

STANDARD SPECIFICATION MANUAL



**W. W. Wheeler and Associates, Inc.
Water Resources Engineers 3700 South Inca Street
Englewood, Colorado 80110**

Revised April 2022

TABLE OF CONTENTS

INTRODUCTION

SPECIFICATION A - EARTHWORK

SPECIFICATION B - WATER TRANSMISSION AND DISTRIBUTION LINES

SPECIFICATION C: WATER SERVICE LINES AND APPURTENANCES

SPECIFICATION D: FIRE PROTECTION FACILITIES

SPECIFICATION E: VALVES AND APPURTENANCES

SPECIFICATION F: DISINFECTION, FLUSHING, AND TESTING

SPECIFICATION G: PRESSURE TESTING AND FLOW TESTING

REQUIREMENTS FOR CONTRACTOR CHECKLIST FOR NEW WATER LINE
INSPECTION

PRE-CONSTRUCTION MEETING CHECKLIST FOR WATER LINE INSTALLATION

LIST OF DETAILS

DETAIL NO. 1 - WATER DISTRIBUTION MAIN: TYPICAL TRENCH SECTION

DETAIL NO. 2 - SERVICE LATERAL: TYPICAL TRENCH SECTION

DETAIL NO. 3 - SERVICE LINE INSTALLATION

(NOTE: THESE DETAILS ARE ONLY FOR EXAMPLE PURPOSES)

DETAIL NO. 4 - CONNECTION TO EXISTING MAIN

DETAIL NO. 5 - WATER PIPE BLOCKING

DETAIL NO. 6 - FIRE HYDRANT ASSEMBLY

DETAIL NO. 7 - GATE VALVE AND VALVE BOX

DETAIL NO. 8 – PRESSURE REDUCING STATION VAULT

DETAIL NO. 9 – PRESSURE BOOSTING PUMP VAULT

DETAIL NO. 10 – COMBINATION AIR VALVE? VAC & MANHOLE

INTRODUCTION

1 GENERAL STATEMENT

The purpose of this document is to ensure that all water lines and other appurtenances provide adequate and reliable service and that they are constructed in a manner that provides for future accessibility and maintenance. These standards and specifications represent the minimum requirements. The engineer, or contractor may adopt more stringent standards if he so chooses. The latest edition of ASTM, AWWA, and ANSI standards shall apply where referenced in these standards and specifications.

2 DEFINITIONS

- “APPURTENANCE” shall mean all accessory items associated with the water distribution facilities proposed for or under construction.
- “CONTRACTOR” shall mean any person, firm, or corporation licensed by Lake County to perform the work and furnish materials within the County.
- “DISTRICT” or “PARKVILLE” shall mean Parkville Water District
- “EASEMENT” shall mean a dedicated legal right for the specific use of land owned by others.
- “ENGINEER” shall mean a person registered by the State of Colorado to issue drawings and specifications for construction of water distribution facilities.
- “OWNER” shall mean any individual, firm, company, association, or group who possesses the property.
- “SERVICE CONNECTION” shall mean the process of constructing a service line from the building to the distribution system.
- “SERVICE LINE” shall mean a water line which connects the building’s plumbing system to a water main in the distribution system.
- “SHALL” is mandatory.
- “WATER MAIN” shall mean any pipe, piping, or system of piping used as a conduit for water. Unless otherwise designated by the District, a water main shall be any line six inches or more in diameter.

SPECIFICATION A

EARTHWORK

1 SCOPE

The work covered by this Specification includes obtaining all materials and performing all operations required for excavation, backfill, and compaction. Items involved within these operations include lines and grades, borrow area operations, clearing and stripping, materials, handling and placement of materials, and quality assurance and testing.

2 APPLICABLE STANDARDS

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI), AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C105/A21.5-99 - ANSI Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems

AMERICAN SOCIETY FOR TESTING MATERIALS (ASTM)

ASTM D422 - Grain Size Analysis of Soils.

ASTM D698 - Moisture Density Relation of Soils, 5.5 Pound Hammer and twelve-inch (12") Drop. (Standard Proctor test).

ASTM D1556 - Density of Soil in Place by Sand Cone Method.

ASTM D3017 - Standard Method of Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils and Using a Vibratory Table.

ASTM D4254 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils and Calculation of Relative Density.

ASTM G51-95 - Standard Test Method for Measuring pH of Soil for Use in Corrosion Testing.

ASTM G57-95a(2001) - Standard Test Method for Field Measurement of Soil Resistivity Using the Wenner Four-Electrode Method.

3 LINES AND GRADES

- 3.1** The Owner shall provide engineering surveys for construction to establish reference points which in his judgment are necessary to enable the Contractor to proceed with the work.
- 3.2** The Contractor shall be responsible for laying out the work and for slope grade control.
- 3.3** The Engineer reserves the right to verify correctness of the layout of the work and slope grades during the progress of the work.

4 MATERIALS

4.1 GENERAL

- 4.1.1** Earth materials specified herein shall be free of topsoil, organics or other deleterious material and meet the gradation requirements stated in this Specification. Earth materials are designed to possess certain characteristics such as high density, high strength, and low compressibility and they shall be placed in such a way that the desired characteristics are obtained.
- 4.1.2** The Contractor shall use only earth materials obtained from designated borrow areas and/or other sources designated or approved by the Engineer.

4.2 BEDDING MATERIAL

The bedding material shall be Colorado Department of Highways Class 6 road base, $\frac{3}{4}$ -inch washed rock with District approval, or locally available material if submitted gradation is approved. Three-quarter-inch ($\frac{3}{4}$ ") washed rock shall conform to the following gradations:

3/4-Inch Washed Rock	
SIEVE SIZE	TOTAL PERCENT PASSING BY WEIGHT
1-inch	100
3/4-inch	85 - 100
3/8-inch	60 - 85
No. 4	35 - 60
No. 8	25 - 45

4.3 BACKFILL MATERIAL

At the option of the Contractor, compacted backfill may be (a) suitable job excavated material or (b) graded gravel as described below:

4.3.1 Job Excavated Material. Job excavated material may be used as compacted backfill when the job excavated material is finely divided and free from debris, organic material, cinders, or other corrosive material, and stones larger than three inches in greatest dimension. Masses of moist, stiff clay shall not be used. If the excavated material is not suitable for backfill, as determined by the Engineer, suitable material shall be hauled in and utilized, and rejected material hauled away and disposed of properly.

4.3.2 Graded Gravel. Gravel used for compacted backfill shall conform to the following gradation:

GRAVEL USED FOR TRENCH BACKFILL	
SIEVE SIZE	TOTAL PERCENT PASSING BY WEIGHT
1-inch	100
3/4-inch	85 - 100
3/8-inch	40 - 85
No. 4	35 - 60
No. 8	15 - 30
No. 8	5 - 10

The gravel mixture shall contain no clay lumps or organic matter. The fraction passing the No. 4 sieve shall have a liquid limit not greater than 25 and a plasticity index not greater than 5.

5 EXCAVATION

5.1 SITE PREP

5.1.1 Vegetation, stumps, roots, organic matter, debris, and other miscellaneous structures and materials shall be removed from the work site.

5.1.2 Topsoil to be disturbed by construction shall be stripped from all areas to a depth of eight inches (8"). Topsoil shall be stockpiled separately from excavated materials.

- 5.1.3 Asphalt and bituminous pavements shall be saw cut to the full depth of pavement. The vertical face of the cut shall be a straight line parallel to the limit of excavation. Cuts shall be made with a flat-bladed air hammer, concrete saw, or as approved by the District General Manager. The method used should provide a straight, true cut. All asphalt located within trench limits shall be hauled off site.
- 5.1.4 Where trenches lie within the Portland Cement concrete section of streets, alleys, driveways, curbs, gutters, or sidewalks, etc., such concrete shall be saw cut to the full depth of pavement with vertical, true lines in such a manner that the adjoining surface will not be damaged.
- 5.1.5 All pavement shall be disposed of off site prior to starting the trench excavation. Broken pavement shall not be used in backfill material.

5.2 TRENCHING OPERATIONS

- 5.2.1 The trench shall be excavated as shown in **Detail No. 1** and **Detail No. 2**.
- 5.2.2 The minimum trench width, measured at the top of the pipe, shall be the outside diameter plus 12 inches for pipe diameters 12 inches and less to allow for proper placement and densification of the bedding and pipe zone or backfill material. The maximum trench width, measured at the top of the pipe, shall be the outside diameter plus 24 inches regardless of the type of pipe, type of soil, depth of excavation, or the method of densifying the bedding and backfill. If a pipe crib or cradle is required, these dimensions shall be applied in addition to the box width.
- 5.2.3 The trench shall be adequately supported and the safety of workers provided for as required by the most recent standards adopted by OSHA. Sheet piling and shoring shall be utilized where required to prevent any excessive widening or sloughing of the trench, that may be detrimental to human safety, to the pipe or appurtenances being installed, to existing utilities, to existing structures, or to any other existing facility or item.
- 5.2.4 Excavated material shall not be placed closer than two feet (2') from the top edge of the trench. Heavy equipment should not be used, or placed, near the sides of the trench unless the trench is adequately braced.

- 5.2.5** Excavated material shall be stockpiled so as not to endanger the work or public safety. Existing vehicular and pedestrian traffic shall be maintained with minimum disruption. Emergency access and access to existing fire hydrants and water valves shall be maintained. Natural drainage courses and street gutters shall be maintained.
- 5.2.6** Trench excavation shall not be completed more than 100 feet in advance of pipe installation.
- 5.2.7** *One-foot thick clay barriers shall be installed or approved equal, in place of aggregate, 4-inches below and 12-inches above pipe, every 500 feet for all water mains.*

5.3 BOTTOM PREPARATION

- 5.3.1** Where soils are suitable and have adequate strength, the bottom of the trench shall be graded and hand-shaped such that the pipe barrel rests uniformly on embedment material.
- 5.3.2** Excavation outside the limits of the trench shall be made as required for the satisfactory installation of valves, boxes, and other appurtenant structures without affecting placement of the pipe.
- 5.3.3** Whenever the trench is over-excavated to eliminate point bearing rocks or stones or when undisturbed grade tolerances of 0.1 foot are exceeded, the Contractor shall reestablish the grade using aggregate bedding materials.
- 5.3.4** If the bottom of the excavation is soft or unstable, and in the opinion of the Engineer cannot satisfactorily support the pipe or structure, a further depth and width shall be over-excavated (minimum 6-inches) and refilled to below grade with rock uniformly graded between $\frac{3}{4}$ -inch and $1\frac{1}{2}$ -inch.
- 5.3.5** Rock shall be removed to a 4-inch depth below the bottom of the pipe grade. Additionally, all rock loosened during excavation shall be removed from the trench. Blasting shall not be allowed without prior authorization from the District.

5.4 DEWATERING

- 5.4.1** All pipe trenches or structure excavation shall be kept free from water during pipe laying and other related work. The method of dewatering shall provide for a completely dry foundation at the final lines and grades of the excavation.

5.4.2 Dewatering shall be accomplished by the use of well points, sump pumps, rock or gravel drains placed below subgrade foundations, or subsurface pipe drains. All water shall be disposed of in a suitable manner without being a menace to public health or causing public inconvenience in accordance with any required permit. No water shall be drained into other work being completed or under construction.

5.4.3 The dewatering operation shall continue until such time as it is safe to allow the water table to rise in the excavations. Pipe trenches shall contain enough backfill to prevent pipe flotation of the carrier or casing pipe. When pipe is laid in a casing or tunnel longer than 30 pipe diameters, the pipe inside said casing or tunnel shall be secured so flotation does not occur when the pipe is empty.

6 INSTALLATION OF BEDDING AND PIPE

6.1 Installation of bedding and pipe shall be done as shown in ***Detail No. 1 and Detail No. 2.***

6.2 Bedding material shall be deposited in the trench for its full width on each side of the pipe, fittings, and appurtenances simultaneously. All trenches shall be backfilled by hand, from the bottom of the trench to the centerline of the pipe with approved bedding material placed in layers of three inches (3") and compacted. A total of six inches (6") of bedding material shall be placed on the trench bottom for support under the pipe. Bell holes shall be dug deep enough to provide a minimum of two inches (2") of clearance between the bell and bedding material. All pipe shall be installed in such a manner as to ensure full support of the pipe barrel over its entire length. After the pipe is adjusted for line and grade, and the joint is made, the pipe zone material shall be carefully placed and tamped under the haunches of the pipe and in the previously dug bell holes. A total of six inches (6") of bedding material shall be placed above the top of the pipe. From the centerline of the pipe, fittings, and appurtenances to a depth of six inches (6") above the top of the pipe, the trench shall be backfilled by approved mechanical methods. Special care shall be used in placing this portion of the backfill to avoid disturbing the pipe. Approved backfill shall then be installed to the ground line.

6.3 Except immediately next to the pipe, mechanical or air operated tamping equipment shall be used. Hand equipment, such as a T-bar, is to be used next to the pipe.

6.4 Tamping is herein defined as the act of placing approved pipe zone material under the haunches of the pipe, paying particular attention to voids, bell hole, and sling holes. The purpose of tamping is to ensure uniform support for the pipe.

- 6.5** Moisture content of the bedding material shall generally be maintained within $\pm$ two percent (2%) of optimal moisture content as determined by ASTM D698. Close tolerances shall be maintained as needed to obtain densities required.
- 6.6** The bedding shall be compacted to a maximum density (100 percent) not less than 95 percent Standard Proctor based on ASTM D698.
- 6.7** A vapor barrier consisting of one sheet or layer of polyethylene plastic at least six millimeters (6 ml) in thickness and one (1) sheet of 2" XPS foam panel insulation shall be placed on top of the filter sand material. Over the vapor barrier, the pipe may be backfilled and compacted with either excavated material or graded gravel material in accordance with that described in paragraph 4.4 of SPECIFICATION A, EARTHWORK.

7 BACKFILL AND COMPACTION

- 7.1** No section of water main, appurtenance, or structure shall be backfilled until the Engineer has examined and approved that section of the installation.
- 7.2** From six inches (6") above the top of the pipe to the grade shown on the plans or specified herein, the trench shall be backfilled by approved mechanical methods.
- 7.3** The backfill shall be placed in 8-inch maximum lifts and compacted by vibrating, tamping, or a combination thereof, to a minimum relative density of 70 percent for sand material, as determined by ASTM D4253 and D4254, or to 95 percent of maximum dry density for cohesive soils, as determined by ASTM D698. Close tolerances shall be maintained as needed to obtain densities required.
- 7.4** Moisture content of the backfill material shall generally be maintained within ± 2 percent of optimal moisture content as determined by ASTM D98.
- 7.5** Contractor shall maintain all backfill in a satisfactory condition during the extent of the contract and warranty period. The Contractor shall be responsible for repairing any deterioration or settlement of the road surface. Notification of the required repairs shall be issued by the Water District, the State of Colorado, by Lake County, or the City of Leadville. All costs for repair and all liability, as a result of surface deterioration or settlement, shall be the responsibility of the Contractor.
- 7.6** All backfilling shall be completed within 20 feet of pipe installation by the end of any working day.
- 7.7** Absolutely no frozen backfill material permitted.

8 QUALITY ASSURANCE AND TESTING

- 8.1** The Engineer will perform tests on earth materials at the site to determine if such materials are in compliance with the respective specified requirements.
- 8.2** All tests to ensure that embedment, fill, and backfill materials and their placement comply with specified requirements shall be made by an independent testing laboratory at the expense of the Contractor unless otherwise specified in the Contract Documents. The following tests will be required:
 - 8.2.1** Two (2) initial gradation tests for each type of embedment, fill, or backfill material and one (1) additional gradation test for each additional 500 tons of each material.
 - 8.2.2** Two (2) moisture-density (Proctor) tests in accordance with ASTM D698 or two (2) relative density tests in accordance with ASTM D4253 and D4254 for each type of embedment, fill, or backfill material proposed, except for granular embedment material.
 - 8.2.3** For pipelines, in-place field density tests at average intervals of 1,000 feet along the trench and at vaults and other pipeline structures or as directed by the Engineer or the District.
 - 8.2.4** For area fills and embankments, an in-place field density test for each 5,000 cubic yards of material placed or as directed by the Engineer or the District.
- 8.3** Acceptance of earth materials will be made only after such materials have been incorporated into the completed work. Rejection of such materials by the Engineer can be made in the borrow areas, transportation vehicles, or in-place in the completed work. The Contractor shall cooperate with the Engineer to provide access to the work areas as needed for testing and to ensure that only acceptable materials will be incorporated into the completed work.
- 8.4** Unacceptable work shall be reworked until satisfactory tests are obtained, or shall be removed and replaced to meet the requirement of this Specification.

- 8.5** In addition to the tests mentioned above, the following tests, either in the field or in the laboratory, may be performed to identify materials, to determine the compaction characteristics, to define the moisture content of earth material, and to determine the in-place density of the compacted fill. The Contractor shall aid and cooperate with the Engineer in obtaining samples of the earth materials for testing:

Unified classification of soil, ASTM D2487.

Density of fill by in-place sand cone method, ASTM D1556, and by nuclear methods, ASTM D2922.

Grain size analysis of the soil, ASTM D422.

Moisture content of the soil by laboratory determination, ASTM D2216, and by nuclear methods, ASTM D3017.

Atterberg limits, ASTM D4318 and ASTM D425.

Identification of dispersive clay soils, ASTM D4647.

- 8.6** Some locations within the District have been found to contain soils with characteristics that could be potentially corrosive to ductile iron pipe, appurtenances, and other water distribution materials. At the discretion of the District, the Contractor may also be required to test the resistivity, pH, redox potential, sulfides, and moisture of the soil to determine its corrosiveness, according to methods described in ANSI/AWWA C105/A21.5-99, ASTM G51, and ASTM G57. If the soil is found to be corrosive as determined by the Engineer or criteria in ANSI/AWWA C105/A21.5-99, an adequate means of protecting the water distribution materials shall be determined by the District or the Engineer and completed by the Contractor.

9 PROTECTION OF WORK

- 9.1** All excavation shall be protected by barricades, lights, signs, etc. as required by governing federal, state, and local safety codes and regulations. Under no circumstances, will more than 20 feet of trench be left open at night. Any trench left open at night shall be protected by a temporary snow fence barricade and reflective tape.

9.2 Sheeting, Shoring, and Bracing

- 9.2.1** Where trench walls are not excavated at a stable slope, the Contractor shall provide and maintain sheeting or shoring equipment sufficient to prevent caving, sliding, or failure, and property or bodily damage according to all governing regulations.

9.2.2 Under normal construction conditions, sheeting or shoring shall be removed as work progresses. Sheeting or shoring shall remain installed if directed by the District or if pipe does not have sufficient strength to support backfill based on trench width as defined by the sheeting.

9.2.3 The Contractor shall be held solely responsible for any violations of applicable safety standards. Particular attention is called to minimum requirements of OSHA and State of Colorado Occupational Safety and Health laws.

9.3 Excavation shall be protected from surface water at all times.

10 CLEANUP AND SURFACE RESTORATION

10.1 Upon completion of the work, all rubbish, unused materials, and other like material shall be disposed of as specified and the areas shall be left in a state of order and cleanliness.

10.2 In easements, cultivated, or agricultural areas, topsoil to a depth of eight inches (8") shall be removed from the area of general disturbance and stockpiled. After installations of all pipelines, appurtenances and structures, and completion of all backfill and compaction, the stockpiled topsoil shall be redistributed evenly over all disturbed areas. Care should be taken to conform to the original ground contour or final grading plans.

10.3 All streets, alleys, driveways, sidewalks, curbs, or other surfaces, in which the surface is broken into or damaged by the installation of the new work, shall be resurfaced in kind, to the satisfaction of the Engineer or Owner.

10.4 All surface cuts shall be, as a minimum, restored to a condition equal to that prior to construction. All resurfacing shall be done in accordance with the requirements of the Engineer, Owner, the City of Leadville, Lake County, Colorado Department of Transportation, or the property owner.

10.5 In areas where existing gravel surfacing is removed from the streets, the Contractor shall replace the graveled surfacing with material at least equal in depth and quality to that removed, but in no case shall the resurfacing be less than eight inches (8") in thickness.

10.6 A minimum of eight inches (8") of gravel base material shall be installed and thoroughly compacted beneath the paving or other surfacing to be installed, and no less than the base course immediately adjacent to such cut will be acceptable.

- 10.7** For the replacement of asphalt pavement a minimum of three inches (3") of asphalt shall be applied. Hot mix asphalt shall be used if available in the area. The Contractor or owner will be responsible for installing and compacting the gravel base material, and replacing of all asphalt surfaces.
- 10.8** For the replacement of Portland Concrete pavement a minimum of six inches (6") of concrete shall be applied.
- 10.9** Unsuitable or excess material removed in excavation shall be wasted or mounded neatly over the pipe or spread evenly over the area adjacent to the pipe trench, except in cases where mounding would disrupt the normal use of the area. In these cases, such materials shall be removed to an approved disposal area.

SPECIFICATION B

WATER TRANSMISSION AND DISTRIBUTION LINES

1 SCOPE

The work covered by this specification includes all materials, labor, equipment, and miscellaneous items necessary to install all raw water, potable water transmission, and distribution pipelines and appurtenances as specified herein for the District.

1.2 Scheduling Inspections

The customer shall notify the District when the Water Service is ready for inspection or Connection to the Water Main. Appointments for inspections, testing, Connection, meter inspection, Turn-on, Turn-off, or operation of Water Main valves must be scheduled with the District a minimum of two (2) business days in advance.

2 GENERAL

2.1 The District requires an Overall Utility Site Plan of the project to be submitted indicating all utilities and their proposed locations for review prior to Construction Plan Approval. All plans submitted shall include a geotechnical report if requested by the District. The design and installation of all facilities shall ensure development of an integrated distribution system and in general shall be the most efficient layout possible to serve the proposed development. All buried pipelines shall be electronically locatable with a tracer wire system.

2.2 All materials shall conform to the District's Specifications. Material substitutions may be considered on a case-by-case basis. Written approval is required prior to furnishing. Applicant must submit shop drawings and specifications for substituted materials considered 'or equal' for review and approval prior to the preconstruction conference. A bill of materials shall be furnished to the District Inspector at the preconstruction conference.

2.3 All materials utilized shall be new and undamaged. Everything necessary to complete all installations shall be in accordance with the Specifications 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.

2.4 Sizing Distribution Mains

All mains shall be sized large enough to provide for domestic, irrigation, and fire protection flows to the area requesting service without exceeding maximum pipe velocities of 8 feet per second. The minimum size of all District mains shall be eight inches (8").

The District reserves the right to request oversized mains to provide service for projected future needs. The additional cost for the oversizing may be negotiated between the District and the Applicant and will be reviewed on a case-by-case basis.

Special situations approved by the District water system supervisor or Engineer may be acceptable with lines smaller than eight inches (8") in diameter, such as a short dead-end domestic service feeder with no hydrants.

- 2.5** All piping shall be constructed at the locations indicated on the Drawings or at such alternative locations dictated by field conditions and located by the Owner.

2.6 Marking Tape

Marking tape is required on all water mains. The tape shall meet the following specifications

- (a) Five (5) mil thick Polyethylene material.
- (b) Solid "blue" color with black lettering.
- (c) Six inches (6") in width.

2.2 Tracer Wire

Tracer wire on is required on all water main lines and shall be #12 AWG 0.1019" diameter copper conductor or copper clad steel insulated with a 30 mil, high-density, high molecular weight polyethylene (HDPE) insulation, blue in color, and rated for direct burial use at 30 volts. Service line tracer wire shall be connected to mainline tracer wire using approved splice connectors. The Mainline tracer shall follow the main line and terminate at the top of the gate valve box

- 2.3** All materials shall be installed in strict accordance with the manufacturer's recommendations, as applicable.

- 2.4** All pipe, fittings, valves, and equipment shall be carefully handled, stored, and protected to prevent damage to materials, protective coatings, and linings. At no time shall such materials be dropped or dumped into the trench.

- 2.5** Precautions shall be taken to prevent foreign matter from entering the pipe, fittings, and valves prior to and during installation. No debris, tools, clothing, or any other material shall be placed in the pipe during installation. Whenever pipe installation is suspended, either temporarily or overnight, the open end of the pipe shall be sealed with a watertight plug to prevent the entrance of trench water, debris, or foreign matter into the pipeline system.
- 2.6** Under no circumstances shall trench water be allowed to enter the pipeline. When water is present in the trench, the plug shall remain in place until the trench is pumped dry. Whenever trench water becomes evident, measures shall be taken to prevent pipe floatation.
- 2.7** If, in the opinion of the Engineer or the District, the Contractor is incapable of keeping the pipe free of foreign matter during installation, the Engineer or the District shall require the Contractor to cover the pipe ends with close-woven bags until the start of the joining operation.

3 APPLICABLE STANDARDS

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI), AMERICAN WATER WORKS ASSOCIATION (AWWA)

ANSI/AWWA C104/A21.4-03 - Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

ANSI/AWWA C110/A21.10-03 - Standard for Ductile Iron and Grey Iron Fittings for Water.

ANSI/AWWA C111/A21.11-00 - Standard for Rubber-Gasket Joints for Ductile Iron and Pressure Pipe and Fittings.

ANSI/AWWA C151/A21.51-02 - Standard for Ductile-Iron Pipe, Centrifugally Cast for Water.

ANSI/AWWA C600-99 - Installation of Ductile Iron Water Mains and Appurtenances.

4 MATERIALS

This item covers the types of material that will be required for the construction and installation of water lines. All materials used shall be new, of the best quality available, and conform to applicable standards as indicated herein. Cast iron pipe, plastic pipe, and asbestos cement pipe will not be permitted.

4.1 DISTRIBUTION MAIN

- 4.1.1** The ductile iron pipe for the distribution main shall be Class 52, manufactured in accordance with AWWA C151/A21.51-02. The ductile iron shall have a minimum tensile strength of 60,000 psi, minimum yield strength of 42,000 psi and a minimum elongation of 10 percent. Pipe shall have normal laying lengths of either 18 feet or 20 feet. Random lengths are not acceptable.
- 4.1.2** The pipe shall be capable of withstanding 250-psi pressure. The minimum wall thickness of the pipe shall be 0.31-inch (Class 52).
- 4.1.3** The ends of the pipes shall be fabricated to accommodate push-on single gasket joints as specified in ANSI/AWWA C111/A21.11-00. A non-toxic vegetable soap lubricant shall be supplied with the pipe.
- 4.1.4** The ductile iron pipe shall be furnished with standard thickness cement mortar lining (CML) in accordance with ANSI/AWWA C104/A21.4-03.
- 4.1.5** The exterior surfaces of all pipe and fittings, which will be exposed in interior locations, shall be shop primed. Flange faces shall be coated with rust preventive compound. Exterior surfaces of all other pipe and fittings shall be asphaltic coated.
- 4.1.6** Every pipe, joint, and fitting shall be provided with conductivity straps or wedges to provide electrical continuity at all reaches of the network. Type of conductivity strap and proposed method of installation to be approved by the water system supervisor.

4.2 FITTINGS

- 4.2.1** All fittings shall be manufactured in accordance with ANSI/AWWA C110/A21.10-03.
- 4.2.2** All buried fittings shall be mechanical joint with megalugs except where specifically authorized by the District.
- 4.2.3** The fittings shall be capable of withstanding 250-psi pressure.

4.3 JOINTS

Every joint shall be provided with conductivity straps or wedges to provide electrical continuity at all joints. Type of conductivity strap and proposed method of installation is to be approved by the water system supervisor.

5 FABRICATION AND INSTALLATION

5.1 GENERAL

- 5.1.1 All transmission and distribution lines to be dedicated to Parkville Water District shall be located a minimum of 10 feet inside a public easement. The location of water lines with side lot line easements or rear lot easements is discouraged. Use of public or private easements or public rights of way for water line placement shall be approved and properly permitted by appropriate government agencies (Federal, State, County or City) or private owners, prior to construction.
- 5.1.2 When site conditions allow, the water line should be located outside paved areas. Wherever possible, mains shall be placed in areas where snow cover will not be removed in winter. At all times water lines shall be located so that the District maintenance personnel can easily maintain and operate those lines.
- 5.1.3 Easements or rights-of-way used during the installation of water mains shall be a minimum width of 25 feet, 12½ feet on either side of centerline. In dredge areas and other special conditions, a wider easement may be required.

5.2 PIPELINE DEPTH

The minimum depth of cover of water mains and service lines shall be as follows: (Depth to cover equals depth from finished grade to top of pipe.)

- 5.2.1. Establish elevations of buried piping to ensure not less than eight feet (9') of cover. ***Some locations at the outer reaches of the system will require up to nine and a half feet (9.5') of cover. The District General Manager shall determine such locations.***
- 5.2.1. Maximum depth of bury for any water main or service shall be 14 feet (14') except by District approval.
- 5.2.2. When water mains are to be located underneath storm drains, culverts, or any other submerged air space, the required depth of cover may be greater than eight feet. This is necessary to ensure that the water line is beyond the frost depth associated with the storm drain culvert, etc. In some cases, the District water system supervisor may allow insulation in place of increased depth where water lines cross under one of the above.

5.3 CLEANING AND INSPECTION

- 5.3.1** Clean all pipe, fittings, valves, and related materials thoroughly of all foreign material; inspect for cracks, flaws, or other defects prior to installation. Mark all defective, damaged, or unsound materials with bright marking crayons or paint and remove from job site.
- 5.3.2** All spurs, excess paint, and any other defects within the gasket groove shall be either removed or repaired or the pipe shall be deemed unacceptable.

5.4 INSTALLATION

- 5.4.1** All materials shall be installed in strict accordance with the manufacturer's recommendations, as applicable. Piping shall be installed in accordance with ANSI/AWWA C600-99 and as shown in the ***Detail No. 1 and Detail No. 2.***
- 5.4.2** Pipe and accessories shall be handled in such a manner as to ensure delivery to the trench in a sound, undamaged condition.
- 5.4.3** Cutting of pipe shall be done in a neat and workman-like manner without damage to the pipe or lining. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs. Scale and dirt shall be removed on inside and outside before assembly. Flame cutting on pipe by means of an oxyacetylene torch shall not be allowed.
- 5.4.4** Pipe shall be lowered into the trench with ropes, slings, or machinery. Under no circumstances will the pipe be pushed off the bank and allowed to fall into the trench.
- 5.4.5** Pipe shall be laid in straight sections with bell ends facing the direction of lying unless otherwise directed by the District water system supervisor. Where pipe is laid on grade of one percent (1%) or greater, the installation shall proceed uphill with the bell ends facing upgrade. The pipeline shall be installed so that a continuous positive or negative grade is maintained between high and low points to avoid air pockets. At no time will a high point in the line be acceptable unless an air and vacuum valve is installed to relieve air pockets.
- 5.4.6** Deflection from a straight line or grade, as required by vertical curves, horizontal curves, or offsets, shall not exceed the manufacturer's recommendations with five (5) degrees at the joint being the maximum. If the alignment requires deflections in excess of these limitations, special bends or a sufficient number of shorter

lengths of pipe shall be furnished to provide angular deflections required.

5.4.7 Joints shall be push-on single gasket type conforming to applicable requirements of ANSI/AWWA C111/A21.11-00. Gasket lubricant used shall be suitable for joint assembly. It shall be nontoxic, taste and odor free, and have no deteriorating effects on the gasket material.

5.4.8 The spigot end of the pipe shall be placed in the bell end with care to prevent the joint from contacting the ground. The joint shall be completed with a slow, steady pressure, without jerky or jolting movements. Pipe furnished without a depth mark shall be marked before assembly to assure insertion to full depth of the joint. The spigot end of field cut pipe lengths shall be filled, or ground to resemble the spigot end of such pipe as manufactured.

5.4.9 All joints shall be bonded to ensure a continuous flow of electric current. Either bonding straps or brass wedges (2 per joint) are allowed. On push-on joints, where possible, the conductivity connections shall be made to the bell end at the shop prior to the job site delivery and to the spigot end in the field. The conductivity connection shall be a minimum of 1/16-inch thickness by 3/4-inch width copper strips with welded and bolted connections or brass continuity wedges, minimum two per joint.

5.4.10 The pipe will be put inside of a poly tube 8-mil bag for corrosion control and 12 gauge tracer wire will be installed along the pipe for future pipe locating capabilities.

5.5 CONNECTION TO EXISTING WATER FACILITIES

All main line connections between existing and proposed piping shall be made during non-business hours or at a time that is acceptable to and coordinated with Parkville Water District. All shutoffs shall be planned 24 hours in advance and all persons affected by the shutoff shall be given a 24-hour notice. Take all precautions to prevent contamination when making connections to existing potable water lines. No trench water, mud, or other contaminating substances shall be permitted to enter the pipeline. Some connections to existing system may require "Hot Tap" type connection to avoid service interruptions, at the discretion of District Management.

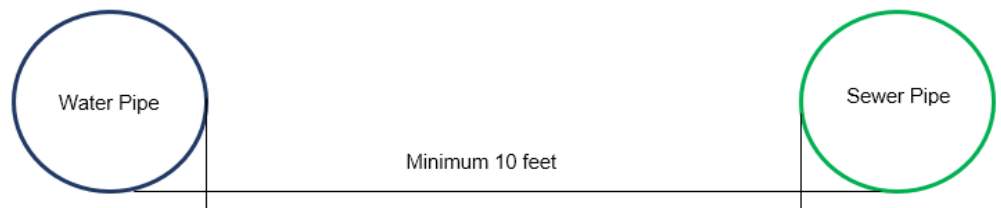
5.6 FUTURE CONNECTIONS

At intersections of new lines to old lines where the possibility may exist for a future connection, two (2) tees and two (2) valves should be provided. On dead-end runs of new lines, one (1) valve should be provided at least

40 feet back from the thrust end. This procedure allows a future connection to be made while keeping the existing main line in service at all times (**See Detail No. 4**).

5.7 PROTECTION OF WATER SUPPLIES

5.7.1 Water mains and lateral service lines shall be laid at least 10 feet laterally from existing or proposed sanitary sewers, unless local conditions or barriers prevent a 10-foot separation, in which case the water main/service line is laid in a separate trench, with the elevation of the bottom of the water main/service line at least 18 inches above the top of the sanitary sewer pipe or the water main/service line is laid in the same trench as the sanitary sewer with the water main/service line located at one side on a bench of undisturbed earth, and with the elevation of the bottom of the water main/service line at least 18 inches above the top of the sanitary sewer with District approval. The water main shall be constructed of ductile iron pipe and the sewer or the force main shall be constructed of ductile iron pipe with a minimum vertical distance of 6 inches. The water main should always be above the sewer. Joints on the water main shall be located as far apart as possible from joints on the sewer or force main (staggered joints).



5.7.2 When a proposed water main or lateral service line crosses over a proposed or existing sanitary sewer, the water main/service line shall be laid at such an elevation that the bottom of the water main/service line is at least 18 inches above the top of the sanitary sewer, unless local conditions or barriers prevent an 18-inch vertical separation, in which case both the water main and the sanitary sewer shall be constructed of push-on single gasket joint ductile iron pipe with joints that are equivalent to water main standards for a distance of 10 feet on each side of the point of crossing with District approval. All crossing shall be arranged so that the sewer pipe joints and the water main pipe joints are equidistant from the point of crossing (pipes centered on the crossing).

- 5.7.3** When a proposed water main crosses under a proposed or existing sanitary sewer, both the water main and the sanitary sewer shall be constructed of push-on single gasket joint ductile iron pipe with joints that are equivalent to water main standards for a distance of 10 feet on each side of the point of crossing. The section of water pipe shall be centered at the point of crossing. A sewer line crossing may require encasement of the sewer main according to District specifications at the discretion of District Management. (See sewer encasement Detail Drawing.)
- 5.7.4** Water mains shall be separated from septic tanks, disposal fields, and seepage beds by a minimum of 25 feet.

5.8 REACTION ANCHOR AND BLOCKING

- 5.8.1** Concrete thrust blocks shall be provided as shown in the ***Detail No. 5*** for all tees, elbows, bends, plugs, reducers, valves, fire hydrants, and crosses if one or more sides of the cross are plugged. The bearing area of the block shall be at least equal to that stated on the ***Detail No. 5***. The bearing surface shall be against undisturbed earth. The block shall be placed normal to the thrust, as shown on the Drawings.
- 5.8.2** If the concrete has not had sufficient time to cure (e.g., restoring water service), the Contractor shall be required to use temporary bracing for added strength. Use of additional wood or steel bracing shall help prevent fittings and valves from leaking and “blowing off” when water pressure is restored to the main.
- 5.8.3** Whenever a concrete thrust block is placed, wood or plastic sheets shall be used to prevent concrete from adhering to nuts and bolts. Any concrete splattered onto a nut or bolt will be removed before the line is backfilled.

5.9 SIZING OF THE MAINS

- 5.9.1** General. All water main lines shall be sized for peak hour flow plus fire flow. Minimum size shall generally be eight-inch (8”) diameter.
- 5.9.2** Special situations approved by the District water system supervisor or Engineer may be acceptable with lines smaller than eight inches (8”) in diameter, such as a short dead-end domestic service feeder with no hydrants.
- 5.9.3** Fire Flow. Generally, main lines supplying high-density commercial facilities shall be sized at a minimum of ten inches (10”) in diameter to supply 2,500 gpm at 20 psi. Water mains

supplying residential facilities shall be sized at a minimum of eight inches (8") in diameter to supply adequate fire flow.

- 5.9.4** Design Operation Pressure The design operation pressure for the District shall be a maximum of 250 psi. The minimum operating pressure at any tap shall be 60 psi; the maximum operating pressure at any tap shall not exceed 190 psi. If the pressure in a mainline is outside of standard specified operating range, a regulating device (mainline booster pump or mainline PRV, pressure relief or check valve) shall be installed.
- 5.9.5** Distribution regulating installations Regulating installations are required to control pressure, provide pressure relief, and separate pump and gravity zones throughout the distribution system. When main extension plans are submitted for review, the need for regulating installations must be approved by the District as determined by existing distribution system piping. Presently, regulating installations shall be categorized as follows: 1. Pressure Regulating Station 2. Pressure Relief Station 3. Check Valve Station 4. Booster Pump Station Location and pressure settings of main line pressure regulating devices will be reviewed by the District on a case-by-case basis.

PARKVILLE WATER DISTRICT SYSTEM Water Transmission and Distribution line
INSPECTION Checklist Used By District

DATE: _____ INSPECTOR NAME: _____
 INSPECTOR SIGNATURE: _____
 PROJECT: _____ # _____
 TIME: _____
 CONTRACTOR: _____

WEATHER: _____

PIPE MATERIAL, SIZE, GEOMETRY, & ALIGNMENT	GRADE ELEVATION-HYDRANTS, CURB STOPS, VALVE BOXES	TRACE WIRE CONTINUITY
BEDDING MATERIAL	POLY WRAP/SOIL TEST	INSULATION
BACKFILL/COMPACTION	CHLORINE LEVEL CHECKS	FIRE HYDRANT SPECIFICATION & OPERATION
SERVICE MARKERS	WATER LINE PROTECTION AT SEWER CROSSING	CORP STOP SPECIFICATION
VALVE NUT ACCESS, VALVE OPERATION	BACTERIA SAMPLE/TESTS	CORP STOP OPEN
MINIMUM BURY DEPTH, 9' OF COVER ACHIEVED	PRESSURE TESTS	SERVICE LINE SIZE & SPECIFICATION
MEGA LUGS-PIPE RESTRAINT SYSTEMS	CURB STOP OPERATION	CLEANUP, RESTORATION & REVEGETATION
BORING LOCATION & GRADE	AIR/VAC VALVE, PIPING AND VAULT	GEOTECHNICAL COMPACTION TEST REPORTS
TRACE WIRE/SPEC/LOCATION	BORING CASING, MATERIAL SIZE	FLUSH LINE

CODE:

A - CHECKED & MEETS SPECIFICATIONS FOR MATERIAL, INSTALLATION & PERFORMANCE
 B – CHECKED & DOES NOT MEET SPECIFICATIONS FOR MATERIAL, INSTALLATION OR PERFORMANCE
 N – NOT APPLICABLE OR NOT INSPECTED DURING THIS VISIT
 S – SAMPLE TAKEN, RESULTS PENDING

DETAILS/COMMENTS:

PROJECT REPRESENTATIVE: _____
 REPORT RECEIVED BY REPRESENTATIVE: _____ DATE: _____

SPECIFICATION C

WATER SERVICE LINES AND APPURTENANCES

1 SCOPE

The work covered by this specification includes all materials, labor, equipment, and miscellaneous items necessary to install all water service lines and appurtenances as specified herein for Parkville Water District. Note: The District will own and maintain that portion of the service line from the main line up to and including the curb valve. The curb valve shall be placed on the property line; however, at all times it will fall on the District side of the property line.

These Water Service Construction Specifications are intended to insure that the Services extended from the Water System is constructed so as to not adversely impact the Water System.

1.2 Scheduling Inspections

The customer shall notify the District when the Water Service is ready for inspection or Connection to the Water Main. Appointments for inspections, testing, Connection, meter inspection, Turn-on, Turn-off, or operation of Water Main valves must be scheduled with the District a minimum of two (2) business days in advance.

2 APPLICABLE STANDARDS

2.1 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI), AMERICAN WATER WORKS ASSOCIATION (AWWA)

ANSI/AWWA C800-01 - Underground Service Line Valves and Fittings.

2.2 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B88-03 - Seamless Copper Water Tube.

3 MATERIALS

3.1 General Requirements

The District follows, and all water service construction shall conform to, the CDPHE lead-free policy. The joining of dissimilar metals in water service lines is prohibited.

3.2 SERVICE PIPE

3.2.1 COPPER TUBING

Copper Water Services shall be $\frac{3}{4}$ ", 1", 1.5", or 2" diameter seamless Type K copper tubing in accordance with ASTM B88. Connections shall be compression in accordance with ANSI/AWWA C800. All shall be certified to comply with NSF/ANSI 61 Annex G, and NSF/ANSI 372. No lead solder joints shall be allowed. All copper service lines must use full lengths of tubing (i.e. for $\frac{3}{4}$ ", 100' and 40' for 2") before a splice can be installed. Installed Type K copper tubing shall be free of kinks, indentations, and damaged areas. Copper tubing must be properly reamed at all connections. Any damaged copper tubing or fittings may be rejected by the District Inspector. An appropriate size gooseneck shall be made in the Water Service at the corporation valve to prevent the Service from being pulled from the Water Main during backfill and compaction operations.

3.2.2 Polyethylene Tubing (PE)

Polyethylene tubing used for water services shall meet the requirements of AWWA C901, shall be PE4710 high density resin material and conform to ASTM 2737 standards listed for water service pipe in the latest edition of the IPC. All joints shall be brass compression grip ring type with stainless steel inserts or fused. Polyethylene tubing shall have pressure rating of 250 psi. All polyethylene service lines must use full lengths of tubing (i.e. 500' for $\frac{3}{4}$ ", and 200' for 2") before a splice can be installed. Pipe dimensions shall meet Copper Tubing Size (CTS) standards.

3.2.3 Ductile Iron Pipe

Water services greater than or equal to four (4) inches in diameter are to be constructed of ductile iron pipe, AWWA class 52, with a pressure rating of 350 psi. Services to be constructed of ductile iron pipe must be designed by a licensed engineer and construction plans must be submitted to the District for approval.

3.3 CORPORATION STOPS

Corporation stops shall be a **Ballcorp Corporation Stop** constructed of brass or bronze, 3/4-inch diameter, and manufactured in accordance with ANSI/AWWA C800-01. The inlet of the corporation stops shall be threaded cc type only. The outlet of the corporation stops shall be copper service thread for compression (or pack joint) connection, no flaring or soldering will be allowed.

3.4 SERVICE SADDLES

Service saddles shall be ductile iron with an "O" ring gasket, double strap, cc thread, 3/4-inch copper tap size, 4-inch and larger, fabricated and manufactured in accordance with ANSI/AWWA C800-01. The District will allow saddles or direct taps to be installed, provided that the proper direct tapping equipment is used. Otherwise, the District will schedule and inspect the tapping operation.

3.5 CURB STOP

Curb stops shall be ball valve type, constructed of a cast bronze body, resilient "O" ring seals, and a standard tee head operator. The inlet and outlet of the curb stop shall be a copper service thread for compression connection; no flaring or soldering will be allowed.

The Curb Stop shall be located within maximum of one (1) foot inside the property line or edge of easement and shall be easily accessible to District personnel.

3.6 CURB BOX

The curb box shall be a McDonald 1" telescoping box complete with lid with a two hole "Erie" pattern and an arch pattern base, with a standard 1/2" operating rod six feet (6') in length with the cap set 1/2" below finish grade. Swing tie measurements shall be provided for all curb stop box locations.

3.7 COUPLINGS

Couplings shall be **Ford CTS Grip Joint** compression fittings only or equivalent. No flaring or soldering will be allowed. Where possible, buried joints and couplings shall be avoided by using adequate piping length. Any buried joints or couplings must be approved by the District prior to backfilling.

Service Line Design

The alignment of the Water Service shall take the shortest, most direct route from the Water Main to the Water Meter.

4 FABRICATION AND INSTALLATION

4.1 GENERAL

- 4.1.1** All earthwork shall conform to SPECIFICATION A, EARTHWORK of this document. All service lines shall be disinfected and pressure tested as per the requirements set forth in the SPECIFICATION G, PRESSURE TESTING AND FLOW TESTING section of this document. The District must inspect all service lines before being backfilled.
- 4.1.2** Location of service lateral pipes, taps, and curb stops will be determined by the Owner and staked in the field. Swing tie measurements shall be provided for all valve boxes.

4.2 LATERAL DEPTH

Depth of cover for all service lines shall be a minimum of 9 feet. **Some locations at the outer reaches of the system will require up to 9.5 feet or more of cover. The District General Manager shall determine such locations. Maximum depth of bury shall be 14 feet.**

4.3 INSTALLATION

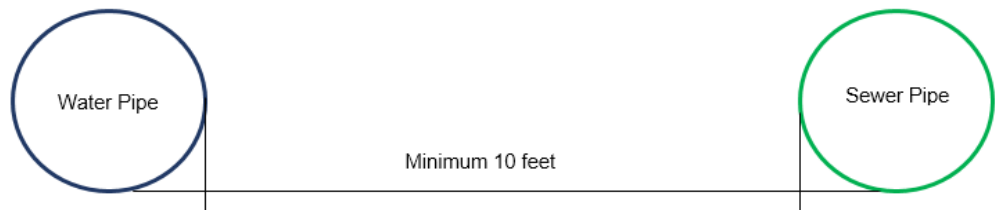
- 4.3.1** Service laterals shall be installed as shown in **Detail No. 2** and **Detail No. 3**.
- 4.3.2** ***All copper joints installed underground shall be compression, grip joint type. Flaring and brazing shall not be allowed between the corporation stop and the water meter.***
- 4.3.3** The service laterals shall be installed on top of approved bedding material with a width of not less than one foot and eight inches (1'-8").
- 4.3.4** The service lateral pipe may be "sleeved". Four-inch (4") diameter, Schedule 40 sanitary sewer pipe may also be used as a pipe sleeve for 3/4-inch service laterals.
- 4.3.5** A minimum thickness of six inches (6") of bedding material shall cover sides and bottom of the pipe and a minimum of six inches (6") shall cover the top.
- 4.3.6** A vapor barrier consisting of one layer of black polyethylene plastic at least six millimeters (6 mm) in thickness and one (1) sheet of two inch (2") thick by twenty-four inches (24") wide XPS

foam panel insulation shall be placed on top of the bedding material.

- 4.3.7** Over the vapor barrier, the pipe may be backfilled and compacted in accordance with SPECIFICATION A, EARTHWORK of this document.

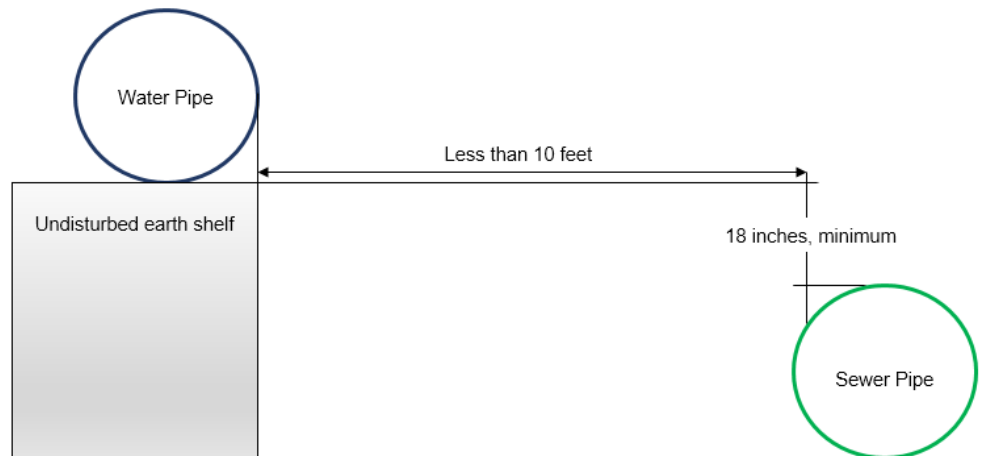
4.3.8 Separation of Services

A horizontal separation of ten (10) feet must be maintained between parallel Water and Wastewater Services. Water and Wastewater Services shall not cross



4.3.9 Horizontal Separation Exemption

In cases where it is not practical to maintain a ten foot (10') separation, the District may allow installation of the sewer pipe closer to a water pipe utilizing encasement or pressure rated joints, provided that the water pipe is on a separate trench or on an undisturbed earth shelf located on one side of the pipe and at an elevation so the bottom of the water pipe is at least eighteen inches (18") above the top of the sewer pipe.



crossing. The casing must be a single section of steel or ductile iron pipe. The design must include a means to support the interceptor or sewer main to prevent settlement and permit maintenance of the water main without damage to the sewer pipe. Alternatively, concrete or controlled low strength material (e.g., flowable fill) encasement of either pipe extending no less than 10-feet each side of the crossing may be used. Crossings involving jointless pipe such as HDPE or copper do not require installation of secondary containment.



4.3.11 Vertical Separation Exemption- Water Under Sewer

If the sewer service must cross above or over a water main, the sewer service shall be installed with secondary containment unless the vertical distance exceeds five feet (5'). Acceptable options include a pipe casing extending no less than 9-feet each side of the

crossing. The pipe casing must be of watertight material with no joints. The casing pipe materials may be steel, ductile iron, fiberglass, fiberglass reinforced polymer mortar (FRPM), or polyvinylchloride (PVC) with suitable carrier pipe supports and casing pipe end seals. Alternatively, concrete or controlled low strength material (e.g., flowable fill) encasement of either pipe extending no less than 10-feet each side of the crossing may be used. Crossings involving joint less pipe such as HDPE or copper do not require installation of secondary containment.



4.3.12 Underground Warning Tape

Underground warning tape shall be installed twenty-four inches (24") above all buried portions of the Water Service. The tape shall meet the following requirements:

- (a) Four (4) mil thick Polyethylene tape
- (b) Solid blue color with black lettering
- (c) Six (6) inches in width

4.3.13 Tracer Wire

Tracer wire on is required on all water service lines and shall be #12 AWG 0.1019" diameter copper conductor or copper clad steel insulated with a 30 mil, high-density, high molecular weight polyethylene (HDPE) insulation, blue in color, and rated for direct burial use at 30 volts. Service line tracer wire shall be connected to mainline tracer wire using approved splice connectors. If no mainline tracer wire is present, a grounding anode will be installed beneath the tapping saddle. Tracer wire shall be spliced at the curb stop, and an anode, with separate anode lead wire, installed at that location. The service line tracer shall then follow the service line and terminate at a grounding anode adjacent to the structure served.

4.3.14 Connection to Existing Curb Valve

A District Water Technician will make the connection to the existing curb valve when installing a new inside (home owner) lateral service line. If a contractor makes the connection to the existing curb valve, the contractor assumes all liability of damage caused by the connection.

A pre-construction meeting for all replacement inside (home owner) lateral service lines is required at least 48 hours before construction.

4.4 TAPPING PRESSURIZED MAINS

The District shall inspect all taps on pressurized mains. The Contractor shall perform all taps with acceptable tapping equipment approved by the District. No pressurized main with service connections will be shut down for connections except for special conditions approved by the District general manager. Taps four inches (4") and larger must have a thrust block behind the tapping tee and under the tapping valve.

4.5 TAPPING UNPRESSURIZED MAINS

The Contractor shall perform all taps on unpressurized mains (new subdivision mains) with acceptable tapping equipment approved by the District.

4.6 PERMITS

An encroachment permit for excavation in the streets, alleys and easements of the Town of Leadville must be completed prior to tapping any water pipeline. The District requires 48-hour notice prior to making taps and locating lines. Taps and locations will not be done without prior payment of the inspection fee and/or connection fee to the District.

4.7 SERVICE LINE SIZING

The Owner shall be responsible for sizing service lines. The Owner is encouraged to have a licensed engineer, plumber, or mechanical contractor size the service line. The District will not provide this service.

4.8 FLUSHING

All service lines shall be thoroughly flushed at a velocity of at least two feet (2') per second. This needs to be witnessed by the District or documented.

4.9 METERS

4.9.1 *All meters will be purchased by the customer through the District. Meter brand and type will be specified by the District.*

4.9.2 Turbo meters should be installed with five (5) pipe diameters downstream of bends, valves, PRV's, check valves, or any other fitting that causes turbulence.

4.9.3 All meters shall be installed inside the building in a horizontal position with a suitable holding device to support piping, meter and provide electrical bond when the meter is taken out for testing. Meter installations 1 ½ inch and larger shall include bypass valves and pipe to maintain service during repairs.

4.9.4 The meter and pressure-reducing valve shall be installed in the building where they will not freeze. The remote readout shall be installed on an outside wall at least six feet (6') above grade where it is freely accessible and where falling, blowing, melting, or plowed snow will not cover it.

4.9.5 A water department representative must inspect the water meter after it is installed and before the Certificate of Occupancy is issued.

4.10 PRESSURE REDUCING VALVES (PRV'S)

4.10.1 A pressure reducing valve (PRV) shall be installed on all water service lines, at the customer's expense. PRV's shall be installed upstream of the meter on one-inch (1") and three-quarter-inch (3/4") diameter meters only. PRVs shall be installed downstream of the meter for pipe with a diameter of one and one-half inch (1½") or greater.

4.10.2 The PRV shall be installed such that the strainer and cleanout plug is easily accessible.

4.10.3 The downstream pressure on the PRV is to be set at 40 to 75 psi. unless otherwise specified by the District.

4.11 CROSS CONNECTION CONTROL

- 4.11.1** All building plans must be submitted to the local plumbing official and approved prior to issuance of water service. All plumbing plans will include an approved backflow prevention device.
- 4.11.2** Approved backflow prevention assemblies shall be installed on all commercial, industrial, and mixed usage properties, and fire sprinkler systems to protect the domestic water system from potential cross-connection contamination.
- 4.11.3** By law, residential properties are required to have backflow prevention assemblies. If the residential property does not contain hazards to the public water supply, which hazards include, but are not limited to, home photo labs, solar power systems connected to the potable water systems, and auxiliary wells, the District does not require Device Inspection Reports.

Service Line Installation Inspection Checklist Used by District

Address: _____

Name of Contractor or Installer: _____

Type:

Commercial

Residential

Size:

$\frac{3}{4}$ "

1"

1.5"

2"

Pipe Type:

K Copper

Other

Corp Stop:

Parkville Supplied and Installed
Installed

Parkville Supplied

Contractor

Curb Stop:

Parkville Supplied and Installed
Installed

Parkville Supplied

Contractor

Service Line Depth:

9'

Less than 9'

Actual Depth _____

Bedding Material:

Gravel

Pea Gravel

Sand

Other

Vapor Barrier and Insulation:

6mm Plastic Vapor Barrier

2" Min. Styrofoam Insulation

Acceptable Installation
Unacceptable

Acceptable With Notes

Notes: _____

Inspector's Name _____

Inspector's Signature _____

Date: _____

SPECIFICATION D

FIRE PROTECTION FACILITIES

1 SCOPE

This specification shall include furnishing all materials, labor, equipment, and miscellaneous items necessary to install fire hydrants as specified herein for the District.

2 APPLICABLE STANDARDS

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI), AMERICAN WATER WORKS ASSOCIATION (AWWA)

ANSI/AWWA C502-94 - Dry Barrel Fire Hydrants

3 FIRE HYDRANT MATERIALS

3.1 All fire hydrants shall be dry barrel, traffic model type with a breakaway flange, manufactured in accordance with ANSI/AWWA C502-94.

3.2 Fire hydrants shall be:

**3.2.1 "Waterous" WB 67 Pacer
Mountain Specification 250**

3.3 Other brand or model hydrant may be allowed only when approved by District Management.

3.4 The outlets for the hydrants shall consist of one, 4½-inch N.S.T., pumper nozzle and two, 2½-inch N.S.T., hose nozzles. Outlet nozzle threads shall be ANSI/NFPA 1963 and outlet nozzle cap chains shall be required.

3.5 The hydrant shall be sized at 5¼-inch valve opening or greater, bronze-to-bronze seating, and a compression type shut off.

3.6 The fire hydrant shall be constructed with a one-inch (1") square national standard operating nut, opening in a clockwise (right) direction. A weather cap shall be supplied for the operating nut.

3.7 The bonnet section shall be designed so all bearing surfaces and stem threads are sealed in a lubricant reservoir. If oil is used as a lubricant, the reservoir shall be designed to allow for easy filling through a fitting or plug. Where grease is used as a lubricant, the reservoir will be sealed. The reservoir will be adequately sealed with "O" rings or other suitable sealing system approved the Parkville Water Department.

- 3.8 The fire hydrant shall be furnished with pipe and tee, 6-inch restrained mechanical-joint gate valve, and thrust blocks. Hydrant shall be restrained to the hydrant tee by $\frac{3}{4}$ -inch threaded rods protected from corrosion by the use of an approved bituminous coating.
- 3.9 The fire hydrant shall have a safety flange or breakaway flange at the ground line at stipulated in Section 3.1 General Design of ANSI/AWWA C502-94 or latest revision thereof.
- 3.10 The fire hydrant shall be painted international yellow with epoxy paint.

4 INSTALLATION

4.1 FIRE HYDRANT DEPTH

Depth of cover for all hydrants shall be a minimum of nine feet (9'). ***Some locations at the outer reaches of the system will require up to nine and a half feet (9.5') of cover. The District General Manager shall determine such locations.***

4.2 LOCATION

Fire hydrants shall be located whenever possible at an intersection and in a public right-of-way or a utility easement. Use of public right of way and utility easements will be allowed only after proper approval by all appropriate agencies. There shall be a minimum of one and one-half feet (1½') between outlet nozzle and back of curb or sidewalk. The minimum clearances around all fire hydrants shall be: ten feet (10') in the front, seven feet (7') on the sides, four feet (4') on the back and twenty (20') above. No form of obstruction will be allowed within the hydrant clearance area. In all cases, hydrants shall be located out of the direct flow of pedestrian and vehicular traffic. Wherever possible, hydrants located consecutively along a street shall be placed on opposite sides of the street so that stringing fire hoses across a street during a fire can be kept to a minimum. Hydrants shall be placed at all intersections, at end of cul-de-sacs, and at all dead end runs. Specific hydrant location will also be approved by the Leadville/Lake County Fire Chief.

4.3 HYDRANT SPACING

The Leadville-Lake County Fire Department and the District Engineer shall determine the spacing of fire hydrants. Fire hydrants shall be located at 300-foot intervals, at all intersections and at the end of all cul-de-sacs over 150 feet in length. The Fire Department may adjust distances depending upon special circumstances. The Uniform Fire Code requires a fire hydrant when any portion of a building is in excess of 150 feet from a water supply on a public street.

4.4 INSTALLATION

4.4.1 Immediately prior to installation of a hydrant, the following operations shall be performed:

4.4.1.1 The hydrant shall be thoroughly inspected.

4.4.1.2 The hydrant interior shall be thoroughly cleaned.

4.4.1.3 The hydrant shall be opened and closed as many times as may be necessary to determine if all parts are in proper working order, with valves seating properly and the drain valve operating freely.

4.4.1.4 The packing gland shall be checked to determine if the packing is in place and the gland nut properly tightened.

4.4.2 Hydrants shall be installed according to ANSI/AWWA C502-94 and as shown in **Detail No. 6**.

4.4.3 Hydrants shall be set so that at least the minimum pipe cover is provided for the branch supply line. All hydrants must be extended so the top of the hydrant is four feet (4') above finished grade. The breakaway flange shall be located three inches (3") above finished grade. If the previous mentioned conditions are not met after the hydrant is installed and the street is at final grade, the hydrant must be brought to proper grade by installing extensions or other modifications as required. All hydrants shall stand plumb. Hydrants shall have hose nozzles parallel with, and the pumper nozzle perpendicular to, the curb line. All hydrants that are not in service shall be bagged.

4.4.4 All fire hydrants shall be connected to the main line by means of a mechanical joint tee with 6-inch Class 52 ductile iron pipe branch piping to the hydrant. Each fire hydrant shall have a 6-inch valve on the branch pipe. The 6-inch gate valve shall not be located in the sidewalk, curb line, or gutter of the proposed street and shall be rodded to the main tee.

4.4.5 The hydrant and main line tee shall be provided with concrete reaction blocks that are suitably anchored. Care will be taken not to cover weep or drain holes with concrete when setting reaction blocks.

4.4.6 All minimum of one-third cubic yard of ½-inch to one inch (1") cleaned, crushed rock shall be placed under the weep-hole outlet to assure proper drainage. The granular fills shall be placed on suitably prepared subgrades and compacted by vibration.

4.5 HYDRANT MARKERS

A hydrant marker of approved brand and type will be required on hydrants that are located outside of paved or concrete areas.

4.6 TESTING AND INSPECTION

- 4.6.1** Each assembled hydrant shall be subjected to two shop tests under a hydrostatic pressure of 300 psig or twice the rated working pressure, whichever is greater. One test shall be made with the entire interior of the hydrant under pressure and another test made with the main valve closed and the base under pressure from the inlet side. Under the test procedure, there shall be no leakage through the main valve or seals or through the castings or the joints of the assembled hydrant. Under the test conditions, the leakage through the drain valves shall not exceed 5 fl. oz/min. Other leakage or other imperfections found in either test shall be corrected and the hydrant retested. The tests shall be conducted for a sufficient time to allow a check of all points of possible leakage and for a minimum of 30 seconds after all air has been exhausted.
- 4.6.2** Each assembled hydrant shall be operated through a full open-close cycle when not under pressure. The torque required for performing this operation shall not exceed 20 ft-lb.
- 4.6.3** All fire hydrant tests and inspections shall conform to ANSI/AWWA C502-94 Section 5.1 Production Testing, ANSI/AWWA C502-94 Section 5.2 Prototype Testing, and ANSI/AWWA C502-94 Section 5.3 Inspection and Rejection.
- 4.6.4** Prior to backfilling around the hydrant, a visual test shall be conducted to ensure the proper operation of the weep holes. The hydrant shall be partially opened and then closed. Water trapped in the hydrant barrel section should begin to drain. If water is not draining, then the well holes should be cleared of any obstructions restricting the flow of water. Inspect the main valve bottom nut for proper tightness before backfilling.
- 4.6.5** The manufacturer shall provide an Affidavit of Compliance conforming to Section 1.7 Affidavit of Compliance of ANSI/AWWA C502-94 or latest revision thereof.

SPECIFICATION E

VALVES & APPURTANCES

1 SCOPE

This section includes furnishings all materials, labor, equipment, and miscellaneous items necessary to install gate valves, butterfly valves, air and vacuum valves, and valve boxes as specified herein for Parkville Water District.

2 APPLICABLE STANDARDS

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI), AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA M44 - Distribution Valves: Selection, Installation, Field Testing, and Maintenance

ANSI/AWWA C504-00 - Rubber-Seated Butterfly Valves

ANSI/AWWA C507-99 - Ball Valves, 6 In. Through 48 In. (150 mm Through 1,200 mm)

ANSI/AWWA C509-01 - Resilient-Seated Gate Valves for Water Supply Service

ANSI/AWWA C550-01 - Protective Epoxy Interior Coatings for Valves and Hydrants

ANSI/AWWA C800-01 - Underground Service Line Valves and Fittings

3 RESILIENT SEAT GATE VALVES

3.1 MATERIALS

3.1.1 Resilient seat gate valves shall be manufactured in accordance with ANSI/AWWA C509-01. They shall consist of an iron body and a bronze stem resiliency gate valve. The valve shall be encapsulated inside and out with epoxy coating, lubricant free, and have no obstructions through the port to minimize flow.

3.1.2 The valve shall have a pressure rating of 200 psi. If existing line pressure exceeds 200 psi, a Class 250 double disk gate valve shall be provided.

3.1.3 The wrench nut on the valve shall be 2-inch square and open by turning left (counter clockwise).

3.1.4 Gate valves that are buried or submerged shall be non-rising stem type with O-ring stem seals. Buried gate valves shall be provided with valve boxes and shall be installed as shown in **Detail No. 7**.

3.1.5 Valve stem extensions and rings shall be provided on all buried gate valves.

3.2 LOCATION

Whenever possible, water main valves shall be located at street intersections. Valves must be placed on all runs of a tee or cross. For instance, each cross shall have four (4) valves located at the intersection, while tees shall have three (3) valves located at the intersection. Valves shall be located 40 feet before the end of all dead-end intersections for future connections, without service connections in the 40-foot interval.

3.3 VALVE SPACING

Valves on cross-connecting or looped mains shall be spaced such that no single break shall require more than 500 feet of line to be out of service at one time. At all locations where distribution mains connect to transmission mains a valve must be supplied at the tie-in.

3.4 INSTALLATION

All gate valves shall be installed with the 2-inch operating nut plumb and true and centered within the valve box. District personnel will inspect the valve and valve box after installation to ensure that a valve key can easily be set on the operating unit.

4 BUTTERFLY VALVES

4.1 Butterfly valves shall be manufactured in accordance with ANSI/AWWA C504-00. The valve shall be a rubber seated, tight closing type. Both ends of the valve shall be mechanical joint unless installed in valve vaults. The valve body shall be high strength cast iron ASTM A 125 Class B with 18-8 type 304 stainless steel body seat.

4.2 The valve shall have a rated working pressure of 200 psi (Class 150B). If existing line pressure exceeds 200 psi, a Class 250B or equal shall be used.

4.3 The valve operator shall be of the traveling nut type, sealed, gasketed and lubricated for underground service. Operating nut shall be 2-inch square and shall open left (counter clockwise). A valve position indicator shall be provided on each exposed operator and on each operating nut on an extension stem. Butterfly valves shall be installed as shown in **Detail 8**.

5 AIR RELEASE AND VACUUM VALVES

5.1 MATERIALS

Air release and vacuum valves shall be constructed of a cast iron body with a stainless steel float, and a Buna-N seat. The valve shall have a pressure rating of 200 psi.

5.2 LOCATION

Air release, vacuum valves or combination air release valves shall be installed to permit efficient filling or draining of long pipelines. In addition, they should provide protection against vacuum and shall continuously vent pockets of air accumulated in the pipeline. The type of valve shall depend upon the intended use of operation. Generally, combination air release and vacuum relief valve assemblies shall be installed at each high point on all water mains. Air release vacuum valves shall be provided with proper back flow prevention equipment when direct above surface venting is not provided.

5.3 INSTALLATION

Each valve assembly shall be installed in a concrete vault complete with appurtenant piping.

6 EXTENSION STEMS

6.1 GENERAL

Extension stems shall be provided for buried gate valves when the valve operator is four feet (4') or more below finished grade.

6.2 MATERIALS AND INSTALLATION

Extension stems shall be of solid steel and shall be not smaller in diameter than the stem of the operator shaft. Extension stems shall be connected to the valve operator with Hooke's type universal joints. All stem connections shall be pinned.

Each extension stem for a buried valve shall extend to within six inches (6") of the ground surface, shall be provided with spacers, which will center the stem in the valve box, and shall be equipped with a wrench nut.

7 VALVE BOXES

7.1 MATERIALS

All buried valves shall be provided with valve boxes. Valve boxes shall be of cast iron, three-piece adjustable screw-type, suitable for depth of cover required by the drawings. Valve boxes shall be 6-inch diameter, shall have a minimum thickness of any point of 3/16-inch, and shall be provided with suitable cast iron bases designating the service for which the valve is used. All parts of valve boxes, bases, and covers shall be coated by dipping in bituminous varnish. Valve boxes shall be of the following pattern.

7.1.1 For Gate or Butterfly valves, the valve boxes shall be screw type, 6-inch diameter cast iron with oval base.

7.1.2 For Curb stops the valve box shall be Buffalo type, with a 5-foot extension.

7.2 INSTALLATION

Valve boxes shall be installed plumb and true, and centered over the 2-inch operating nut. Bricks shall be placed under the flange of the valve box bottom so that at no time loadings on the valve box will be transmitted to the valve. Valve box lid shall be placed 1/2-inches to 1/4-inches below grade when located in asphalt or concrete and six inches (6") below grade in gravel roads. After being placed in proper position, earth shall be filled in around each valve box and thoroughly tamped in each side of the box. Swing tie measurements will be provided to the District, for all valve boxes

For valves that fall outside of road pavement and shoulders, a six-foot long, green "safe-hit" marker shall be installed with a valve decal at the top.

SPECIFICATION F

DISINFECTION, FLUSHING, AND TESTING

1 SCOPE

The work covered by this specification consists of furnishing all materials, labor, equipment, and miscellaneous items necessary to disinfect all raw water, potable water transmission and distribution pipelines, service lines, and appurtenances as specified herein for the District.

2 APPLICABLE STANDARDS

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA B300-99 - Hypochlorites.

AWWA B301-99 - Liquid Chlorine.

AWWA C600-99 - Installation of Ductile Iron Water Mains and Their Appurtenances.

AWWA C651-99 - Disinfecting Water Mains.

3 SUBMITTALS

The Contractor shall submit the following documents to the Engineer.

3.1 Disinfection report inclusive of the following information:

- Type and form of disinfectant used.
- Date and time of disinfectant injection start and time of completion.
- Test locations.
- Initial and 24-hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
- Date and time of flushing start and completion.
- Disinfectant residual after flushing in ppm for each outlet tested.

3.2 Bacteriological report inclusive of the following information:

- Date issued, project name, and testing laboratory name, address, and telephone number.
- Time and date of water sample collection.
- Name of person collecting samples.
- Test locations.
- Initial and 24-hour disinfectant residuals in ppm for each outlet tested.
- Coliform bacteria test results for each outlet tested.
- Certification that water conforms, or fails to conform, to bacterial standards of Colorado Department of Health.

4 MATERIALS

4.1 Liquid Chlorine may be used and shall conform to AWWA B301-99.

4.2 Hypochlorite may be used and shall conform to Federal Specification O-C-114, Type II, Grade B, and AWWA B300-99.

5 FLUSHING AND DISINFECTION

5.1 GENERAL

Potable water lines shall be flushed and disinfected in accordance with the procedures set forth in AWWA C651-99 and the local health authority having jurisdiction. The chlorination of the pipeline shall be done prior to hydrostatic testing and the pipe shall be cleaned to the satisfaction of the District Representative prior to disinfection.

5.2 PIPE CLEANING.

If the pipe contains dirt or heavy encrusted matter that in the opinion of the District representative or Engineer will not be removed during the flushing operation, the Contractor shall clean and swab the interior of the pipe with five percent (50,000 ppm) chloride solution.

5.3 PRELIMINARY FLUSHING

The pipeline shall be flushed prior to disinfection to remove all remaining foreign material. The flushing operation shall develop a minimum velocity of 2.5 feet per second.

5.4 DISINFECTION

In general, chlorine shall be applied using the continuous feed method. However, on large diameter lines where this would not be practical, the slug method may be used.

5.4.1 CHLORINE APPLICATION

5.4.1.1 Continuous Feed Method. Water shall be introduced into the line at a constant rate while adding chlorine at a minimum concentration of 50 mg/liter. Chlorinated water shall be maintained in the pipeline for a minimum of 24 hours after which period the treated water shall contain no less than 25 mg/liter of chlorine throughout the entire length. This procedure shall be repeated if the residual at the end of 24 hours fails to meet the minimum concentration.

5.4.1.2 Slug Method. Water shall be introduced with a minimum chlorine concentration of 300 mg/liter at a constant measured rate into the pipeline. The chlorine shall be applied for a sufficient length of time to develop a solid column or slug of chlorinated water that will, as it passes along the line, expose all interior surfaces for a period of three (3) hours. The application shall be checked at the upstream end of the line.

5.4.2 All valves in the lines being sterilized shall be opened and closed several times during the contact period.

5.4.3 The sterilization and chlorine residual test shall meet with the approval of the Health Department Sanitarian.

5.4.4 The Contractor shall submit a Disinfection Report to the District Representative or Engineer.

5.5 FINAL FLUSHING

After the required retention period, flush with clean water all heavily chlorinated water from the main until the chlorine concentration is no higher than that prevailing in the system, or less than 1 mg/liter. Once the main line has been properly flushed, service lines shall be flushed at the curb stop. Care shall be taken in flushing the pipeline to prevent property damage and danger to the public. Water with high chlorine content shall not be flushed into sewers or creeks unless necessary precautions as established by the Engineer are taken. All flushing shall be according to the state health requirements. All measures will be taken to prevent flushing of mains into the ditch line. If water is flushed into the

ditch line, all material will be dug out, backfilled, and compacted with dry material.

5.6 BACTERIOLOGIC TESTS

After completion of the final flushing and prior to placing the pipeline in service, samples shall be collected from the end of the pipeline and tested for bacteriologic quality to show the absence of coliform organisms. The number and frequency of samples shall conform to the requirements of the public health authority having jurisdiction but in no case shall the number be less than one (1) for chlorinated supplies.

5.7 REPETITION OF PROCEDURE

If the original disinfection fails to produce satisfactory samples, the disinfection procedure shall be repeated until satisfactory results are obtained.

SPECIFICATION G

PRESSURE TESTING AND FLOW TESTING

1 SCOPE

The work covered by this specification consists of furnishing all materials, labor, equipment, and miscellaneous items necessary to perform pressure, leakage, and flow tests as specified herein for the District.

2 APPLICABLE STANDARDS

AMERICAN WATER WORKS ASSOCIATION (AWWA)

ANSI/AWWA C600-99 - Installation of Ductile Iron Water Mains and Appurtenances.

3 GENERAL

All waterlines shall be subjected to pressure and leakage tests as specified herein, and performed in accordance with AWWA C600-99.

The pressure and leakage tests shall be made after all pipe laying and backfilling work has been completed. All concrete reaction blocks and bracing or restraining facilities shall be in place at least 14 days before the initial filling of the line, except where tension joints are used at bends.

4 TEST SPECIFICATIONS

The pressure and leakage tests may be applied to the entire line and end plugs. The Contractor shall be solely responsible for any and all damage to the pipeline, and to public and private property, which may result from defective material or workmanship.

5 FILLING AND VENTING

The section of line to be tested shall be slowly filled with water and all air expelled from the pipe. Care shall be taken that all air valves are installed and open in the section being filled, and that the rate of filling does not exceed the venting capacity of the air valves.

6 TEST EQUIPMENT AND FACILITIES

The Contractor shall perform the necessary work to fill the pipeline with test water, as specified. The Contractor shall furnish all pumping equipment, water meter, pressure gauge, and other equipment required for the tests.

Test pressures shall be applied by means of a force pump of such design and capacity that the required pressure can be applied and maintained without interruption for the duration of each test.

The water meter and pressure gauge shall be accurately calibrated and shall be subject to the approval of the District representative.

7 PRESSURE AND LEAKAGE TEST

7.1 The District or its Engineer shall supervise all testing at the expense of the Contractor.

7.2 All pipe shall be subject to a test pressure of at least 1.5 times the working pressure at the point of testing. At the highest point in any section the test pressure shall not be less than 1.25 times the working pressure at that point. The pressure test shall be conducted for two (2) hours, and the pressure shall not vary +/- five psi. The test pressure shall, under no circumstances, be in excess of the design pressure for the pipe or thrust restraint. The specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. The specified test pressure shall be applied and maintained by continuous pumping if necessary for the entire test period. The pump suction shall be in a graduated barrel or similar device to measure the amount of water required to maintain the test pressure. All water used in testing the pipelines shall be taken from the existing system

7.3 The leakage test and the pressure test shall be conducted in conjunction with each other, with the allowable leakage as follows:

Allowable Leakage per 1,000 Feet of Pipe (gph) *				
Test Pressure (psi)	Pipe Diameter (inches)			
	6	8	10	12
150	.55	.74	.92	1.1
200	.64	.85	1.06	1.28
250	.71	.95	1.19	1.42
300	.78	1.04	1.3	1.56
350	.84	1.12	1.4	1.69
400	.9	1.2	1.5	1.8
* For pipe with 18-ft nominal lengths. To obtain the recommended allowable leakage for pipe with 20-ft nominal lengths, multiply the leakage calculated from the table by 0.9.				

7.4 Where the leakage test shows a leakage rate in excess of the permissible maximum, the Contractor shall make all necessary surveys in connection with the location and repair of leaking joints to the extent required to reduce the total leakage to an acceptable amount.

All joints in piping shall be watertight and free from visible leaks during the prescribed tests. Each and every leak which may be discovered at any time prior to the expiration of one (1) year from and

after the date of acceptance of the work shall be located and repaired by and at the expense of the Contractor, regardless of any amount that the total line leakage rate during the specified leakage test may be below the specified maximum rate.

8 FLOW TEST

The District shall conduct a fire flow test out the hydrants after the pressure test is completed to gather data and verify that the system meets required fire flow and design criteria.

Requirements for Contractor Checklist for New Water Line Inspection

The Contractor is required to have all applicable tasks completed before calling the District for an inspection.

Failure to meet these requirements may be subject to a \$169 Re-inspection fee.

- ☐ 1. The trench shall be adequately benched or shored, and the safety of workers provided for as required by the most recent standards adopted by OSHA. The District inspector reserves the right to refuse to inspect if all applicable OSHA standards are not met or if they feel unsafe in any way.
- ☐ 2. All pipe material, fittings, and appurtenances shall comply with the material specifications listed in Parkville Water District Construction Specifications.
- ☐ 3. New taps on existing mains are made by District personnel.
- ☐ 4. Taps must be a minimum of 18" apart and at least 18" from the nearest bell and spigot joint.
- ☐ 5. Water Services shall be buried a minimum of nine (9) feet and a maximum of thirteen (13) feet below the ground surface. If minimum bury depth cannot be achieved, additional insulation is required.
- ☐ 6. The Curb Stop shall be located a maximum of one (1) foot within the property line or edge of easement and shall be easily accessible to District personnel.
- ☐ 10. At least ten (10) feet of horizontal separation must be maintained between parallel Water and Wastewater Services. District authorization must be obtained to install Water and Wastewater Services with less than ten (10) feet of horizontal separation. Water and wastewater service lines shall not cross.
- ☐ 11. The trench shall be excavated so that a minimum clearance of six inches (6") shall be maintained on each side of the pipe for proper placement and compaction of the bedding or backfill material.
- ☐ 12. Bedding material shall consist of uniformly graded granular material, 3/8-inch or 3/4-inch minus screened rock material, laid six (6) inches below and twelve (12) inches above the service pipe.
- ☐ 13. Tracer wire on is required on all water service lines and shall be #12 AWG 0.1019" diameter copper conductor or copper clad steel insulated with a 30 mil, high-density, high molecular weight polyethylene (HDPE) insulation, blue in color, and rated for direct burial use at 30 volts. Service line tracer wire shall be connected to mainline tracer wire using approved splice connectors. If no mainline tracer wire is present, a grounding anode will be installed beneath the tapping saddle. Tracer wire shall be spliced at the curb stop, and an anode, with separate anode lead wire, installed at that location. An at-grade tracer wire access box shall be installed adjacent to the curb box. The service line tracer shall then follow the service line and terminate at a grounding anode adjacent to the structure served.
- ☐ 14. Underground Warning Tape shall be installed twenty-four inches (24") above all buried portions of services. The tape shall meet the following requirements: Five (5) mil thick Polyethylene tape, solid green (sewer) or blue in color (water), respectively, with black lettering, six (6) inches in width.
- ☐ 15. No Services shall be covered with bedding material or backfill without the District Inspector's approval. All portions of the Service must be visible to the District Inspector for an inspection to be completed.

Pre-Construction Meeting Checklist for Water Line Installation

An in-person meeting with a District Distribution Technician is required before construction can start.

- ☐ 1. Customer Notification
- ☐ 2. All licenses and permits are secured for work.
- ☐ 3. A bill of materials has been provided and reviewed.
- ☐ 4. Site Safety
 - ☐ OSHA safety standards and practices apply.
- ☐ 5. Survey
- ☐ Survey layout is complete and surveyor retained for as-built locations.
- ☐ 6. Minimum Depth of Bury and Bedding Nine to Thirteen (9'-13')
- ☐ In cases where minimum bury depth cannot be achieved, one inch (1") of approved insulation will be required per foot of missing cover, minimum 2 inches.
 - ☐ Six inches (6") of approved bedding material under the pipe and twelve inches (12") over the top of pipe.
- ☐ 7. Cutting of Pipe. All cuts will be straight, true and beveled. All burrs will be removed from the ends of cut pipe and the ends lightly rasped or filed.
- ☐ 8. Tracer Wire and Joint Bonding
 - ☐ Tracer wire *#12 AWG 0.1019" diameter copper conductor or copper clad steel insulated with a 30 mil, high-density, high molecular weight polyethylene (HDPE) insulation, blue in color, and rated for direct burial use at 30 volts. Tracer wire will be installed on all water mains and service lines.
 - ☐ The Applicant shall submit plans for a complete tracer wire system.
 - ☐ All new mainline trace wire installations shall be located by the applicant using typical low frequency (512Hz) line tracing equipment, witnessed by the inspector, contractor, engineer and facility owner as applicable, prior to acceptance of ownership.
 - ☐ Tracer wire grounding anode at all dead ends
 - ☐ Tracer wire splicing/connections shall include two and 3 way lockable connectors or a three way lug connector specifically manufactured for use in underground trace wire installation
 - ☐ A No. 4 conductor and cad-welds or continuity straps will be used to bond each joint and fitting.
- ☐ 9. Marking Tape and Locating Disk
 - ☐ Marking tape will be placed twenty-four inches (24") above the pipe for all main and service lines. Marking tape shall be solid blue color with black lettering six inches (6") wide and of five (5)-mil thick PVC material.
 - ☐ A 3M disk marker will be placed at all service curb stops with a maximum four foot (4') bury from finish grade
- ☐ 10. Thrust Blocks and Anchors
 - ☐ Concrete thrust blocks and anchors will be used in conjunction with mechanical joint restraints. All mechanical joints require megalugs. Thrust blocks will be poured and formed per District specifications and inspected by the District inspector prior to backfill.
- ☐ 11. Fire Hydrants

- ☐ 12. Testing
- ☐ Allow a minimum of five (5) days for testing for each test segment; 24 hours for high and low chlorine tests, two consecutive sets of bacteriological tests taken 24 hours apart and hydrostatic pressure testing of mains and required assets. Main lines will be disinfected and bacteriological samples approved prior to hydrostatic pressure tests. Disinfection must be per ANSI/AWWA C651 using calcium hypochlorite granules, not tablets. The contractor is responsible for disposal of chlorinated water used for disinfection. No main, which has been disinfected and flushed, shall stand stagnant for more than 15 days without being re-flushed and a new disinfecting test performed, passed, and approved by the District.
- ☐ 13. Tapping and Service Lines
- ☐ Service lines will not be tapped until the main has passed all testing procedures.
- ☐ Service lines will be tapped above the spring line of the pipe (10 or 2 o'clock position)
- ☐ 14. Valve and Curb Stop Boxes
- ☐ All curb stop boxes will require extension rods.
- ☐ The top of the shaft will be between 18 and 24 inches below final grade.
- ☐ All valve boxes are to be centered and plumb over the operating nut.

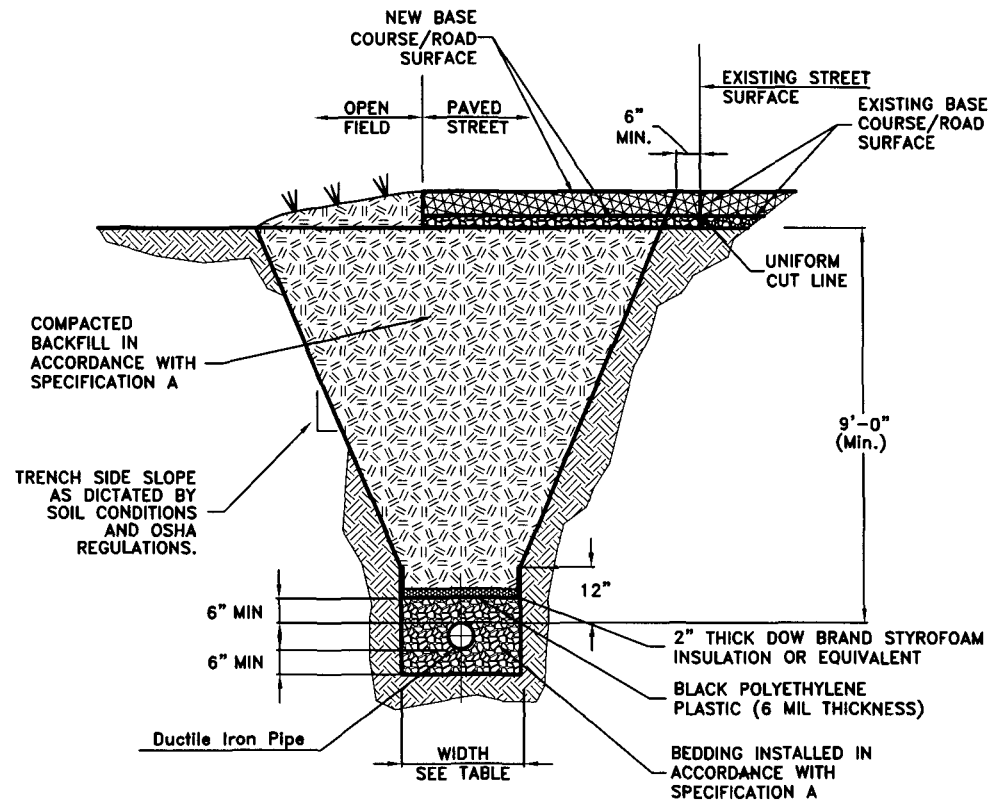
**STANDARD
SPECIFICATION
MANUAL**

**PREPARED FOR
PARKVILLE WATER DISTRICT**

W. W. Wheeler and Associates, Inc.
Water Resources Engineers
3700 South Inca Street
Englewood, Colorado 80110

W. W. Wheeler and Associates

NOTE:
OWNER RESPONSIBLE FOR REPLACING
BASECOURSE AND ROAD SURFACE



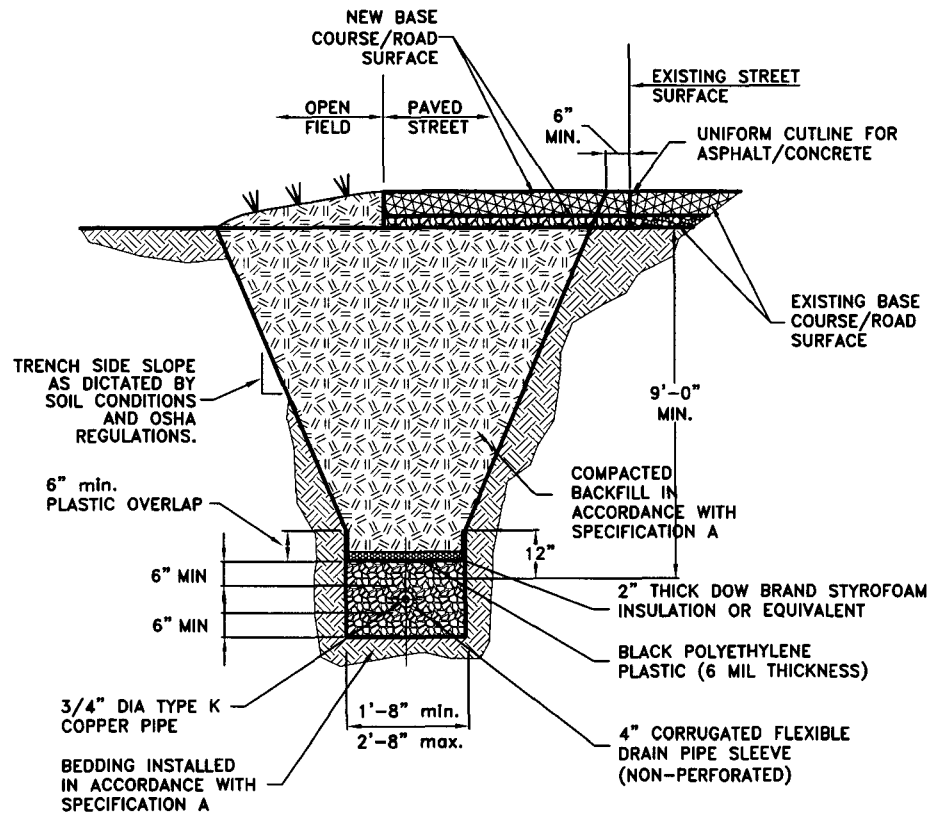
PIPE DIAMETER	MINIMUM WIDTH	MINIMUM WIDTH
4"	1'-4"	2'-4"
6"	1'-6"	2'-6"
8"	1'-8"	2'-8"
12"	2'-0"	3'-0"
16"	2'-8"	3'-4"

**① WATER DISTRIBUTION MAIN
TYPICAL TRENCH SECTION**

August 2007	W. W. Wheeler and Associates, Inc. Water Resources Engineers	
	Parkville Water District Leadville, CO Standard Spec. Detail	
	Job Number 568	Detail No. 1

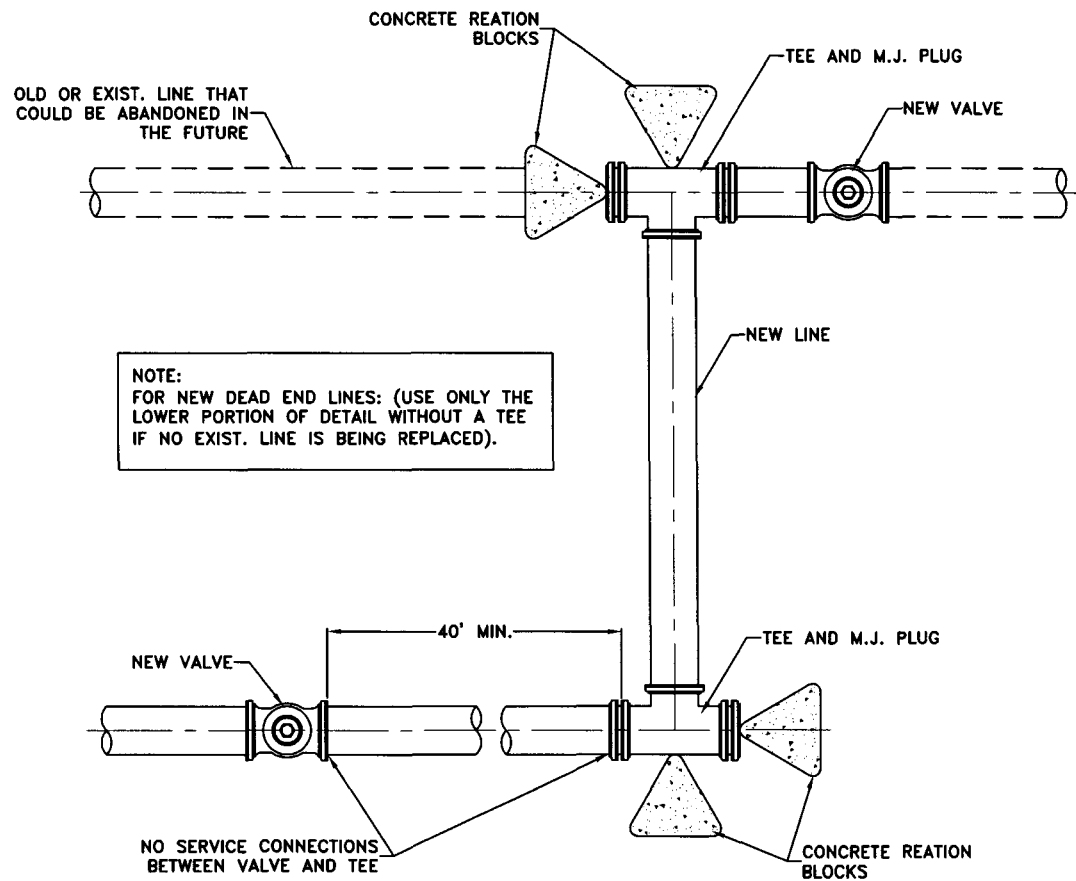
NOTES:

- 1) OWNER RESPONSIBLE FOR REPLACING BASE COURSE AND ROAD SURFACE
- 2) WOODEN PIPE CRADLE TO BE FABRICATED FROM SAWN TIMBER PONDEROSA PINE. THE MINIMUM GRADE SHALL BE "CONSTRUCTION".



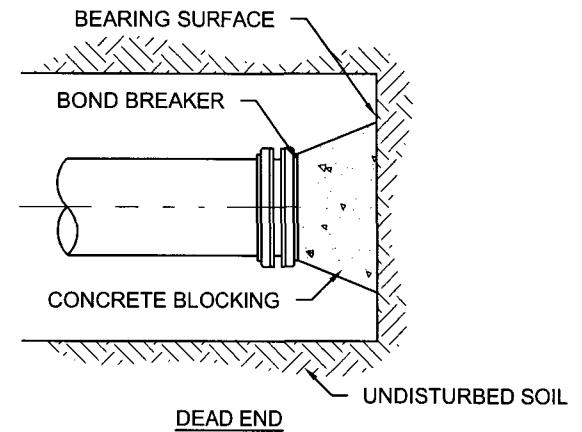
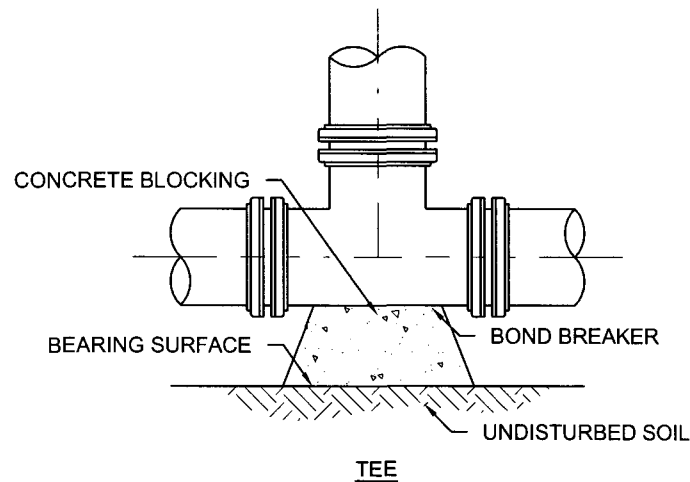
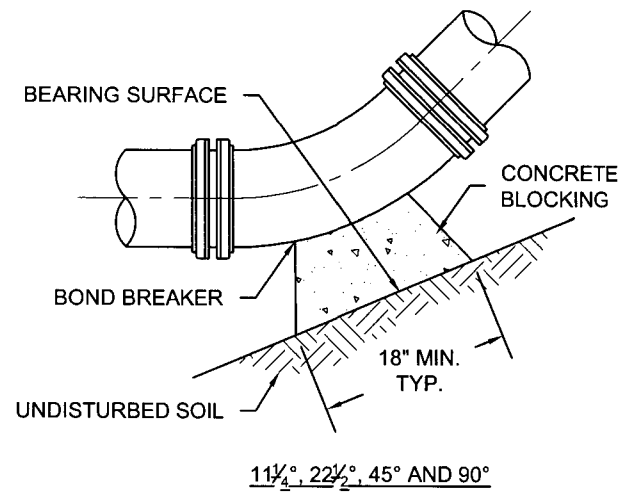
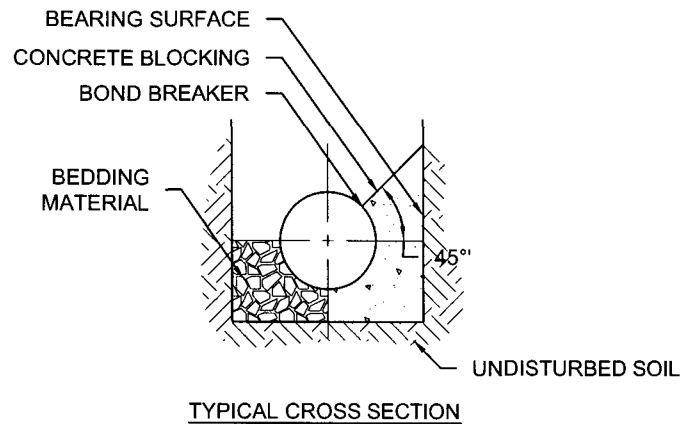
**② SERVICE LATERAL
TYPICAL TRENCH SECTION**

August 2007	 W. W. Wheeler and Associates, Inc. Water Resources Engineers	
	Parkville Water District Leadville, CO Standard Spec. Detail	
	Job Number 568	Detail No. 2



④ CONNECTION TO EXISTING MAIN

August 2007	 W. W. Wheeler and Associates, Inc. Water Resources Engineers	
	Parkville Water District Leadville, CO Standard Spec. Detail	
	Job Number 568	Detail No. 4

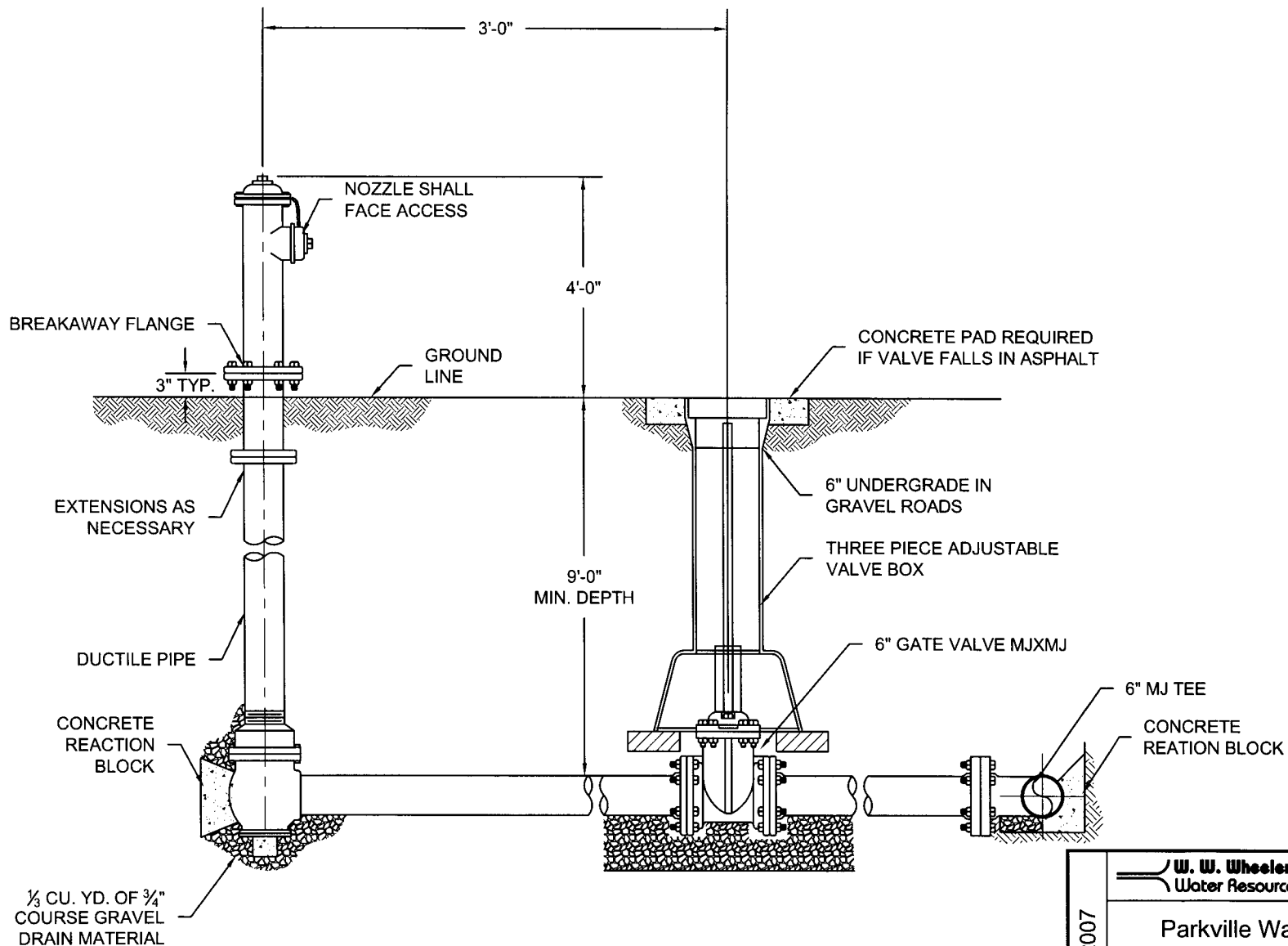


MINIMUM BEARING SURFACE AREA (FT²)

PIPE DIAMETER	BENDS				TEE OR DEAD END
	11¼°	22½°	45°	90°	
6"	1.5	3.0	6.0	12.0	7.0
8"	2.5	5.0	8.0	28.0	15.0
10"	3.5	7.0	18.0	43.0	37.0
12"	5.0	8.0	29.0	61.0	50.0
14"	6.5	15.0	40.0	78.0	64.0

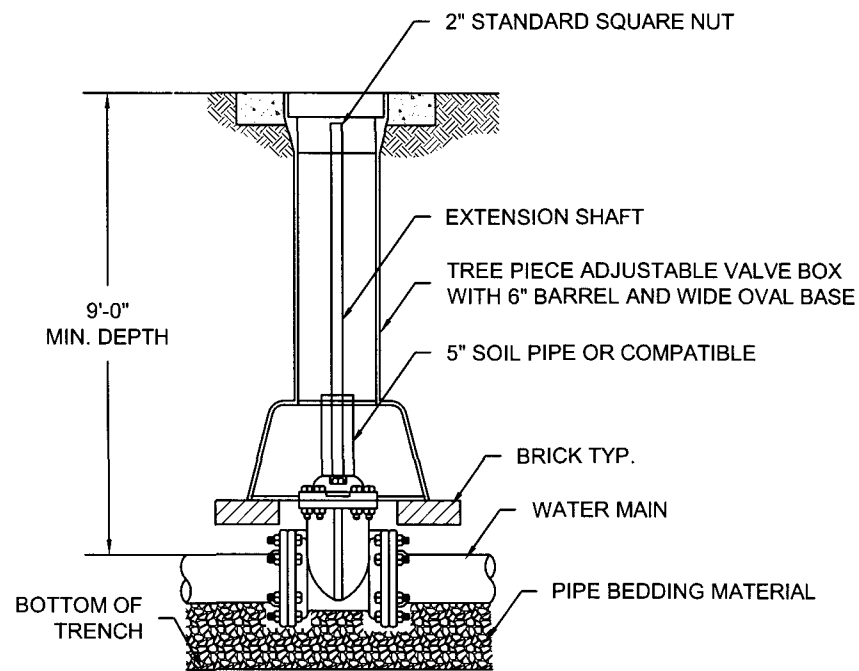
⑤ WATER PIPE BLOCKING
NOT TO SCALE

August 2007	W. W. Wheeler and Associates, Inc. Water Resources Engineers	
	Parkville Water District Leadville, CO Standard Spec. Detail	
	Job Number 568	Detail No. 5



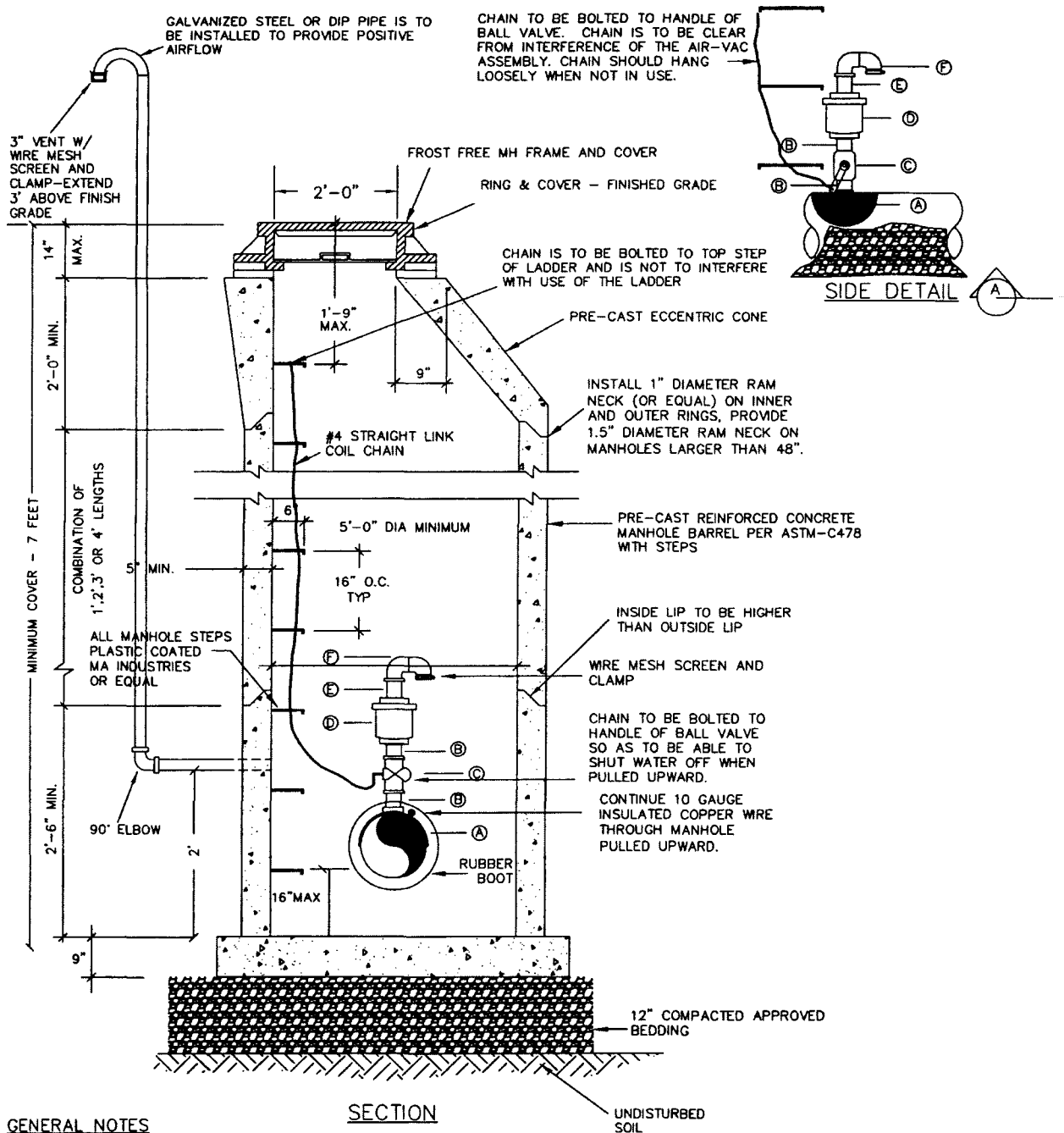
⑥ FIRE HYDRANT ASSEMBLY
NOT TO SCALE

August 2007	 W. W. Wheeler and Associates, Inc. Water Resources Engineers	
	Parkville Water District Leadville, CO Standard Spec. Detail	
	Job Number 568	Detail No. 6



⑦ GATE VALVE AND VALVE BOX
NOT TO SCALE

August 2007	 W. W. Wheeler and Associates, Inc. Water Resources Engineers	
	Parkville Water District Leadville, CO Standard Spec. Detail	
	Job Number 568	Detail No. 7



8 Pressure Regulating Valve Vault

NOT TO SCALE

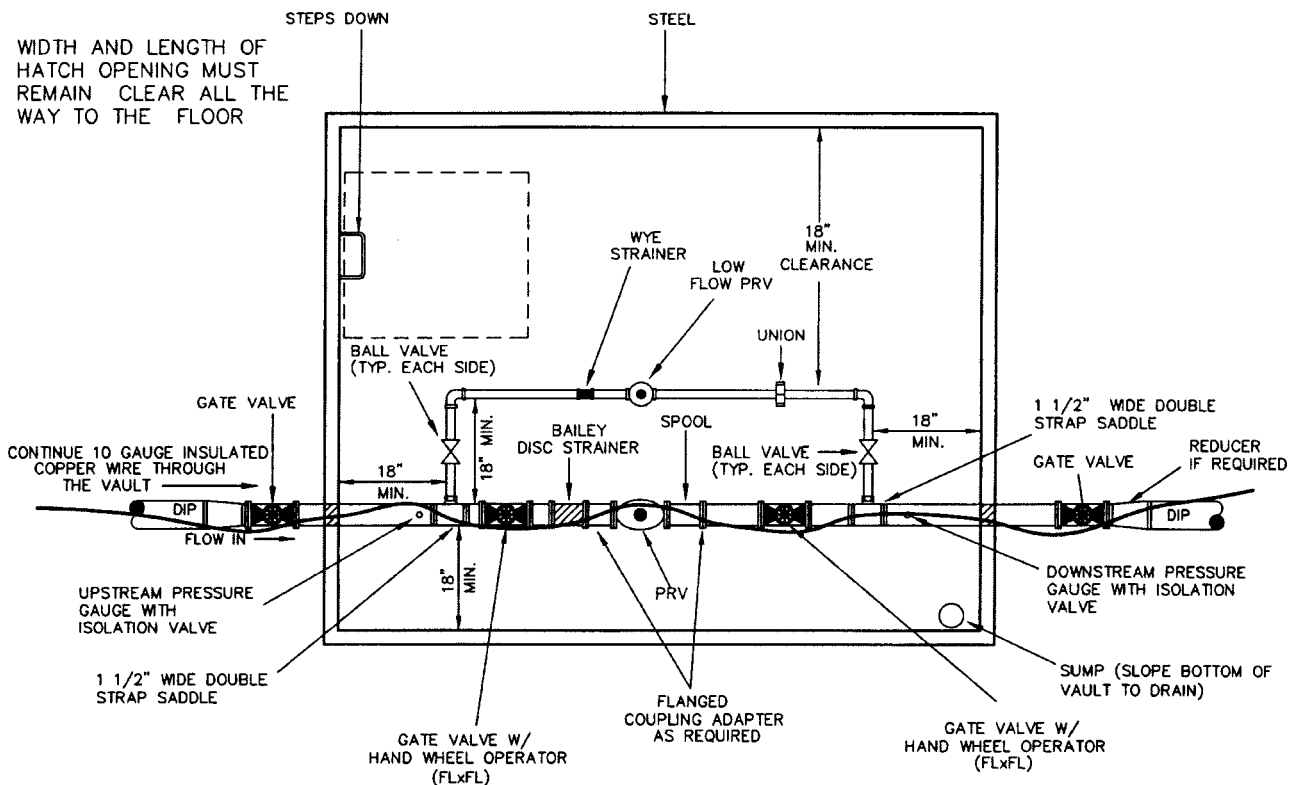
August 2007

W. W. Wheeler and Associates, Inc.
Water Resources Engineers

Parkville Water District
Leadville, CO
Standard Spec. Detail

Job Number
568

Detail No. 8



GENERAL NOTES

PLAN or TOP VIEW

1. FURNISH AND DELIVER ONE PRESSURE REDUCING STATION INCLUDING APPROPRIATE SIZE MAIN INLET AND OUTLET: TWO(2) APPROPRIATELY SIZED CLA-VAL MODEL 90G-01ABC PRESSURE REDUCING VALVES, EACH WITH ISOLATING VALVES: 120/240 VOLT POWER PANEL: ALL ASSEMBLED, TESTED AND PAINTED IN A VAULT WITH MINIMUM DIMENSIONS OF 7'H x 8'L x 6'W INSIDE HEIGHT STEEL, SKID-MOUNTED CAPSULE WITH BILCO MODEL MNB-50 ACCESS HATCH, LADDER, FLUORESCENT LIGHT, GRAVITY DRAIN IN SUMP, DEHUMIDIFIER, 240 VOLT HEATER, EXHAUST FAN AND TWO MAGNESIUM ANODE PACKS. ALL APPURTENANCES TO BE APPROVED BY THE DISTRICT.
2. SUPPLIER DELIVERS THE VAULT WITH ALL EQUIPMENT INSTALLED IN IT ALREADY OR EQUIVALENT.
3. CONTRACTOR MUST DIG HOLE, POUR SLAB, LIFT AND PLACE VAULT AND HOOK UP PIPING.
4. SIZE OF PIPING AND PRV TO BE DETERMINED BY ENGINEER.
5. MUST PROVIDE SUITABLE ACCESS TO THE HATCH FOR INSPECTIONS INCLUDING INSIDE THE VAULT AT BASE OF LADDER.
6. VAULT SHALL BE CAPABLE OF WITHSTANDING HS 20-44 TRAFFIC LOADING CONDITIONS.
7. WHERE PIPES PENETRATE WALLS, USE LINK SEAL, PSI SEAL, OR FILL ANNULAR SPACE W/ NON-SHRINK GROUT.
8. COAT ALL EXTERIOR VAULT SURFACES WITH BITUMINOUS DAMP PROOFING.
9. ALL LOW FLOW PIPE SHALL BE BRASS W/ ALL OTHER PIPE AND FITTINGS BEING FLANGED DUCTILE IRON.
10. MEGALUGS SHALL BE USED ON ALL EXTERIOR CONNECTIONS.
11. CONTRACTOR SHALL SUBMIT VAULT PIPING SCHEMATIC W/ VAULT DIMENSIONS TO DISTRICT PRIOR TO ORDERING MATERIALS AND EQUIPMENT.
12. IT SHALL BE THE OWNER'S RESPONSIBILITY TO VERIFY ALL PRV SIZING AND PRESSURE SETTINGS.
13. THE DISTRICT SHALL APPROVE FINAL SIZING OF ALL PRV'S AND VALVES.
14. SEE W-13 FOR SIDE PROFILE

9 Pressure Regulating Valve Vault - Plan View

NOT TO SCALE

August 2007

W. W. Wheeler and Associates, Inc.
Water Resources Engineers

Parkville Water District
Leadville, CO
Standard Spec. Value

Job Number
568

Detail No. 9



DRAIN TO DAYLIGHT W/
STAINLESS STEEL SCREEN
AND CLAMP AT END

- ⑩ Pressure Regulating Valve Vault - Elevation View**
NOT TO SCALE

August 2007

Parkville Water District
Leadville, CO
Standard Spec. Detail

Job Number
568

Detail No. 10