. In those specific instances where the District deems the hazard to be great enough, it will require certified inspections at more frequent intervals. These inspections and tests shall be at the expense of the water user and shall be performed by water utility personnel or by a certified technician approved by the District, the Colorado Department of Health, or the Water Distribution and Wastewater Collection Systems Certification Council.
- 2) The customer shall notify the District 48 hours in advance of when the tests are to be performed so that the District's representative may witness the tests if so desired. The devices shall be repaired, overhauled or replaced at the expense of the customer/user whenever the device(s) are found to be defective. Records of all such tests, repairs and overhauls shall be kept, with a copy sent to the District.
- (3) The customer may request a private certified tester to perform the annual test and furnish the District with a copy of the test, pursuant to the aforementioned stipulation.
- (4) Existing devices shall be sealed by the technician performing the test at the completion of the test.
- (5) All testing gauges shall be checked for accuracy and be kept in good operating condition.

- (6) The District retains the authority to test or otherwise check the installation and operation of any backflow device.
- (7) The customer may request that the District perform the test for a fee as indicated on the following schedule. The District will not perform any repairs; this must be accomplished by certified personnel from the private sector.

All backflow prevention devices 3/4" - 2"	\$20.00
Reduced pressure assemblies 2" - 10"	\$25.00
Double check assemblies 2" - 10"	\$30.00

g. Right of Entry

The District water utility representative(s) assigned to inspect premises relative to possible hazards shall carry proper credentials of his/her office, upon exhibit of which he or she shall have the right of entry during usual business hours to inspect any and all buildings and premises for cross connections in the performance of his or her duties.

This right of entry shall be a condition of water service in order to provide assurance that the continuation of service to the premises will not constitute a menace to health, safety and welfare of the people throughout the District's potable water distribution system. Where building security is required, the backflow device should be located in an area not subject to security.

h. Violations

- (1) Failure of the customer to cooperate in the installation, maintenance, testing or inspection of backflow prevention devices required by this regulation shall be grounds for the discontinuance of water service to the premises or the requirement for an air-gap separation from the public potable water system.
- (2) Service of water to any premises may be discontinued by the District after written notification if unprotected cross connections exist on the premises, or if any defect is found in an installed backflow prevention device, or if a backflow prevention device has been removed or bypassed. Service shall not be restored until such conditions or defects are corrected.
- (3) Discontinuance of service may be summary, immediate and without written notice whenever, in the judgment of the District's Manager, such action is necessary to protect the purity of the public potable water supply or the safety of the water system.

7.02 Cross Connection Control & Backflow Prevention - Criteria List

a. Abbreviations

A/G - Air Gap Separation  
 A.V.B./A.T.V.B. - Atmospheric Vacuum Breaker  
 R/P - Reduced Pressure Zone Device  
 D/C - Double Check Valve Assembly  
 P.V.B./P.T.V.B. - Pressure Type Vacuum Breaker

b. Type of Establishment

Device Required

Apartments and condominiums - 4 stories or more	R/P
Apartments and condominiums - 4 stories or less	D/C
Auxiliary water systems	R/P
Barber shop or college	R/P
Beauty shop or college	R/P
Belted meter installations	R/P
Beverage bottling plants	R/P
Buildings - 4 stories or more	R/P
Cafeteria, restaurant, or any food handling establishment	R/P
Car Wash	R/P
Cemeteries	R/P
Chemical Plants	R/P
Child day care center	R/P
Dairies	R/P
Dry Cleaners	R/P
Film Laboratory or Processing Plant	R/P
Fire Line (chemicals added)	R/P
Fire Line (no chemicals)	D/C
Florist shop <u>with</u> irrigation and plant growth	R/P
Florist shop <u>without</u> irrigation and plant growth	R/P
Food processing/packing plant	R/P
Gas station, pumps only	R/P
Garage for equipment and vehicle repair	R/P
Greenhouse	R/P
Hospital, dental or medical facility	R/P
Hotels and motels - single and multi-structures, 3-stories & less	R/P

Irrigation System	R/P - P.T.V.B.
Kennels - dog/cat	R/P
Laboratory- chemical or medical	R/P
Laundromat	R/P
Lease space (shopping centers, warehouse, main water supply)	R/P
Manufacturing/Processing Plant	R/P
Metal Plating and Processing Plant	R/P
Mobile equipment (landscape, lawn, tree spraying, water hauling)	A/G variance by review only
Morgue, mortuary, or autopsy facility	R/P
Nursing home/retirement home	R/P
Office or warehouse except as otherwise described herein	D/C
Pet shops	R/P
Petroleum Storage Yard	R/P
Photo developing lab	R/P
Planned Unit Development	R/P
Plating facilities	R/P
Printing shop	R/P
Private well supply	A/G
Recirculated water	R/P
Reflecting ponds, swimming pools, fountains, open ponds, etc.	R/P
Residences, single-family including townhomes	D/C
Restaurants	R/P
RV Parks and Campgrounds	R/P
Sand and Gravel Pits	R/P
Schools - Colleges w/Lab	R/P
Sewage treatment plant	R/P
Solar system	R/P by review
Swimming Pools	R/P
Transportation terminal	R/P
Veterinary Services	R/P

NOTE: Other types of establishments may require protection via air gaps or backflow prevention devices depending on the equipment and/or plumbing arrangements utilized therein. These shall be considered individually, at the discretion of the District. All of the establishments listed below will require review by the District and a determination made as to the need for a backflow prevention device.

Buildings - three stories or less

Department store