



Water Distribution Standards

2024 Update

The Design Standards ensure the public welfare,
preserve the community aesthetic, and promote
efficient development within the city limits of Aspen.

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American National Standards Institute (ANSI)

American Society for Testing and Materials (ASTM)

Aspen Consolidated Sanitation District: Pipeline and Manhole Design and Construction Specifications

American Water Works Association (AWWA)

City of Aspen Electric Standards and Specifications

City of Aspen Engineering Standards

City of Aspen Municipal Code

City of Aspen Urban Runoff Management Plan

City of Aspen Construction Mitigation Plan

Colorado Department of Public Health and Environment (CDPHE)

Colorado Department of Transportation (CDOT)

Ductile-Iron Pipe Research Association (DIPRA)

Environmental Protection Agency (EPA)

International Fire Code (IFC)

National Fire Protection Association (NFPA)

National Science Foundation (NSF)

Abbreviations

American National Standards Institute (ANSI)

American Society for Testing and Materials (ASTM)

American Water Works Association (AWWA)

Aspen Consolidated Sanitation District (ACSD)

Aspen Fire Protection District (AFPD)

Authority Having Jurisdiction (AHJ)

City of Aspen (City)

City of Aspen Construction Mitigation Plan (CMP)

Colorado Department of Public Health and Environment (CDPHE)

Ductile-Iron Pipe Research Association (DIPRA)

Environmental Protection Agency (EPA)

International Fire Code (IFC)

National Fire Protection Association (NFPA)

National Science Foundation (NSF)

Operator in Responsible Charge (ORC)

Pressure Reducing Valve (PRV)

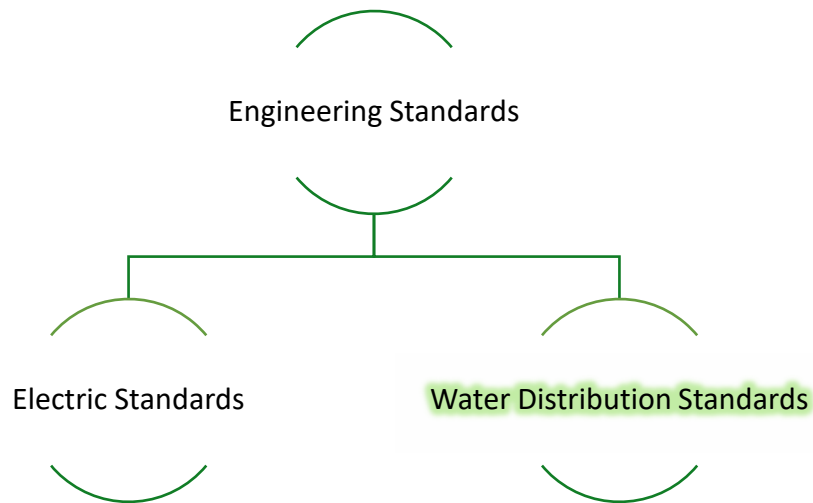
Right-of-way (ROW)

Water Service Agreement (WSA)

Introduction

Objective

The *Water Distribution Standards* provide policies, design, and construction guidelines for governmental agencies, design professionals, contractors, private developers, and community groups. These standards strive to maintain the public welfare, ensure safe and reliable service for all customers, and promote efficient development within the water service area. Below is a chart that shows how the standards correspond to the Utilities Department's other requirements.



The *Water Distribution Standards* are intended to supplement rather than replace existing engineering, environmental, and public water works standards and requirements, including but not limited to those of the American Water Works Association (AWWA) and Colorado Department of Public Health and Environment (CDPHE).

1 Purpose

1.1 Applicability and Definition

1.1.1 Purpose and Intent

The purpose of these Standards are to ensure development in the City of Aspen meets the City of Aspen Water Utility's minimum standards for working with potable, reuse, and raw water. It is the City's intent to establish Water Distribution Standards that will ensure the public health, safety, and welfare within the City of Aspen Water Utility service area.

1.1.2 Applicability

The City of Aspen, under the direction of the City of Aspen Director of Utilities, publishes the *Water Distribution Standards* to provide minimum design and construction criteria for all planning, design, construction, development, redevelopment, and modifications to any water distribution component within the City of Aspen Water Utility service area. Where any provision of these *Water Distribution Standards* is inconsistent with the provisions of the City of Aspen's Municipal Code, that Municipal Code – or the water policies adopted by the City Council (Resolution No. 9, Series of 1996) – will take precedence.

The Water Distribution Standards provide policies and design guidelines to city agencies, design professionals, private developers, and community groups for residential and commercial development that will ensure the public health, safety and welfare within the City of Aspen Water Utility service area. This design standard is intended to supplement the conditions contained in the water service agreements adopted by city ordinance, which define the standards that new water systems must meet prior to acceptance.

2.1 General Criteria

This section includes guidance for furnishing and installing pipe, valves, meters, vaults, controls, and fittings for potable water lines. All materials shall be new and of the best available quality. All materials used shall be manufactured and supplied according to the latest revised standards of the American Water Works Association (AWWA), the American National Standards Institute (ANSI), and the American Society for Testing and Materials (ASTM), or as specified hereinafter.

If a development requires the installation, replacement, or upgrading of any public utilities, including water, wastewater, storm drainage, gas, electric, raw water and telecommunication system infrastructure, then the scope of this work must conform to the minimum clearance standards each utility provider mandates. The contents of these standards shall be used in conjunction with the latest revisions of the following supplementary standards:

1. Colorado Department of Health and Environment (CDPHE) Standards:
 - a. Regulation 11, Colorado Primary Drinking Water Regulations
 - b. Safe Drinking Water Program Policy DW-005, Design Criteria for Potable Water Systems
 - c. Safe Drinking Water Program Policy DW-007, Backflow Prevention and Cross-Connection Control.
 - d. Colorado Cross-Connection Control Manual.
2. AWWA Standards.
3. City of Aspen Engineering Standards.
4. City of Aspen Water Distribution Standards.
5. City of Aspen Electric Standards.
6. Aspen Fire Protection District (AFPD) requirements.

All improvements proposed to the City's public water utility system shall conform to the City's goals, policies, and standards – including those for water distribution, wastewater collection, storm water, raw water, and electric – as well as all applicable City department guidelines.

2.1.1 Approved Drawings

A utility plan shall be submitted when improvements, connections, or abandonments are proposed. A utility plan is also required when conflicts with existing utilities occur that require the redesign and/or relocation of existing infrastructure. Other utilities must be designed in accordance with their respective utility provider standards.

All plans and specifications shall be approved prior to construction through the City's development review process. A Colorado-registered professional engineer shall prepare and stamp all such plans and specifications. The City of Aspen will charge reasonable fees for the city's review, or a designee to review, these plans and specifications. The City's review, however, shall not relieve any owner, developer, engineer, or contractor from the ultimate responsibility of assuring full compliance with the requirements imposed by the Municipal Code, these Water Distribution Standards, the CDPHE, the AWWA, or any other valid law or regulation.

Construction shall not begin until the Contractor has received the reviewed and signed drawings from the City of Aspen or its designee. The Contractor shall possess, at all times, a physical copy of the reviewed plans and specifications. Any changes to the project after the review and signature of the City of Aspen will require a new submittal and review process.

2.1.2 Ability to Serve

Pursuant to Sec. 25.12.020 of the Municipal Code, "...The City shall not be obligated to extend water service outside the corporate limits of the City and may grant water service only upon a determination that no conflict exists between the best interests of the City, as expressed in the Aspen Area Community Plan and as otherwise determined by the City Council and the prospective water use..."

The City of Aspen's water system will maintain sufficient water production capacity to adequately serve customers within the City's service area as well as those properties outside the City that are under the purview of the water service agreements. However, All applications for utility service shall comply with the minimum requirements of these standards and with Chapter 25.12 of the Municipal Code.

2.1.3 Water Main Sizing

Water mains shall be a minimum diameter of 8-inches; water mains shall be increased in size, at the cost of the developer, to provide adequate flow and pressure for both domestic supply and fire protection. Water mains shall be extended in a looped fashion to the farthest point in each development or area that is to be served, and a fire hydrant shall be installed at the end of any non-looped water main if a future system expansion can be anticipated (at the sole discretion of the Water Department).

2.1.4 Looping

All main-feed water supplies to developments shall be looped for dependability and to meet flow requirements of peak water usage plus fire flows while maintaining 20 psig at any point within that pressure zone. Looping shall be such that an interruption of service due to a

water main failure will put no more than 500 feet of main and no more than two fire hydrants out of service, all while maintaining adequate flows and pressure in the remaining portion of the system.

2.1.5 Utility Easements

Public utility easements shall comply with the standards set forth in Titles 21 and 25 of the Municipal Code, which includes the Water Distribution Standards, Electric Standards, and Engineering Standards. All public water utilities shall be located within public right-of-way (ROW) or public utility easements. Potable, reuse, and raw water pipelines and infrastructure shall be installed within dedicated public ROWs or centered within an easement across private property. If, during the building permit process, it is discovered that a public water utility is not located within an easement, the City shall require that an easement be created for that utility. Additionally, existing prescriptive easements for water and raw water will require the dedication of an easement for the respective utility.

Easement requirements are as follows:

1. **Pipelines 12-inch diameter or smaller:** require a minimum of 25-feet wide, centered on the pipeline;
2. **Pipelines larger than 12-inch diameter:** require a minimum of 30-feet wide, centered on the pipeline;
3. **Pipelines installed on land with a grade steeper than 25%:** require a minimum of 30-feet wide, centered on the pipeline;
4. **Fire hydrants:** require a 10-ft by 10-ft easement, centered on the fire hydrant.

If a property re-develops and there are prescriptive easements, then the easements should be described, dedicated and recorded based upon the above dimensional criteria.

2.1.6 Valves

Main-line valves shall be installed on each line at all street intersections, with a maximum line distance between valves of 350 feet in commercial and residential areas and 500 feet in open-space areas. Valves shall also be installed on all fire hydrant branches. When connecting to existing valves, the Water Department may require the replacement of older valve installations to provide for “as new” conditions. Additional valves may also be required to isolate the new system from older sections, and at the discretion of the Water Department, to enable the new installations to be tested separately from the existing system.

2.1.7 Oversized Mains

The City may, at its option, require the installation of mains larger than the sizes required by the above criteria. In such cases, the City shall pay the additional cost above the amount required for mains that meet the above criteria. The method and basis for such payment shall be per the applicable City policies in effect at the time or as established through the Water Service Agreement (WSA).

2.1.8 Fire Protection

Fire flows shall be determined in accordance with the Insurance Services Office (ISO) or International Building Code (IBC) utilizing the standard method of calculation.

Fire hydrants shall be installed at each street intersection and at intermediate points for maximum spacing of 350 feet in commercial and multi-family areas and of 400 feet in single-family residential areas. Prior to submittal for design approval, the location and height of fire hydrants shall be approved by the Aspen Fire Protection District (AFPD) with a signature on an approved site plan that shows the water system layout.

2.1.9 Pumping Stations and Storage Tanks

Any extensions that will necessitate a pump station or water storage tank are subject to special, detailed engineering review. They are also subject to the terms of the Water Service Agreement, the AWWA Standards, and the Design Criteria for Potable Water Systems adopted by the CDPHE's Water Quality Control Division. All requirements of the design standards shall apply, and additional easements shall be required for the pump stations, storage tanks, access, and appurtenances. All materials, equipment, piping, valves, and associated appurtenances must be reviewed and approved by the Water Department.

Pumping Station Requirements:

- All pump stations shall have a common electromagnetic-type flow meter.
- All pump stations will be designed to provide controls that integrate and interface with the Water Department's centralized supervisory control and data acquisition (SCADA) system.
- All 110V outlets shall be ground-fault circuit interrupted (GFCI) and protected by either a GFCI circuit breaker or outlet GFCI receptacles. The stations shall use galvanized rigid steel or waterproof flex conduits.
- Lifting equipment shall be incorporated into the building for required future maintenance.

- All isolation valves shall be flange-by-flange, counter-clockwise, non-rising stem, Mueller-resilient seat gate valves. Openings shall be to the left. Each gate valve shall have an operating wheel that indicates the open and closed directions. Valve operators at heights above 5 feet in elevation shall be outfitted with a chain operator to assist in closing the valve without the aid of a ladder.
- All pump stations shall be designed to eliminate confined space entry.
- All pump stations shall have a check valve or electric pump control valves on the discharge or each pump.
- All pump motors shall be driven by soft starts or variable frequency drives subject to approval by the Water Department.

2.2 As-Built Drawings and Approvals

2.2.1 General

As-built drawings are accurate, scaled representations of appurtenances and infrastructure as they exist in the field at the time of the project's completion. As-built drawings of water distribution system infrastructure submitted to the City of Aspen Water Department for final acceptance in accordance with the following minimum requirements contained herein.

The following are not considered as-constructed drawings and will not be accepted:

- Construction plans.
- Freehand drawings or sketches.
- Drawing measurements that are based on water line locations after the installation work has been buried.

The design engineer of record for the project submitting the reviewed and approved construction plans shall certify in writing that the installation has been accomplished in accordance with the plans and specifications approved by the City.

A complete list of installed items shall be submitted to the City with an inventory of pipe sizes and lengths, bends, valves, valve boxes, fire hydrants, copper lines, blow offs, and any additional appurtenances installed with the new systems.

2.2.2 As-Built Formats

Two hard copies of all as-built drawings and a saved version of the drawings in ArcView format shall be given to the Water Department.

- Two (2) hard copies (on standard 24" x 36" sheets) with the engineer's stamp and signature; labeled "As-Constructed".
- One (1) electronic copy of as-builts in .dwg format.
- One (1) disk with the ArcView drawing in both .mxd and PDF formats.
- As-built survey shots in .dwg or .mxd format.

2.2.3 As-Built Certification

A Colorado-licensed professional land surveyor (PLS) shall survey the water system installations. The locations of all mains, service lines, fittings, bends, valves, tracer wire locator boxes, ARVs, restraint, structures, and all other appurtenances shall be surveyed, located, and identified.

2.2.4 As-Built Plan Drawing Requirements

- The plan view must be drawn to a scale that displays the plan in a way that is clearly legible. Recommended scale(s) are 1-inch equals 5, 10, or 20 feet.
- Existing and installed improvements and structures; including, without limitation, all grading, transportation, landscaping, utilities (including but not limited to storm sewer, telephone, gas, electric, cable television, fiber optic, raw water, potable water, and sanitary sewer); floodways, floodplains, driveway locations, street lights, roadways, sidewalks, curbs, and gutters; traffic signal poles and controllers; and pavement edges, trees, and other significant features.
- Match lines that connect information between drawings.
- Utility information is required according to following (for installed unless otherwise noted):
 - Pipe type, size, class, and joint, thrust restraint, valves (including corporation and curb stop valves), and valve type(s), fittings and fitting type(s).
 - Angles and deflection at alignment changes.

- Horizontal locations of structures.
- Special notation where waterline is buried less than 7 feet or greater than 10 feet below grade.
- Existing and proposed contours of at least 1-foot intervals (steep slopes may have alternate intervals as approved by the Water Department).
- Existing and proposed storm drainage facilities, including storm sewers, inlets, manholes, culverts, swales, detention ponds, and drainage ways.
- Horizontal and vertical locations and sizing of utility covers, surface appurtenances, inlets for storm drainage, potable water, and the electric system.
- Horizontal and vertical location of drainage outfall points.
- Horizontal and vertical location of all utility crossings identified (surveyed) during construction.
- Any installed insulation (type and horizontal alignment).
- Abandoned infrastructure left in place. These should be field located items identified during construction. Designation of all abandonments will be included as a separate layer on as-constructed drawings and labeled as abandoned with the date of abandonment and the pipe material. Details shall be drawn out where abandoned systems are within a 20-foot radius of a water-system valve cluster.

2.2.5 As-Built Profile Drawing Requirements

- The profile view is to be located directly below the plan view along a matching survey line and stationing and is to be drawn at a horizontal scale that matches the plan view and a vertical scale of 1-inch equals 5 feet. The profile view shall contain the following information:
- Finished grade elevations.
- All fittings.
- Insulation (elevation installed above the infrastructure)

- Stationing sequence, left to right.
- Match lines.
- For gravity piping:
 - Top of pipe elevations on piping and fittings.
 - Invert elevations on pipe at point of entry/exit to manholes, vaults, or daylight structures.
- For pressure piping:
 - Top of pipe elevations on piping and fittings. Top of nut/actuator is acceptable for valves.
- Interference drawings that show all crossings for any utilities identified during design or construction. Include location (station) of crossing, as well as specific separation between crossing utilities.
- Elevations of inlets, inverts, and connection locations.

2.3 Utilities and the Public Right-of-Way (ROW)

2.3.1 Colorado Department of Transportation ROW

All work within the Colorado Department of Transportation (CDOT) ROW shall meet all CDOT requirements and standards in addition to these Distribution Standards. All work occurring within the CDOT ROW shall require a permit. To determine the appropriate permitting, contact CDOT for specific requirements.

2.3.2 City of Aspen Right-of-Way

All work within the City of Aspen ROW shall meet all City of Aspen Engineering Department requirements and standards in addition to these Distribution Standards. All work occurring within the City of Aspen ROW shall require a ROW permit. To determine the appropriate permitting and specific requirements, contact the City of Aspen Engineering Department.

2.4 Variances

In accordance with Sec. 25.06.050 of the Municipal Code, the City may grant variances to the Water Distribution Standards when practical difficulties or unnecessary hardships exist that cause inconsistencies with the purpose and intent of the construction standards. These issuances shall not compromise the operation or safety of the potable water distribution system.

Requests for variances from the standards, policies, or submittal requirements of this document shall be submitted in writing with appropriate documentation and justification to the Director of Utilities. Variance requests must, at a minimum, contain the following:

1. Benefit to the City of Aspen and the existing water system and customers.
2. Criteria under which the applicant seeks a variance.
3. Written justification for non-compliance with the standards, cost is not a compelling reason for a variance.
4. Proposed alternate criteria or standards to comply with the intent of the criteria.
5. Supporting documentation, including necessary calculations.
6. The proposed variance's potential adverse impacts for adjacent landowners.
7. An analysis of the variance request, signed and stamped by a Professional Engineer who is licensed in Colorado.

Upon receipt of a complete application for a variance, the Director of Utilities, or their designee shall prepare a statement of recommendation or denial. Except as otherwise established in Title 25 or through vesting of a site specific development plan pursuant to Title 26, a variance granted under Title 25 shall automatically expire after twelve (12) months from the date of approval unless a building permit application submittal is accepted by the Chief Building Official. The City Utility Director may grant an extension to an approved variance. All requests for extensions must be submitted prior to the expiration of the variance, must demonstrate good cause showing the extension is necessary, and must demonstrate that the circumstances for granting the variance are still applicable.

3.1 Pipes and Fittings

3.1.1 General

The City of Aspen Water Department requires correct installation of main lines, utilizing AWWA-approved pipes, and appurtenances; the line or system must be inspected by registered Professional Engineer (PE), the design engineer of record, and a City of Aspen Water Department representative (the Engineering Inspector or a Water Department staff member).

3.1.2 Construction Timeframe

All water-line construction shall take place between April 1st and October 31st. Outside of this construction window, no excavation, testing, or other valve operations shall be allowed, except when the Distribution Supervisor/Operator in Responsible Charge (ORC) determines such operations to be necessary.

3.1.3 Pipe Classification

All water mains shall be Class 52 ductile iron pipe (DIP), be thin-cement-lined, use slip joints or mechanical joints with rubber gaskets, and conform to AWWA specification C151 for minimum pressure of 350 psi. All fittings shall be thin-cement-lined, and use mechanical joints in accordance with AWWA C111.

All pipes and fittings shall have copper straps or No. 4 solid copper wire welded across joints to ensure conductivity. All welds shall be protected with tar.

To resist pipe corrosion, the use of 8-mil polyethylene wrap shall be required in areas of high soil conductivity, as determined by the soils report provided by the developer. When polyethylene wrap is used, additional restraint shall be provided to account for the loss of pipe wall friction.

Plastic or polyvinyl chloride (PVC) pipe is not allowed the City's potable water system. This includes private systems connected to the City of Aspen's system.

3.1.4 Tracer Wire

Tracer wire shall be installed with all buried main and service pipelines in the water system. The Contractor shall submit plans for a complete tracer wire system for all projects.

3.1.4.1 Materials

1. Tracer wire shall be installed with all buried main and service pipelines in the water system. The Contractor shall submit plans for a complete tracer wire system for all projects.
2. All tracer wire shall have HDPE insulation intended for direct bury, color coded per American Public Works Association (APWA) standard for the specific utility being marked. Wire insulation for potable water will be colored blue and wire insulation for the lead from the grounding anode will be colored red.
3. Open Trench Installations: Tracer wire shall be #12 AWG Copper Clad Steel, or Solid Copper, High Strength with minimum 300 lb break load, with minimum 30 mil HDPE insulation thickness.
 - i. Approved Manufacturer:
 1. Copperhead Industries
 2. Pro Line Safety Products
 3. Or Approved Equal
4. Connectors
 - i. All mainline tracer wire must be interconnected in intersections, at mainline tees and mainline crosses. At tees, the three wires shall be joined using a single 3-way lockable connector. At crosses, the four wires shall be joined using a 4-way connector. Use of two 3-way connectors with a short jumper wire between them is an acceptable alternative.
 - ii. Direct bury wire connectors – shall include 3-way lockable connectors and mainline to lateral lug connectors specifically manufactured for use in underground tracer wire installation. Connectors shall be dielectric silicone filled to seal out moisture and corrosion, and shall be installed in a manner so as to prevent any uninsulated wire exposure. Non locking friction fit, twist on or taped connectors are prohibited.
 - iii. Approved Manufacturer:
 1. Burndy Split Bold Connector, copper to copper, square head with King Innovation Split Bolt Aqua Housing 69105
 2. Copperhead Industries Snakebite Connector
 3. Or Approved Equal
5. Termination/Access
 - i. All tracer wire termination points at water service curb stops and sewer service cleanouts must utilize an approved tracer wire access box (above ground access box or grade level/in-ground access box as applicable), specifically manufactured for this purpose as specified below for the type of pipeline.
 - ii. All grade level/in-ground access boxes shall be appropriately identified with “water” cast into the cap and be color coded.
 - iii. A minimum of two (2) feet of service loop wire is required in all tracer wire access boxes after meeting final elevation.

- iv. All tracer wire access boxes must include a manually interruptible conductive/connective link between the terminal(s) for the tracer wire connection and the terminal for the grounding anode wire connection.
 - v. Grounding anode wire shall be connected to the identified (or bottom) terminal on all access boxes.
- 6. Grounding
 - i. Tracer wire must be properly grounded at all dead ends/stubs and at all connection points to existing systems without tracer wire.
 - ii. Grounding of tracer wire shall be achieved by use of a drive-in magnesium grounding anode rod with a minimum of 20 feet of #12 red HDPE insulated copper clad steel or solid copper wire connected to anode (minimum 1 lb.) specifically manufactured for this purpose and buried at the same elevation as the utility.
 - iii. When grounding the tracer wire at dead ends/stubs, the grounding anode shall be installed in a direction 180 degrees opposite of the tracer wire, at the maximum possible distance.
 - iv. Where the anode wire will be connected to a tracer wire access box, a minimum of two (2) feet of service loop is required after meeting final elevation.

3.1.4.2 Installation

- 1. General
 - i. Tracer wire installation shall be performed in such a manner that allows proper access for connection of line tracing equipment, proper locating of wire without loss or deterioration of low frequency (512Hz) signal for distances in excess of 1,000 linear feet, and without distortion of signal caused by multiple wires being installed in close proximity to one another.
 - ii. Tracer wire systems must be installed as a single continuous wire, except where using approved connectors. No looping or coiling of wire is allowed.
 - iii. Any damage occurring during installation of the tracer wire must be immediately repaired by removing the damaged wire and installing a new section of wire with approved connectors. Taping and/or spray coating are prohibited.
 - iv. Tracer wire shall be installed at the top half of the pipe and secured (taped/tied) at five (5) feet intervals.
 - v. Tracer wire must be properly grounded as specified.
 - vi. At all water mainline dead-ends, and at water service line curb stops closest to the property being served, tracer wire shall go to ground using an approved connection to a drive-in magnesium grounding anode rod, buried at the same depth as the service. (See Grounding above)
 - vii. If no mainline tracer wire exists at a connection point, mainline trace wire shall not be connected to existing conductive pipes. Treat as a mainline dead

end, ground using an approved waterproof connection to a grounding anode buried at the same depth as the main.

- viii. All service lateral tracer wire shall be a single wire, connected to the mainline tracer wire using a mainline to lateral lug connector, installed without cutting/splicing the mainline tracer wire.
- ix. In occurrences where an existing tracer wire is encountered on an existing utility that is being extended or tied into, the new tracer wire and existing tracer wire shall be connected using approved splice connectors.

2. Water System

- i. A mainline tracer wire must be installed, with all service lateral tracer wire properly connected to the mainline tracer wire, to ensure full tracing/locating capabilities from a single connection point.
- ii. Lay mainline tracer wire continuously, by-passing around the outside of valves and fittings on the North or East side. Water system valves shall have a tracer wire connected to the mainline tracer wire and brought up the outside of the valve box and inserted into the valve box with a minimum of two (2) feet of spare wire.
- iii. Tracer wire on all water service laterals must daylight at an approved tracer wire access box color coded blue and located adjacent to the curb stop. A grounding anode shall be installed at the curb stop location at the depth of the service.
 - a. Access box approved manufacturer: Copperhead Industries Snake-Pit or approved equal.
- iv. Hydrants – Tracer wire must terminate at an approved above-ground tracer wire access box, properly affixed to the hydrant grade flange. (Affixing with tape or plastic ties shall not be acceptable).
 - a. Approved Manufacturer: Copperhead Cobra Access point with hydrant flange package.
- v. Tracer wire shall terminate at the structure being served with a buried grounding anode beneath the service line at the building foundation or other entry point.
- vi. All conductive and non-conductive service lines shall include tracer wire.

3.1.4.3 Testing

All new mainline tracer 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. This verification shall be performed upon completion of rough grading and again prior to final acceptance of the project. Continuity testing in lieu of actual line tracing shall not be accepted.

3.2 Installation

3.2.1 General

Construction shall not begin until the Contractor has received the approved and signed drawings from the City of Aspen. The Contractor shall possess a physical paper copy of the approved plans and specifications at all times. Any changes to the project after the City of Aspen's approval and signature will require a new submittal and review process.

The Contractor shall notify the City of Aspen Water Department through the front office (970-920-5110) at least two full working days prior to the start of construction. Voicemail messages left outside hours of operation will not count towards the two full working days of prior notice. No other point of contact will result in a work order to document the adequacy of the notice.

The Contractor shall take all precautions with the interior of the water line to be installed, the existing water line, and the valves and appurtenances to keep them dry, clean, and clear of debris. If the pipe is dirty, has gravel or debris inside, or has sat unused for a long-period of time, flushing and/or cleaning the line prior to installation may be required.

Please refer to latest revision of AWWA Standard C600.

3.2.2 Excavation and Potholing Definitions

Excavation is defined as any earth moved by mechanical means. Such as track mounted excavator or rubber tire-mounted backhoe.

Pot-holing is defined as any earth moved by hydro-excavation utilizing a high-pressure water nozzle and vacuum such as a Vac-Trailer or Vac-Truck.

3.2.3 Water Shutdown Requests

The Contractor shall provide the City of Aspen Water Department a minimum of seven (7) days' notice before any work involving a temporary water service interruption to customers. Contractor shall provide notice by calling the City of Aspen Water Department front office (970-920-5110). Voicemail messages left outside hours of operation will not count towards the minimum notification requirement. No other point of contact will result in a work order to document the adequacy of the notice.

Notification to affected customers shall be provided by the City of Aspen Water Department or the City's designated representative, unless otherwise specified, a minimum of 48 hours prior to any temporary interruption in water service. Water main shutdowns are not permitted for service line work without the written permission of the Water Distribution ORC.

3.2.4 Excavation, Bedding, and Backfill

3.2.4.1 General

Trench excavation shall be performed in accordance with the requirements of the latest revision of the City of Aspen's Engineering Standards.

All bedding and backfill material shall be free of frozen material, organic material, and debris. The materials to be used in each trench zone are indicated on the Water Main Trench Cross-Section Detail as shown on the Water Distribution System Standards Installation Details drawing; these materials are described herein.

3.2.4.2 Bedding/Pipe Zone

The bedding zone shall consist of all material placed below the pipe invert. The pipe zone shall consist of all material placed above the pipe invert to the specified elevation. The bedding/pipe zone material shall be placed for the full length of the pipeline. The bedding/pipe zone material shall be $\frac{3}{4}$ " screened rock that has been hauled in for bedding – not native excavated material. The material shall extend from 6" below the pipe and bells to 12" above the top of the pipe and bells, and it shall extend for the full width of the excavated trench. Tamping equipment shall be used to thoroughly tamp the material to a minimum of 95% maximum dry density or 75% relative density. The moisture content of the material shall be within 2% of optimum.

3.2.4.3 Backfill zone

The backfill zone shall consist of all material above the pipe zone. Fabric shall be installed between the screen rock and all other backfill material. Follow CDOT, Pitkin County, and City of Aspen ROW specifications for backfill and compaction within the ROW or where asphalt is to be placed above the pipeline trench.

Compaction shall be completed by mechanical tamping of 12"-maximum loose lifts using mechanical tampers or vibratory rollers. All other means must be approved in writing by the engineer. All backfill shall be compacted to 95% of maximum laboratory dry density (ASTM D698) or to 75% relative density (ASTM D2079). The material shall be within 2% of optimal moisture content.

The Contractor may request approval of alternate means of compaction. Such a request must be submitted to the engineer in writing. The engineer will approve

the compaction method in writing only. Use of specified or approved compaction methods does not relieve the Contractor from providing a completed project that meets the intent of this specification.

Native backfill material shall consist of suitable material from the excavated earth. No rocks or boulders shall be allowed in the first 24" of the trench above the pipeline. The backfill material above the first 24" of the trench shall have no boulders larger than 6" in any dimension and shall be carefully placed so that no damage will be done to the pipeline. Native backfill shall be used to finished grade if trench excavation occurs in open-field conditions.

Engineered backfill material shall be road-base, Class 6 aggregate base course.

3.2.4.4 Testing and Inspection

Prior to backfilling, all waterlines and appurtenances shall be inspected and approved by the City.

All materials shall be subject to gradation and compaction tests prior to approval. The test results shall be submitted to the City for approval and verification of their accuracy. The Contractor shall bear the costs of these tests.

Compaction requirements shall conform to the measurements of maximum dry density according to ASTM D698 (Moisture-Density Relations of Soils [Standard Proctor]). Should ASTM D698 not be suitable for the material placed, the compaction requirements shall conform to ASTM D2049 (Test for Relative Density of Cohesionless Soils).

When the City requires it, the Contractor shall excavate backfilled trenches for the purpose of performing compaction tests at the required locations and depths. The Contractor shall be responsible for reinstalling and compacting the test excavations at no additional cost to the City.

Minimum compaction testing frequency for pipelines shall be one compaction test per 150 linear feet of piping and wherever piping is within 2-feet of structures. A compaction single test shall contain two samples per lift.

3.2.4.5 Road-Base Material Specification

The road-base material shall be Class 6 aggregate base course, as specified by the State of Colorado Department of Transportation (CDOT); the material shall meet the following gradation:

Aggregate Base Course – CDOT Class 6 Gradation	
Sieve Size	Total Percentage Passing By Weight
¾"	100%
# 4	30% – 65%
# 8	20% – 55%
# 200	3% – 12%

3.2.4.6 Screened Rock Material Specification

Granular or granular backfill material shall be imported crushed rock or angular surfaced gravel and shall meet the following gradation (ASTM D448, m 67):

Granular Bedding Gradation	
Sieve Size	Total Percentage Passing By Weight
¾"	100%
3/8"	22% – 55%
# 4	10%
# 8	5%

3.2.5 Depth

New lines and systems installed in the City of Aspen’s water system must be a minimum of 7 feet and a maximum of 10 feet deep, as measured from the top of the pipe to the finished grade. Additional fill placed on the line beyond 10 feet in depth will require removing the fill or moving the main at the property owner’s expense. The City may require a survey and/or potholing, at the property owner’s expense, to determine the depth of bury after final grades are established. Insulation shall not be used as a substitute for the full 7 feet of cover for new construction, unless specifically approved by the Water Distribution Supervisor/ORC. If necessary, water mains shall have extra depth of cover at tie-ins so that the tie-ins can be made without vertical bends.

3.2.6 Thrust Restraint

City of Aspen requires two forms of thrust restraint at all bends and fittings to resist hydraulic thrust. Allowable forms of thrust restraint are concrete thrust blocks, zinc-coated steel tie rods, or Mega-Lug retainer glands. Concrete thrust blocks shall be formed

and poured in place on all fittings, including on 4-inch or larger water service taps. A poly wrap bond breaker shall be installed between concrete and fittings. Concrete shall only be in contact with the fitting and not the pipe that is attached to the fitting. Concrete shall have a minimum 28-day compressive strength of 3,000 psi.

3.2.7 Clearances

The minimum horizontal and vertical separations of water mains from parallel and crossing utilities, respectively, shall be in accordance with the tables below.

Table 3.2.7.1 – Minimum horizontal separation for parallel utilities (feet)*

	Communications	Electric	Gas	Storm	Water**	Sanitary
Communications	1	1	3	2	2	2
Electric	1	1	1	1	Depth of water line minus 4-ft	Depth of sanitary line minus 4-ft
Gas	2	3	-	2	2	2
Storm	2	2	2	-	10	2
Water**	***	***	2	10	10	10
Sanitary	***	***	***	2	10	-

* These depths are based on 2018 Utility Standards. Please confirm depths with utility provider for any updates.

** Includes, but not limited to, potable, raw water, pressurized raw water and re-use water. Separation requirements include from manholes, culverts, etc.

*** Horizontal separation is not applicable, because vertical separation is achieved. For example, a shallow communications line can be located above a water line as long as vertical separation is achieved.

Table 3.2.7.2 – Minimum vertical separation at utility crossings (feet)*

	Communications	Electric	Gas	Storm	Water**	Sanitary
Communications	1	1	1	2	2 above	2
Electric	1	1	1	2	2 above	2
Gas	1	1	1	2	2 above	2
Storm	2	2	2	2	1.5 above	2
Water**	2 below	2 below	2 below	1.5 below	2	1.5
Sanitary	2	2	2	2 below	1.5	2

* All depths are based on 2018 Utility Standards. Please confirm depths with utility provider for any updates.

** Includes, but not limited to, potable, raw water, pressurized raw water and re-use water.

If a non-potable conduit and a water main or service line are proposed to cross, the existing line shall be potholed (or otherwise exposed) and physically surveyed to ensure proper separation during the design process.

At all perpendicular crossings, the water main shall be at least 18 inches separated from the non-potable pipe as measured from outside diameter (OD) of the water pipe to OD

of the non-potable pipe. In addition, a full length of water pipe must be located so both water pipe joints will be as far from the non-potable pipe as possible. Refer to the Water Distribution Standard Details for further information. All other crossing circumstances shall require a variance.

3.2.8 Identification

Potable water systems shall be marked with blue identification tape. Tape shall be installed 2 feet above the pipe.

Non-potable systems will be marked with purple identification tape. Tape shall be installed 2 feet above the pipe.

Where there are potable and raw water lines in the same area, as defined by the City of Aspen or its designee, the pipe being laid at the tie (whether raw or potable) will also be installed with the appropriate identification tape.

3.3 Valves and Valve Boxes

3.3.1 Valve Operation

City of Aspen Water Department employees are the only people authorized to operate valves on the water distribution system.¹ It is unlawful for any persons other than Water Department personnel to operate any City of Aspen Water Department water system appurtenances, per Municipal Code Sec. 25.08. The Contractor shall notify the City of Aspen Water Department through the front office (970-920-5110) at least two full working days prior to any requested operation of a water system valve for either main line extensions or testing. Voicemail messages left outside hours of operation will not count towards the two full working days of prior notice. No other point of contact will result in a work order to document the adequacy of the notice.

3.3.2 Valve Size and Type

- **All valves 12" and smaller**
 - Valve Type: Gate valve
 - Approved manufacturers:
 - Mueller, or

¹ Customer-owned services begin after the corporation stop and are not considered a part of the water distribution system. Refer to subsequent section on "Water Service Ownership and Owner Responsibility" for details.

- Pre-approved equivalent
 - Valve characteristics: have a resilient seat, be epoxy-coated, use a mechanical joint or flange (as required), have a non-rising valve stem, and open by turning to the left (counterclockwise). Gate valves shall conform to latest revision of AWWA Specification C509 and be certified by ANSI/NSF 61.
- **Valves greater than 12"** – Water Department shall evaluate valve selection for valves greater than 12" on a case-by-case basis.
 - Valve Type: Butterfly valve
 - Approved manufacturers:
 - Mueller, or
 - Pre-approved equivalent
 - Valve model dependent upon working pressure.

3.3.3 Installation at Intersections

At intersections, gate valves shall be installed within 3-feet of a tee, cross, or bend. All connections shall have Mega-Lug® followers on the fittings. All mechanical joint fittings shall have the appropriate restraint as required in section 3.2.5 above.

3.3.4 Valve Box Assemblies

- A. For valves 4" through 12" in size, valve boxes shall be three-piece Tyler Pipe cast-iron (or preapproved equivalent).
- B. The shaft size shall be 5.25", and the screw type shall be 6850 Series-668-S and/or 6865 Series-F. Complete extension shall be 62" to 82".
- C. Parts shall be universally interchangeable for other valve boxes within the system.
- D. Lids shall be flat-shallow or ribbed-regular and are to be marked with the word "WATER."
- E. The top of the valve boxes shall be set recessed below the existing or future asphalt surface. In areas that are not to be paved, the valve box shall extend 6" above the finished grade and be protected by a metal fence post or other means as approved by the Water Department.
- F. Extension rods and a rod-centering ring are required for valves installed on lines deeper than 9 feet. A solid 6" DIP shall be required in place of the sectional valve

boxes. This alternate riser shall incorporate valve box tops with standard water lids, as specified above.

G. At completion, the Contractor – in the company of the City or its designated representative – shall inspect the valve boxes to confirm the below conditions are met, prior to City’s acceptance of the installation:

- Valve boxes are plumb;
- Valve-operating nuts are centered in the valve boxes;
- A standard valve key will fit over all the operating nuts;
- All newly installed valve boxes are clean of obstacles that might prevent operation.

3.4 Pressure-Reducing Valve Installation and Vaults

Design and installation of pressure reducing valves and associated vaults must be approved by the Water Department and will be evaluated on a case-by-case basis.

3.5 Fire Hydrants

- A. Fire hydrants will not be used for purposes other than authorized Fire Department and Water Department use.
- B. Aspen Water Department personnel and Aspen Fire Department personnel are the only people authorized to operate the system’s fire hydrants, per Municipal Code Sec. 25.08.

3.5.1 Hydrant Lead Size

- A. Each fire hydrant assembly shall be equipped with a 6-inch auxiliary shut-off valve located between the water main and the fire hydrant, as shown on the Water Distribution Standard Details. The auxiliary valve is bolted directly to the tee. The branch piping from the main to the fire hydrant shall be 6-inch ductile iron pipe (DIP). An MJ x swivel tee is acceptable on branch.
- B. Hydrant laterals shall be installed as straight possible with a minimal number of joints.

3.5.2 Easements

- A. Fire hydrants require a 10-ft by 10-ft easement, centered on the fire hydrant.

3.5.3 Placement and Accessibility

- A. A minimum of 4-feet of clear area shall be kept around all hydrants. Clear area shall not include any fences, shrubs, trees, bushes, or snow storage.

3.5.4 Spacing

- A. Fire hydrants shall be installed at each street intersection and at intermediate points for maximum spacing of 350 feet in commercial and multi-family areas and of 400 feet in single-family residential (SFR) areas.

3.5.5 Restraint and Thrust Protection

- A. Megalugs will be installed on all branch and run connections.
- B. Megalugs and concrete thrust blocks will be accepted where virgin soil is available.
- C. Megalugs and tie rods will be installed where soil disturbance has occurred. Two $\frac{3}{4}$ " zinc-coated, high-strength steel tie rods (or preapproved equivalents), nuts, and bolts shall be installed from the mechanical-joint side of the fire hydrant valve.

3.5.6 Installation and Depth of Bury

- A. Fire hydrants depth of bury shall be a minimum of 7-feet.
- B. Valves on fire hydrant laterals shall be 6" mechanical joint x mechanical joint.
- C. A minimum 2 cubic feet of $\frac{1}{2}$ " screened-rock drain bed, 12" deep, shall be provided at the base of each fire hydrant and covered with a double thickness of plastic sheeting for a distance of at least 3 feet around the barrel of the hydrant.
- D. Hydrants shall be installed in accordance with manufacturer's installation instructions and be buried to the manufacturer's bury line indicated on the hydrant column.

3.5.7 Materials

- A. Fire hydrants shall be Mueller A-403 Super Centurion Glass-Black a 6" mechanical joint-end connection (Model A-403 or a preapproved equivalent).
- B. Hydrants shall have one 4 $\frac{1}{2}$ " pumper connection and two 2 $\frac{1}{2}$ " hose connections. No other type of hydrant connections will be accepted.

- C. Hydrants shall have National Standard Thread, open to the left (counterclockwise), and have a standard five-sided operating nut.
- D. The main valve opening shall be 5¼" minimum.
- E. Hydrants shall be designed to operate under less than 250 psi working pressure.

3.5.8 Pressure Testing

- A. Refer to Pressure Testing requirements under Section 4 of these standards for testing requirements.
- B. Fire hydrants shall be pressure tested up against the hydrant auxiliary shut-off valve.

3.5.9 Disinfection

- A. Disinfection procedures for fire hydrants shall be the same as for water mains. Refer to Disinfection requirements under Section 4 of these standards.

3.5.10 Inspection and Acceptance

- A. All fire hydrants should be verified for proper operation and witnessed by City staff prior to acceptance.

3.6 Fill Station Program

Contractors who require bulk water must contact the Water Department's front office at 970-920-5110 and comply with all requirements of the City's Fill Station Program, details of which can be found on the City's website.

3.7 Air/Vacuum Valve and Vaults

Design and installation of air release valves and associated vaults must be approved by the Water Department and will be evaluated on a case-by-case basis.

3.8 Abandonment of System Appurtenances

3.8.1 Abandonment of Main Lines

All main lines scheduled to be abandoned shall be removed where applicable. Main lines that are to be left in place shall be plugged/capped at both ends of abandonment unless otherwise specified by the City of Aspen.

3.8.2 Abandonment of Fire Hydrants

Fire hydrants, associated valves, and laterals shall be removed. The tee on the main waterline where the hydrant lateral began shall be removed and replaced with two restrained solid sleeves and a similar-sized ductile iron pipe pup.

3.8.3 Abandonment of Service Lines

Service lines shall be abandoned at their source prior to the tapping of a new service. Abandonment shall include turning off the corporation stop (valve), cutting the old service above the compression nut, and crimping the abandoned service line. In the event the corporation stop (valve) leaks, a repair clamp shall be utilized. This shall be inspected by Water Department Staff before the work is backfilled and buried.

The Contractor shall notify the City of Aspen Water Department through the front office (970-920-5110) at least two full working days prior to the day the service is to be abandoned. Voicemail messages left outside hours of operation will not count towards the two full working days of prior notice. No other point of contact will result in a work order to document the adequacy of the notice.

3.8.4 Abandonment of Tees

Tees shall be removed and replaced with two restrained solid sleeves and a similar-sized ductile iron pipe pup.

3.8.5 Abandonment of Valves

Valves shall be removed and replaced with two restrained solid sleeves and a similar-sized ductile iron pipe pup.

3.8.6 Abandonment of Pressure-Reducing Valves and Vaults

PRVs and PRV vaults shall be removed including all associated appurtenances, including the vault. Prior to abandonment of PRV vault the Water Department shall determine which appurtenances shall be salvaged and turned over to the Water Department. Electric

and telecom service to the physical vault shall be properly disconnected and abandoned according to the specifications of the service provider. PRVs shall be removed and replaced with two restrained solid sleeves and a similar-sized ductile iron pipe pup.

3.8.7 Abandonment of Meter Pits

Meter pits shall be abandoned by removing all metering equipment and associated metering pit infrastructure. Abandoned vaults should be filled with pea gravel, any grade rings and access be removed, and asphalt or concrete patched.

3.8.8 Thrust Restraint of Abandoned Appurtenances

All capped or plugged pipe ends or fittings shall be restrained with a properly installed concrete thrust block and Megalug joint.

3.8.9 City of Aspen Inspection of Abandonments

A City of Aspen Water Department representative shall visually inspect and witness any and all infrastructure scheduled to be abandoned. The City of Aspen Water Department shall be notified through the front office (970-920-5110) at least two full working days prior to the day any infrastructure is to be abandoned. Voicemail messages left outside hours of operation will not count towards the two full working days of prior notice. No other point of contact will result in a work order to document the adequacy of the notice.

4.1 City of Aspen Inspection

Backfill shall not be done until the main and its services (where applicable) have been inspected by the City's designated representative for alignment, depth, and proper bedding. Inspections of water system improvements shall be made each day prior to the trench backfill.

4.2 Disinfection

4.2.1 Main Line Disinfection – General Considerations

4.2.1.1 Disinfection Plan

The Contractor or design engineer of record is required to submit a disinfection plan, conforming with AWWA C-651, for review and approval by the Water Department prior to delivery of potable water to customers.

4.2.1.2 Main Line Disinfection

Disinfection by chlorination of the pipe shall be performed prior to its acceptance by the City. Flushing, chlorination agent, and method of application shall be approved by the City of Aspen or its designee in accordance with latest revision of ANSI/AWWA Standard C651. The City will not provide labor, material, or test kits for disinfection to contractors installing mains.

Chlorine residuals greater than 200 mg/L are detrimental to the lining of the pipe; therefore, the City will not accept lines with disinfectant residuals greater than 200 mg/L.

The Contractor shall test the chlorine residual and flush water in the presence of an appointed City of Aspen representative. Copies of the test results shall be provided to the City of Aspen Water Department. Care shall be taken in flushing the pipeline to prevent property damage, danger to the public, and stream contamination. Please refer to ANSI/AWWA Standard C655.

The chlorination, flushing, and bacteriological testing of the finished pipeline shall be done prior to hydrostatic testing. All valves connecting to the City of Aspen's water system shall be operated by City of Aspen Water Department personnel only.

4.2.1.3 Disinfection Methods and Water Department Preference

The City of Aspen Water Department recognizes all disinfection methods presented in ANSI/AWWA Standard C651. The Water Department prefers the disinfection of new water lines be accomplished using the tablet chlorination method. A written request shall be submitted for the Water Department's review and approval to justify the use of alternate method of pipeline disinfection.

The maximum time the Water Department will allow tablets to be installed prior to filling the pipeline for disinfection testing is the end of the ROW season. Tablets sitting for any length of time may lose effectiveness, and not reach the initial High Chlorine levels as required within AWWA C-651. If initial High Chlorine levels are not met, the Contractor will have to develop a written plan to utilize an alternative testing method.

4.2.2 Bacteriological Sampling and Testing

Water samples shall be collected for bacteriological examination and residual chlorine content testing and acceptance before the pipe is pressure tested. This sampling will be done by the Contractor and witnessed by the City of Aspen representatives assigned to the project. The testing shall conform to AWWA Standards C651, Section 5.1.1.1, Option B:

The state-certified laboratories in the area are:

- Snowmass Water and Sanitation District
- Aspen Consolidated Sanitation District

4.2.3 Storage Tank Disinfection

Refer to AWWA Standard C652, Disinfection of Water-Storage Facilities for complete tank disinfection procedures and guidance. Storage tank disinfection procedures shall be submitted for review and acceptance by the Water Department on a case-by-case basis.

4.3 Testing

The Contractor shall notify the City of Aspen Water Department through the front office (970-920-5110) at least two full working days prior to the start of any testing. Voicemail messages left outside hours of operation will not count towards the two full working days of prior notice. No other point of contact will result in a work order to document the adequacy of the notice. All tests, including pressure and electrical tests, shall be performed in the presence of the City of Aspen's designated representative.

4.3.1 Pressure Tests

4.3.1.1 Testing and Acceptance

The Contractor shall be responsible for the following:

1. Notifying the authorities having jurisdiction (AHJs) of the requested date for testing to be performed. This includes the City of Aspen Water Department, as well as the Aspen Fire Protection Department.
2. Performing all required acceptance tests.
3. Completing and signing a contractor's material and test certificate(s), as attached to these Standards.

4.3.1.2 Hydrostatic Test

In the presence of the City of Aspen Water Department's designated representative, the Contractor shall pressure test all pipelines and piping to the pressures indicated in the table below, for a duration of two continuous hours. No hydrostatic test shall be conducted on any portion of the pipeline(s) until:

- all field-placed concrete has set,
- the line has been chlorinated,
- and the bacteriological test has been passed.

Condition	Hydrostatic Test Pressure Requirement
Water mains and other distribution system appurtenances	150 psi or 150% of the static pressure, whichever is greater (to a maximum of 350 psig), for a duration of two (2) continuous hours.
Underground services: greater than or equal to 4" diameter	200 psi (gauge) or 50 psi (gauge) greater than the system working pressure, whichever is greater (to a maximum of 350 psig), for a duration of two (2) continuous hours.
Underground services: 3/4" to 2" diameter (domestic only)	Plumbers and contractors are advised to perform a pressure test on all services.
Underground services: 3/4" to 2" diameter (common domestic/fire suppression)	Plumbers and contractors are advised to perform a pressure test on all services. It is strongly recommended that Contractors notify the AFD of pressure testing date and time and pressure test the line to 200 psi (gauge) or 50 psi (gauge) greater than the system working pressure,

Condition	Hydrostatic Test Pressure Requirement
	whichever is greater (to a maximum of 350 psig), for a duration of two (2) continuous hours.

4.3.1.3 Hydrostatic Test Setup and Pressurization

Prior to testing, the pipeline shall be filled at a rate that will neither cause surges nor exceed the rate at which air can be released through the air valves at a reasonable velocity. All the air within the pipe shall be properly purged. If no air valves are installed on the pipeline, air shall be released through fire hydrants and blow offs. Where blow offs or hydrants are not available – or where they are not effective in purging air from the line – the Water Department or it’s inspector shall require a tap to purge the line. The location of the tap shall be at the inspector’s discretion, but preferably located at the highest point on the line. The size of the tap will be determined by a Water Department representative. The tap will be removed, and a stainless steel full-circle clamp will be placed over the pipe penetration after the testing is complete.

If a blow off needs to be maintained on the pipe, the tap will be made on top of the main, with a curb stop valve installed to control the flow. The curb box and associated blow off pipe shall be installed inside a 5.25” valve box embedded in 12” of gravel. The blow off shall consist of a Type-K copper pipe and a 1” Mueller curb box.

The Contractor shall furnish the water, pump, and means of measuring water volume associated with pressure testing at testing locations designated by the Water Department. The Contractor shall also furnish all labor, bulkheads, and miscellaneous material. The Contractor will perform all work to test the pipeline, maintain the required test pressure, and relieve the pressure in the pipeline after testing. All valves connected to the City system shall be operated solely by City of Aspen Water Department personnel.

The filling of the pipeline and the proper disposal of chlorinated or other water shall be done only with approval of the City of Aspen’s designated representative.

4.3.1.4 Hydrostatic Testing Allowance

All testing procedures shall be conducted in accordance with the latest revision of ANSI/AWWA C600 Section 5.2.

Testing allowance is defined as the maximum quantity of makeup water that is added to a pipeline undergoing hydrostatic pressure testing, or any valved section thereof, to maintain pressure within 5 psi (+/-) of the specified test pressure (after the pipeline has been filled with water and air has been expelled). No pipe installation will be accepted if the quantity of makeup water is greater than that determined by the following formula:

$$L (gph) = \frac{SD\sqrt{P}}{148,000}$$

Where:

L = testing allowance (makeup water) [gallons per hour (gph)]

S = length of pipe tested [feet]

D = nominal pipe diameter [inch]

P = average test pressure during hydrostatic test [psig]

All visible leaks shall be repaired regardless of the allowance used for testing.

4.3.2 Conductivity Tests

The pipeline shall also be tested for electrical conductivity in the presence of the City of Aspen's designated representative. Connectors or bonds shall be installed so that the pipeline will act as a conductor. To be sure that all installed bonds are effective, no more than 1,000 feet of pipeline will be electrically tested at one time. The line shall be tested after the trench is backfilled and compacted but before any street surfacing or seeding has taken place. The line shall be tested by connecting a low-voltage source to be sure that the pipe acts as a conductor. House services and fire hydrants shall be tested on a section-by-section basis. If the pipeline does not conduct an electrical current, the bonds or connectors will be checked and repaired until the defect is found.

Please refer to latest revision of AWWA Standard C600, Installation of Ductile-Iron Water Mains and Their Appurtenances.

5 Water Service

All new water service installations, as well as Substantial Remodels (as defined by City of Aspen Municipal Code 25.12.070), shall comply with current City of Aspen Water Distribution Standards.

Existing installations that are found to be non-compliant shall be required to comply with current Standards as equipment and/or infrastructure fails and needs repair (refer to *Section 5.6 Ownership and Owner Responsibility* for details).

Existing installations that are found to be non-compliant through the course of other work shall be put on notice to comply with current Standards within a timeframe as agreed upon between the Water Department and customer.

Pre-tap agreements do not relieve the customer from complying with all current City of Aspen Standards when the pre-tap account requests permanent active service.

5.1 Water Taps

5.1.1 Responsibility for Tapping

All water service connections to existing City of Aspen water mains and all taps to existing mains shall be made by the City of Aspen Water Department at the expense of the Contractor, unless the Contractor is specifically granted permission to perform the tap or service connection at the Contractor's expense. If the Contractor is granted permission by the City to perform the tap, then the City shall be present at the time of the tap to observe and inspect the work.

5.1.2 Tapping Availability and Prerequisites

Water service taps to the City of Aspen's water mains will be made only from April 1st through October 31st. Billing for utility hookup charges will be done after the work is completed.

Existing taps that are to be replaced will be abandoned prior to the installation of a new tap (see the Section "Abandonment of System Appurtenances" in these standards). The Water Department requires at least two full working days of notice through the Water Department Front Office (920-5110) prior to service abandonments and new taps. No other point of contact will result in a work order to document the adequacy of the notice.

Service taps, curb stops, and service lines shall be located within 10 feet of the primary access to the property (either the driveway or the sidewalk to the front door) unless the Water Department recommends and approves a different location based on the

availability of water mains. Curb stops should be located outside of the Public ROW and in a location open and accessible to the property owner, locations should be reviewed and approved by both the Engineering Department and Water Department prior to scheduling a tap.

- **Prior to tapping ¾" to 2" services**, a minimum of 4 feet in length of the main shall be exposed, with a minimum of 2-feet clearance around the main and 6-feet of clear trench on the side of the main where the tap is to be made. The proposed tap location must be at least 18" away from any other fitting, tap, or pipe disturbance. Excavation shall meet all OSHA requirements.
- **Prior to tapping services of 4" and larger**, a minimum of 4 feet in length of the main shall be exposed, with 3-feet clearance around the main and 10-feet of clear trench on the side of the main where the tap is to be made. Taps that are 4" and larger shall also have a concrete thrust block installed. Excavation shall meet all OSHA requirements.

The Contractor is required to have all materials necessary to install the service line from the corporation stop (valve) on the main to the curb stop valve. City staff will verify materials are on site and will not perform the tap unless all required materials are on site.

5.1.3 Pre-Tapping

To avoid disruption of a roadway surface, pre-tapping of a system may be permitted for new subdivisions only through a prior written pre-tap agreement, to be approved at the discretion of the Water Distribution Supervisor/ORC. Pre-tap agreements do not relieve the customer from complying with all current City of Aspen Standards when the pre-tap account requests permanent active service.

The written pre-tap agreement will specify the following:

- Standards for mapping service lines and curb-box locations
- Responsibility for maintaining connections until service is initiated
- Procedures for setting up an account when water service is desired at a pre-tapped location
- Penalties for failure to comply with the agreement or to connect new uses to the municipal system
- Water Department charges for tap installations and inspections

For private systems, the City of Aspen Standards will be followed for materials and construction.

The Water Department will provide, at the customer's expense, the tapping saddle and the corporation stop (valve). The contractor will provide and install the approved pipe, fittings, curb stop valve, curb box with rod, thaw wire, and clamp. The curb stop valve shall be a Mueller-type (or preapproved equivalent) copper compression type. The curb box shall be a 1" Mueller type with a rod and saddle (or a preapproved equivalent).

5.1.4 Service Line Materials

Each water-service line shall be a continuous tube of Type-K copper from the tap on the main to the curb box and from the curb box to the building/structure, unless otherwise authorized in advance by the Water Department. A solid #4, or larger, copper thaw wire shall be connected to the service line at the corporation stop (valve) with a bronze clamp and laid in the service trench, separated from the service line and the curb box by a horizontal distance of 12", and attached only at the top of the curb box.

A compression-type Mueller ball-curb stop valve and 1" Mueller-type curb fire hydrant box with a rod and saddle (or a preapproved equivalent) shall be installed. Services that are 1.5" to 2" will have enlarged curb box bases and use a 1" curb box. Services that are located within a pressurized system shall include backflow prevention that is rated for a high degree of cross-connection hazard.

Dissimilar metals or materials containing lead will not be allowed.

5.2 Installation

5.2.1 Installation of Service Lines (3/4" to 2")

All 3/4" through 2" water services shall be installed after the water mains have been installed unless they are placed as part of a pre-tapping agreement. All water services shall be placed at least 10 feet away from any non-potable conduit from the main to the building. All plumbers and contractors are advised to perform a pressure test on all services. Where pre-tapping is permitted, the pressure test will include the service lines connected to the main and include the entirety of the service line from corporation stop to within the building/structure. All service lines shall be inspected by Water Department prior to backfill.

All coupons and shavings from taps shall be removed from the main line to protect the system from future damage.

New service lines must be buried a minimum of 7 feet deep. The Aspen Water Department requires correct installation of service lines in full compliance with AWWA

Standards. All services from ¾" through 2" will be connected to the building using Type-K copper.

Each water-service line shall consist of a continuous tube of Type-K copper from the tap on the main to the curb box and from the curb box to the building unless otherwise approved by the Water Department.

All service lines shall be bedded with road base or washed sand from 6" below to 6" above the service line. A Mueller corporation stop (or a preapproved equivalent) with CC threads and copper compression fittings shall be used. An appropriately sized gooseneck shall be made in all copper service lines to prevent them from being pulled from the main during backfill and compaction operations.

A compression-type Mueller ball curb stop valve and 1" Mueller-type curb box with a rod and saddle (or a preapproved equivalent) shall be installed. Services that are 1.5" to 2" will have enlarged curb-box bases and use a 1" curb box. Backfill shall not be done until the line is inspected by the City's designated representative for alignment, depth, and proper bedding. Inspections of all water-system improvements shall be made each day prior to the backfill of the trench.

A solid, bare #4 copper thaw wire must be installed from the corporation stop to the top of the curb box. The thaw wire shall contact the water line only at the corporation stop and at the top of the curb box.

Saddle taps shall be a Mueller series DR2A with double alloy-steel straps, epoxy-coated ductile iron body, and high-strength alloy nuts and bolts (or a pre-approved equivalent).

5.2.2 Installation of Service Lines (4"+)

Services that are 4" and larger will be of DIP, and the specifications for installation will be the same as those for the main lines except that as-built drawings may be omitted at the utility's discretion. Separation from non-potable water conduits shall be the same as for water mains.

All service lines shall be bedded with road base or washed sand from 6" below to 6" above the service line. Backfill shall not be done until the line is inspected for alignment, depth, and proper bedding by the City's designated representative. Inspections of all water-system improvements shall be made each day prior to the backfill of the trench.

All service lines 4" and larger shall be reviewed, tested and inspected in the same manner as the main lines. The line shall be restrained to the first fitting inside the building, this can be accomplished via wall flanges, tie rods or other methods to be reviewed during the submittal process. All testing needs to be completed prior to the connection of any internal plumbing. Testing should be via a blind flange (can be tapped) on the inside of

the building. All parts for service-line installations must be available for inspection prior to the start of construction. Private systems will abide by the system's pre-tap agreement.

5.2.3 Service Line Inspection

All new service lines installed within the City of Aspen Water Distribution System shall be inspected and approved by a State of Colorado certified water professional. Upon approval, service line will be allowed back filled. Inspection must be complete before service line has been back filled.

5.3 Direct Taps

Direct taps to potable water pipelines are not allowed by the Water Department.

5.4 Service Line Sizing

Domestic service lines without oversizing for fire flows will use the same size pipe as the tap (source) on the main line to the discharge side of the meter. This includes all fittings and appurtenances.

Combined fire-flow and domestic service will be the same size from the main to the domestic service junction and will use a common line with a single penetration into the building. For purposes of utility billing (demand charges and tap fees), tap size will then be determined by the sizes of the meter and the piping on the domestic side. Oversized Taps for fire protection systems will be in conformance with City Code Section 25.12.080. Where tap fees are waived for increased service line sizes, documentation from the manufacturer or engineer will be required to determine the minimum line size necessary to provide fire suppression.

Fire flow calculations will be required for all water services requesting fire protection. Fire flows shall be determined in accordance with the Insurance Services Office (ISO) or International Building Code (IBC) utilizing the standard method of calculation.

All flows for commercial, multi-family, and single-family residential areas will be met according to the current International Fire Code and reviewed by the Fire Marshal and a City of Aspen representative.

Fire flow calculations should show:

- That a smaller service line size is not adequate for the necessary demand.
- A summary specifying proposed design and why the line failed.
- Signature block certifying calculations are correct by a Fire Suppression Contractor registered in the State of Colorado (in compliance with 8 CCR 1507-11).

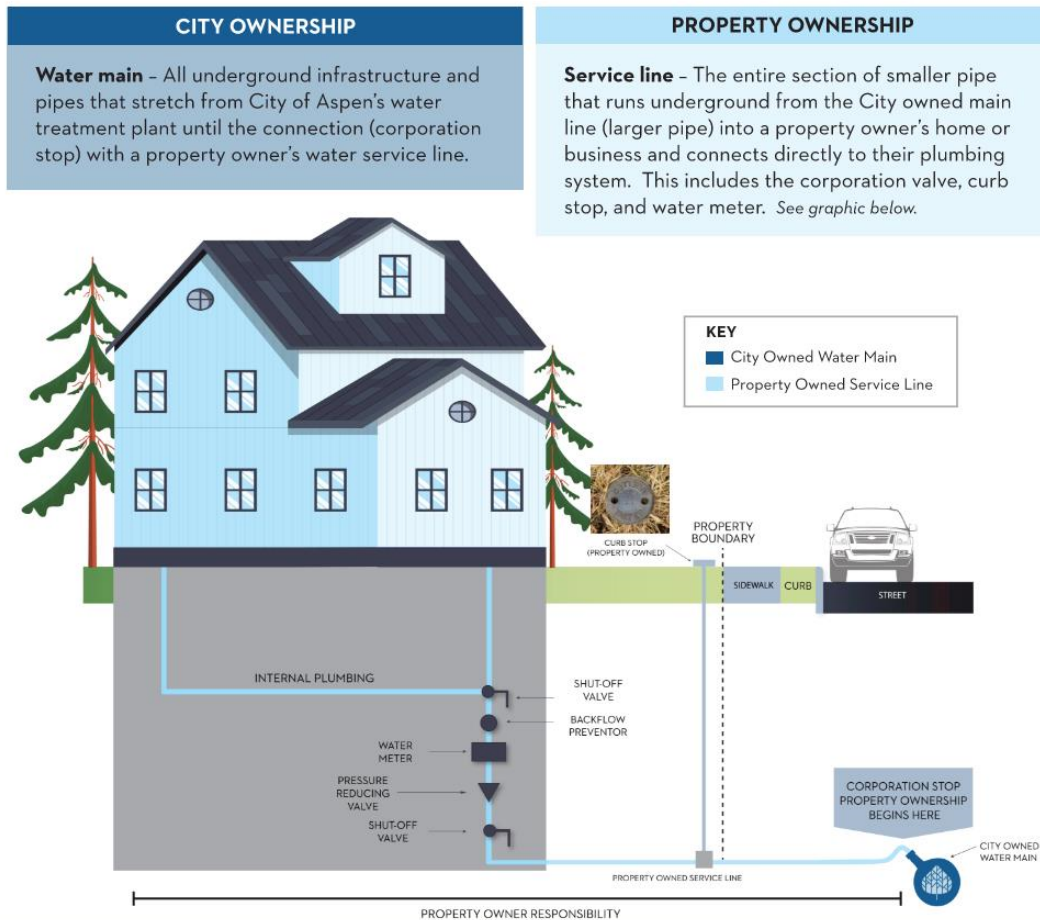
5.5 Common Service Lines

- A. One water service tap and water meter are allowed for Single-Family Residences (SFRs).
- B. For a Duplex, a water service tap and meter will be completed for each side of the duplex.
- C. For Commercial or Multi Family buildings that share a common Fire line, manifolding multiple domestic water meters for individual units is allowed. When manifolding meters, a check valve must be installed before the water meter for each unit to prevent any reverse flow from unoccupied neighboring units.
- D. When separate accounts are supplied by a common service line, the Water Department must approve and record a shared service line agreement. Separate isolation controls to each service must be installed in a mechanical room, which will remain accessible to the Water Department and to emergency workers.

5.6 Ownership and Owner Responsibility

The property owner owns the service line from the corporation stop (valve) to the home or business. City customers with service lines 4" and larger are responsible for the service line and the isolation valve off the mainline tee that connects and isolates their service from the City's water system.

The Water Department requests at least two full working days' notice through the front office (970-920-5110) to assist property owners with locating the curb box.



It is the responsibility of the owner to maintain and repair the service line in its entirety, including the curb stop valve. The owner shall be responsible for repairing leaking service lines within 48-hours of notice by the Water Department or be subject to shutdown of water service in accordance with the latest revision of the City of Aspen Municipal Code.

5.7 Utility Investment Charge (Sec. 25.12.040)

Utility investment charges must be paid before the service tap will be scheduled. Billing for utility-hookup charges will be done after the work is completed. Utility connection permits (UCPs; Code Sec. 25.12.030) and the accompanying work order will state the size of the permitted tap.

5.8 Water Metering

All potable and raw water services shall be metered (Code Sec. 25.16.030) and with meters utilizing advanced metering infrastructure (AMI) technology (Code Sec. 25.16.027). Installation of water meter is the responsibility of the property owner. All

installed water meters will be inspected for conformance with the City's standards by the City of Aspen Water Department.

5.8.1 Meter installations

Water meter installations shall meet the following minimum requirements:

- Location and Access:
 - All meters will be set as close as possible to the point where the service enters the building.
 - All meters will be installed no more than 36" above the floor or work surface with a minimum clearance of 12" above or in front of the meter for easy visual inspection of register face.
 - The installation shall be readily accessible for servicing and repairs. If a meter is installed in a crawlspace, an access panel or trap door will be provided for quick and safe access.
 - Meter vaults, meter pits, and areas defined as confined spaces are unacceptable locations for meter installations.
 - Meter and backflow devices will be placed aboveground **inside a structure** when the water service is specifically for irrigation purposes. The owner of the account is responsible for winterization of the service.
- Other:
 - Meters shall be protected from freezing.
 - The meter will be the same size as the domestic service line on both the inlet and outlet sides of the meter. A ¾" meter is the smallest meter allowed.
 - One meter per service line shall be allowed at each customer's service location.
- Commercial Applications:
 - All commercial applications will install an approved reduced pressure principle backflow device on both the service line and the bypass. Backflow devices shall be downstream from the meter and installed according to current or amended Colorado Department of Public Health and Environment's (CDPHE) Article 1-114 and Article 1-114.1 of Title 25 of the Colorado Revised Statutes and of Section 39 of 5 CCR 1002-11 Colorado Primary Drinking Water Regulations (Regulation 11).

Bypass piping around existing or future water meters shall be accepted on a limited case-by-case basis and can only be implemented if a customer has received written approval from the Aspen Water Department. Bypass piping materials and configuration shall be installed in accordance with the latest edition of the City's Water Standards.

All installations will be set up in the following order:

- 1st – Ball valve
- 2nd – Water cop, if desired
- 3rd – Pressure-reducing valve set at 80 pounds or less
- 4th – Bypass. Note: when a bypass is required, it will have a sealable valve.
- 5th – Meter
- 6th – Ball valve
- 7th – Backflow preventer. Note: Second assembly may be required with a ball valve following this assembly.
- 8th – Jumper wire from the inlet side of the pressure-reducing valve to the outlet side of the meter using N.E.C. standards and from the outlet side of the backflow (if a backflow is required). Note: A “water cop” device may need to be installed after the pressure-reducing valve. Do not exceed the maximum operating pressure recommended by the manufacturer.

Sealed valves shall be maintained closed. Removal of seal will be considered evidence of unauthorized water usage.

5.8.2 Water Utility Advanced Metering Infrastructure (AMI) (Sec. 25.16.027)

Advanced Metering Infrastructure (AMI) technology provides 24/7 water consumption information for both the city water customer and the utility billing staff, which can be used for troubleshooting usage issues, account analysis, and billing. AMI meters are read remotely instead of sending Water Department staff to a home or business each month to read the meter, thus improving operational efficiency and providing customers with near real-time energy use information. As of January 1, 2023, the City of Aspen Water Department will require AMI technology in all water meters used or installed by its account owners, except as expressly provided in the Municipal Code.

5.8.2.1 Water Meter Transmitting Units (MTUs)

Each water meter installation shall be installed with a meter transmitting unit (MTU) on the exterior of the structure where the water meter is installed. A minimum of three low voltage wires (thermostat wire) shall be installed from the interior area where the water meter is located to the exterior of the property and connected to the MTU. The City of Aspen Water Department prefers that the MTU is installed near electric and/or gas

meters. City of Aspen Water Department personnel will install the MTU at the time of inspection.

5.8.2.2 Water Meter Manufacturers

Acceptable water meter manufacturers are Kamstrup or Honeywell/Elster AMCO brand. Meter manufacturer installed shall be based on meter size.

Kamstrup Water Meter Specifications for the City of Aspen (Approved for Horizontal or Vertical Installation in upward flow)

- ¾" diameter x 7.5" lay length, polymer or stainless steel body, male NPT connections, Kamstrup Water Meter flowIQ 2100 Smart Ultrasonic Water Meter with Encoded Output (EO) with 3 bare wires from register for connection to the MTU or Sensus 510M transmitter.
- 1.0" diameter x 10.75" lay length, stainless steel body, male NPT connections, Kamstrup Water Meter flowIQ 3101 Smart Ultrasonic Water Meter with Encoded Output (EO) with 3 bare wires from register for connection MTU or Sensus 510M transmitter.
- 1.5" diameter x 10.75" lay length, stainless steel body, oval flange connections, Kamstrup Water Meter flowIQ 3101 Smart Ultrasonic Water Meter with Encoded Output (EO) with 3 bare wires from register for connection MTU or Sensus 510M transmitter.
- 2.0" diameter x 17" lay length, stainless steel body, oval flange connections, Kamstrup Water Meter flowIQ 3101 Smart Ultrasonic Water Meter with Encoded Output (EO) with 3 bare wires from register for connection MTU or Sensus 510M transmitter.
- 3.0" diameter x 12" lay length, stainless steel body, ANSI flange connections, Kamstrup Water Meter flowIQ 3101 Smart Ultrasonic Water Meter with Encoded Output (EO) with 3 bare wires from register for connection MTU or Sensus 510M transmitter.
- 4.0" diameter x 14" lay length, stainless steel body, ANSI flange connections, Kamstrup Water Meter flowIQ 3101 Smart Ultrasonic Water Meter with Encoded Output (EO) with 3 bare wires from register for connection MTU or Sensus 510M transmitter.

For Technical Briefs please visit www.kamstrup.com

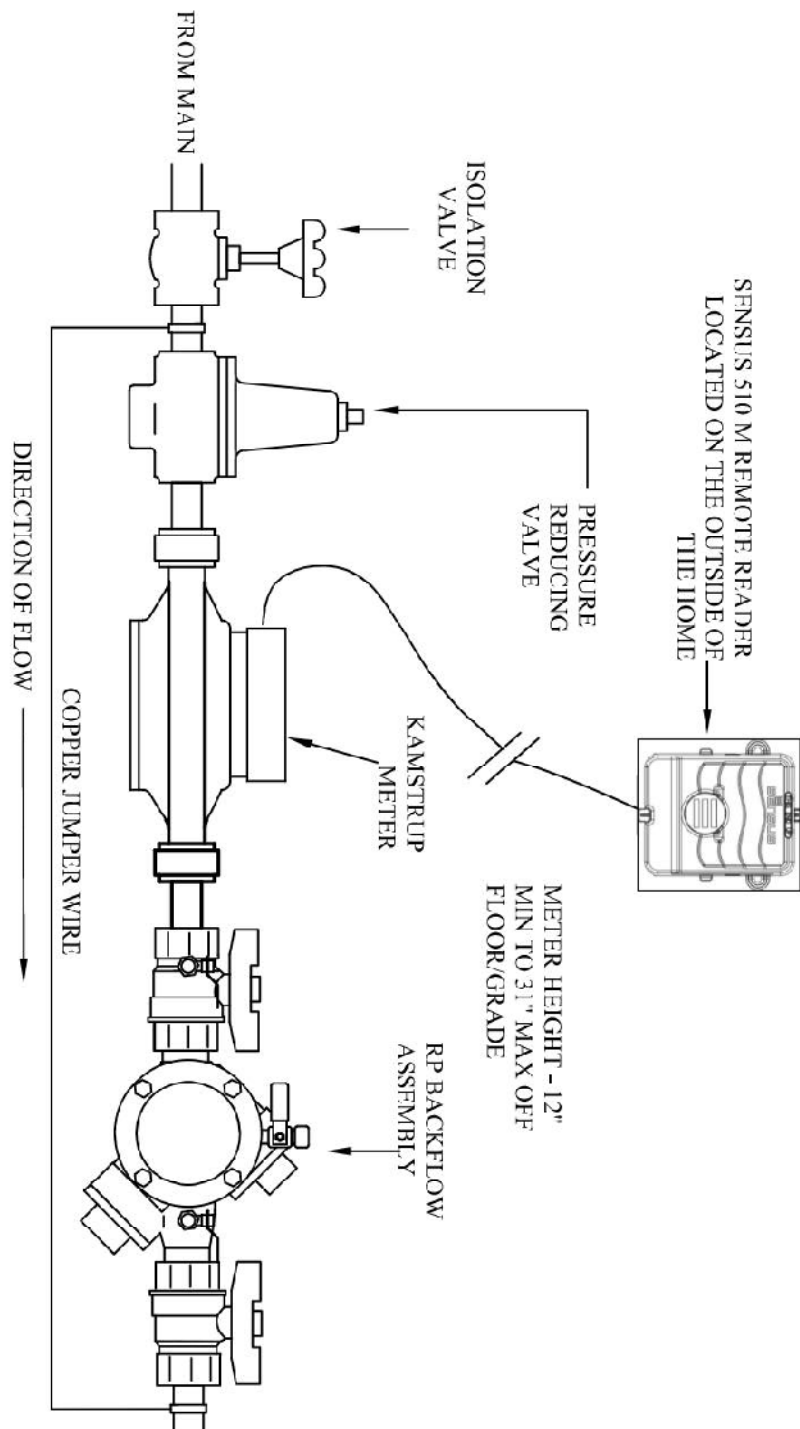
Please see the following page for water meter (3/4" – 2") installation drawing.

Honeywell Elster Water Meter Specifications for the City of Aspen (Approved for all large meter applications (6" – 8"))

- All large meter applications (6.0" thru 8.0") shall use Honeywell Elster EVOQ4 electromagnetic meter with stainless steel body and ANSI class, epoxy-coated flanges using stainless steel nuts and bolts.

For Technical Briefs please visit www.elsteramcowater.com.

METER INSTALLATION 3/4" - 2"



5.9 Backflow and Cross-Connection Control Program

The purpose of the City's backflow prevention and cross-connection control program is to protect the City's water system from contaminants or pollutants that could enter the distribution system by backflow from a customer's water supply system through the service connection.

- I. **Backflow** – reverse flow of water, fluid, or gas caused by back pressure or back siphonage. Backflow can also occur when the pressure in the public distribution system drops. Normally this pressure is high enough to prevent backflow; but certain events – such as main breaks, flushing, or firefighting – can lower the pressure enough to allow the water to flow backwards. Two types of backflow include:
 - a. **Backsiphonage** – a negative pressure that can be caused by water main breaks, fire hydrant flushing or firefighting. Backsiphonage can draw all the water from a private water system. If this water is used for boilers, sprinkler systems, etc., it could contain contaminated water.
 - b. **Backpressure** – caused by the pressure in the private water system exceeding that of the City's water system usually because a private owned pump is being used to increase pressure inside a single structure. This causes water to be forced back into the city owned system.

Cross-connections occur when the public drinking water supply is physically connected to contaminated sources (e.g., a hose submerged in a bucket or lying on the ground). Cross-connections provide a pathway for the backflow of polluted or contaminated water into the drinking water system.

- I. **Cross-Connection** – A cross-connection is an unprotected direct connection or an indirect connection between a potable water system used to supply water for drinking purposes and any source or system containing unapproved water or a substance that is not or cannot be approved as safe, wholesome and potable. Bypass arrangements, jumper connections, removable sections, swivel or changeover devices, or other devices through which backflow could occur shall be considered cross-connections.
 - a. **Controlled Cross-Connection** – a cross-connection that has a properly installed, maintained, and tested or inspected backflow prevention assembly or backflow prevention method that prevents backflow.
 - b. **Uncontrolled Cross-Connection** – a cross-connection that does not have a properly installed, maintained, and tested or inspected backflow prevention assembly or backflow prevention method, or the backflow prevention assembly or backflow prevention method does not prevent backflow.

As a supplier of public drinking water, the City of Aspen has the authority to survey all service connections within the City's water distribution system to determine whether any connection is a cross-connection; to control all service connections within the distribution system that are cross-connections; to charge a fee for the administration of the cross-connection control program; to maintain records of surveys and the installation, testing and repair of all backflow prevention assemblies permitted or required under this program; and to administer, implement and enforce the provisions of this cross-connection control program.

5.10 Cross-Connection Control Standards

Backflow prevention devices are required on all commercial, industrial, institutional, and irrigation connections. Once installed, these devices must be tested annually. The State of Colorado Backflow Regulations require all backflow prevention assemblies to be tested at the time of installation, repair, relocation, and/or at least once annually thereafter, or more often when required by the authority having jurisdiction (AHJ). The Backflow Prevention Education Council of Colorado provides a listing of testers by region on their website.

5.10.1 Containment or Containment by Isolation

An uncontrolled cross-connection can be controlled by containment or by containment by isolation.

- I. **Containment** – installation of a backflow prevention assembly or a backflow prevention method at any connection to the public water system that supplies an auxiliary water system, location, facility, or area such that backflow from a cross-connection into the public water system is prevented.
- II. **Containment by Isolation** – installation of backflow prevention assemblies or backflow prevention methods at all cross-connections identified within a customer's water system such that backflow from a cross-connection into the public water system is prevented.

A containment assembly protects the City's water distribution system from hazards that may be present at private residences. At a minimum, a containment assembly is required on all new service line installations. Additionally, any modifications to a service line require a containment assembly to be installed.

A backflow prevention assembly (in-line testable) installed on the water service line, downstream of the water meter, before any branches or connections to the service line would serve as containment protection. A backflow device installed on a residential lawn

sprinkler system is an example of containment by isolation. This device prevents lawn sprinkler water from getting back into the home.

5.10.2 Backflow Prevention Assemblies and Backflow Prevention Devices

The type of backflow prevention device or assembly needed on a system is determined by the level of hazard posed by the owner's water use. Assemblies are in-line, testable components, whereas devices are not testable system components. Installing backflow prevention assemblies prevents the possibility of contaminated water returning to the distribution line. Please consult the Backflow Prevention Reference Manual or the Plumbing Code for installation requirements and limitations.

- I. **Backflow Prevention Assembly** – any mechanical assembly installed at a water service line or at a plumbing fixture to prevent a backflow contamination event, provided that the mechanical assembly is appropriate for the identified contaminant at the cross-connection and is an in-line field-testable assembly.
- II. **Backflow Prevention Method** – any method and/or non-testable device installed at a water service line or at a plumbing fixture to prevent a backflow contamination event, provided that the method or non-testable device is appropriate for the identified contaminant at the cross-connection.

In general, the City requires the following in-line, testable backflow prevention assemblies:

- **Main Water Service:** reduced pressure principal backflow prevention assembly or double check valve backflow prevention assembly.
- **Irrigation Systems:** vacuum breaker backflow prevention assembly or reduced pressure (RP) backflow prevention assembly.
- **Fire Systems:** double check backflow prevention assembly or RP backflow prevention assembly. Refer to the section below for additional details.

5.10.3 Fire Sprinkler Systems

Where a common service line is used for domestic and fire suppression systems, a separate isolation valve and backflow prevention device will be recommended for each side of the water system.

- For the domestic side, the requirement for backflow prevention is dependent on the presence and type of hazard based on the uses connected to the domestic side of the system.
- For the fire suppression side, a backflow preventer that meets the current requirements of the CDPHE is recommended. Current State Standards permit a double check valve for class 1, 2, and 3 fire suppression systems. When fire

systems are filled with glycol or any material other than air or domestic water (class 4 or 5 fire suppression systems), a reduced pressure principal device will be the standard used for connections to the City of Aspen water system.

External connections for fire pumper trucks will only be provided downstream of the backflow device to prevent introduction of unknown sources of water into the municipal water system. The fire line size will be of uniform size from the corporation stop (valve) through the backflow device. All backflow assemblies shall include isolation valves on both sides of the backflow device.

5.10.4 Mechanical Backflow Prevention Devices

- I. **Pressure Vacuum Breaker Assembly** – ASSE 1020 Standard. This assembly is used mainly on lawn irrigation systems. It has a one-way check and a spring-loaded air inlet valve that closes when City water main pressure drops. Requirements for use of this mechanical backflow prevention device:
 - No backpressure
 - 12" above high point of use
 - Protect from freezing
- II. **Double Check Valve Assembly** – ASSE 1015 Standard. This assembly consists of two tightly closing shut-off valves, two independently acting check valves force-loaded to a closed position, and four properly located test cocks. The double check valve assembly provides backpressure and backsiphonage protection. Requirements for use of this mechanical backflow prevention device:
 - Used in low-hazard applications
 - The double check valve assembly can be used on fire sprinkler systems that do not contain chemicals (e.g., antifreeze, corrosion inhibitors, or other chemicals).
- II. **Reduced Pressure Principal Assembly** – ASSE 1031 Standard. This assembly is used for high-hazard and low-hazard applications. The reduced pressure principal assembly consists of two tightly closing shut-off valves, two independently acting check valves, four properly located test clocks, and one relief valve. The reduced pressure principal assembly provides backpressure and backsiphonage protection.

5.11 Backflow Prevention Overview

If you do not have a backflow device:

1. Call a plumber licensed to do work in the City of Aspen and schedule an installation.

2. Obtain a building and/or plumbing permit.
3. After the device is installed, it must be tested. Your tester is required to submit test reports to the City of Aspen. Test reports should be sent in pdf format to [backflow@aspen.gov/](mailto:backflow@aspen.gov)

Now that the device is installed:

1. Contact a company qualified to perform backflow testing and repair. These companies are listed at the Backflow Prevention and Education Council of Colorado website, as well as being available from the City of Aspen Water Department (970) 920 5110.
2. Ask the backflow tester to send a copy of the test report to the City of Aspen Water Department, 427 Rio Grande Place, Aspen, CO 81611.

Next year:

1. The device must be retested every year. Prior to the anniversary of your test date, you will receive a reminder notice from the City of Aspen. Contact a qualified backflow tester and return the test results to the City of Aspen Water Department.

For more information about the program, please email [backflow@aspen.gov/](mailto:backflow@aspen.gov) or call 970.920.5110.

Additional Links:

[American Backflow Prevention Association](#)
[List of Approved Assemblies](#)

5.11.1 Backflow Prevention Non-Compliance

The City Utilities Department shall require inspection, testing, maintenance and as needed repairs and replacement of all backflow prevention assemblies and methods, and of all required installations within a customer's premises plumbing system in the cases where containment assemblies and or methods cannot be installed. City Utilities customers shall be charged fees in accordance with the most recent Municipal Code for non-compliant and/or uninspected backflow assemblies past the twelve-month required inspection date. Please refer to the Municipal Code for further details.

6 Reuse Water Construction Standards

6.1 General

6.1.1 Purpose

The City of Aspen publishes this Standard, which is prepared under the direction of the City of Aspen's Director of Utilities, to provide minimum design and construction criteria for any covered distribution system component that is installed within the reuse water system service area and for similar components installed outside the service area when eventual connection to the City's system is contemplated.

This section covers providing and installing the following for reuse water lines: buried pipes, valves, meters, vaults, controls, and fittings.

This design standard is intended as an engineering reference manual that contains the minimum standards for the design and construction of reuse water systems. It is intended to supplement conditions contained in reuse water service agreements adopted by City ordinances to define the engineering standards that new water systems must meet prior to acceptance.

6.1.2 Source

Reuse water will be delivered via a contract to customers. Customers will be required to sign reuse water usage agreements.

6.1.3 Reuse Water Review

The City of Aspen or its designee will review all system design plans for the reuse water system.

6.2 Reuse System

All materials shall be new and of the best available quality. All materials used shall be manufactured and supplied according to the latest revised standards of the AWWA, the ANSI, and the ASTM, or as mentioned hereinafter. Miscellaneous valves and fittings shall operate as called out in the drawings.

6.2.1 Installation

Bury depth shall ensure positive drainage to a low-point drain line. This system shall be placed with a positive slope to facilitate easy draining for winterization.

6.2.2 Reuse System

The City's reuse water will be delivered through the City's reuse system. All reuse installations will be marked with purple identification tape labeled "Reuse" 2 feet above the line. Tracer wire will be installed for ease of location (refer to Tracer Wire section in these Standards for requirements).

6.2.3 Reuse Connections

All connections will require the installation of a main line tee (to meet the main line sizing), a three-valve complex (a main-line valve on each side of the tee and a branch isolation valve), a branch sized to meet the approved flow requirements, a meter with a remote flow-control valve, and a vault for the meter and valve. The City will own the tap, main-line valves, and isolation valve. The customer will own the meter vault, meter, control valve, and any additional control features. The City will have the ability to read the meter and adjust the timer on the control valve to ensure that the agreed-upon water delivery quantities are met. The user shall pay for all labor, material, and installation costs for the reuse tap and controls.

6.2.4 Customer Use

The customer shall abide by State regulations pertaining to use of reclaimed or reuse water provided by the City of Aspen. The City of Aspen shall not be responsible for the customer's use of the water.

6.3 Pipe Fittings and Appurtenances

6.3.1 High-Density Polyethylene Pipe

The pipe shall be JM Eagle HDPE PE4710 or equivalent. Depending on location and previous design standards, the specification will generally use DIP-size HDPE. Some locations will use IPS sizing, however. The contractor shall confirm the existing DIP or IPS sizing prior to design approval and make connections by potholing or by another form of identification prior to ordering materials.

The fittings shall be standard commercial products manufactured through injection molding or extrusion and machining, or they shall be fabricated from AWWA C901/C906 pipe conforming to this specification. For each project, all fittings shall be provided or recommended by the pipe manufacturer. The fittings shall be manufactured from the same (or better) resin, grade, and cell classification as the pipe itself. The fittings shall be fully pressure-rated by the manufacturer to provide a working pressure equal to that of the pipe. The manufacture of the fittings shall be in accordance with good commercial

practice to provide fittings that are homogeneous throughout and free from cracks, holes, foreign inclusions, voids, and other injurious defects. The fittings shall be as uniform as commercially practicable in color, opacity, density, and other physical properties. The minimum quick-burst strength of the fittings shall not be less than that of the pipe with which the fitting is to be used. All fittings shall be pressure tested by the pipe/fitting manufacturer to the specifications and requirements of AWWA C901/C906.

Alternative fittings that will be accepted for construction with high-density polyethylene pipe include:

- 1) Epoxy-lined (polyethylene-encased) ductile fittings used in combination with welded MJ adapters (provided at the contractor's expense), as manufactured by Central Plastics or Chevron Phillips (or an approved equivalent)
- 2) Electro-fused fittings as manufactured specifically for HDPE pipe by JM Eagle, Drisco Pipe, Frialen, or Central (or an approved equivalent)
- 3) Fused, welded HDPE fittings welded directly onto the existing pipe

6.3.1 Ductile-Iron Pipe (DIP), Fittings, and Appurtenances

DIP shall be used in vaults, pump stations, PRV vaults, in or under other reuse facilities, or where specifically approved. DIP is used with written approval from the Director of the Water Department only, as specifically addressed in the Special Construction Provisions. All DIP fittings used with mechanical joints (MJs) shall have HDPE-to-MJ adaptors where applicable. All HDPE-to-DIP fittings shall be restrained with MJ adaptors or Thermo-Weld couplings. In specifically approved installations, DIP material will be specified at the time of the proposed use and will require DIP fittings to be installed with megalugs.

6.3.2 Polyvinyl Chloride Pipe

This material is to be used for controls only. The pipe shall be similar or equal to Schedule 40 PVC and shall conform to ASTM D-1784 (Type 1 Grade 1 Cell Class 12454B, 1" through 4") unless otherwise designated in the drawings or Special Construction Provisions. The pipes and fittings shall be made from clean, virgin, NSF-approved Class 12454-A or 12454-B PVC and conform to requirements of ASTM D1784 (latest revision).

6.3.3 Transitions

Transitions from HDPE to DIP may be accomplished with the following products:

- 1) Epoxy-lined (polyethylene encased), cast iron, or ductile reducers used in combination with a welded MJ adapter as manufactured by Central Plastics or Chevron Phillips (or an approved equivalent)
- 2) HDPE-fused diffusers, welded MJ transition adapters, or Drisco pipe (or an approved equivalent)

Use of megalugs on HDPE pipe is not allowed.

6.3.4 Pipe Identification

Each length of pipe and all fittings shall have marked on the exterior the following:

1. Manufacturer's name or trademark
2. Nominal pipe size and dimension ratio
3. HDPE cell classification (e.g., PE 345434C)
4. Legend – Type C901/C906 pressure pipe
5. PE 4710 or other applicable designations
6. Color-coded stripe (e.g., purple to designate raw or reuse irrigation)

HDPE pipeline requires tracer wire in accordance with the Tracer Wire section of these Standards, including locator boxes and locator tape.

6.3.5 Pipe Jointing

Joints shall be made through heat fusion or MJ adaptors. Use welded MJ adaptors (DIP to HDPE fittings) at all required tees, bends, and transitions from HDPE to DIP. HDPE-welded bends or tees are allowed.

6.3.6 Thrust Restraint

Mega-Lugs (EBAA Iron, Inc., Series 100 (or approved equivalent)) and one other form of restraint are required for all fittings. Concrete thrust blocks, as defined below, are preferable, however where disturbed soils or space constraints exist Cor-Ten Rods (or equivalent) will be reviewed as a second form of restraint.

Concrete thrust blocks shall be formed and poured in place as a second form of restraint on fittings, including taps 4" or larger, to resist hydraulic thrust. Thrust blocks shall be sized based on sound engineering judgement and in accordance with the Water

Distribution Standards Details and will be subject to review by the City of Aspen if needed. A poly wrap bond breaker shall be installed between concrete and all pipes or associated appurtenances.

Where designated in the drawings and where existing conditions do not permit the use of concrete thrust blocks, fitting restraints shall be made with tie rods and either pipe clamps or special fitting bolts. Tie-rod restraint systems shall have a minimum of 2 rods per joint or clamp subject to review during the permit process.

The tie bolts shall be fabricated from a Cor-Ten steel or equivalent, according to the requirements of ASTM A242, with a minimum yield stress of 46,000 psi. Retainer clamps shall be equal to socket clamp Figure 595, as manufactured by ITT-Grinnell or equivalent.

6.3.7 Mechanical-Joint Retainer Glands

On all fittings, restraint shall be made with MJ retainer glands. These glands shall be cast from 60-40-12 ductile iron and shall have bolt circles, bolt holes, and dimensions that will permit the glands to be used with standard MJ bells and standard-length bolts, as per ANSI A21.11 and AWWA C111. All special tools recommended by the manufacturer shall be used during installation, supplied to the owner, and designated in the required operations and maintenance manual. Mega-lug retainer glands shall be manufactured by EBAA Iron, Inc., Series 100 (or approved equivalent).

6.4 Gate Valves

Gate valves for buried pipelines 2"-12" shall use a Mueller (or preapproved equivalent) iron-body, bronze-mounted, resilient seat; conform to AWWA C509 for buried service; open counterclockwise; have a non-rising stem and 2" operating nut; and use a working pressure of 250 psi.

The joints for valves connected to the ductile iron shall be MJs in accordance with ANSI A21.11. All gaskets shall be for standard water service.

Valves greater than 12" will be specified and evaluated by the Water Department on a case-by-case basis.

6.5 Valve-Box Assemblies

Valve-box assemblies shall use Tyler Pipe 3-piece cast iron valve boxes. Assemblies shall accommodate 4" through 12" valves. Valve shaft shall be 5.25" shafts and screw types 6850 Series-668-S and/or 6865 Series-F with complete extension of 62" to 82". The difference between the boxes is primarily in the base type. The parts for the different valve boxes must be interchangeable. Lids shall be marked "REUSE." Where the valves are greater than 9 feet deep, solid pipe must be used instead of sectional valve boxes.

6.6 Valve-Key Extensions

All reuse system valves shall have extension rods with centering rings and set screws. Extensions shall be to within 12" of the finished grade on all valves.

6.7 Air/Vacuum Valves and Vaults

Design and installation of air release valves and associated vaults must be approved by the Water Department and will be evaluated on a case-by-case basis.

6.8 Reuse and Raw Water Meters

Meters shall be magnetic meters as manufactured by Badger (or equivalent). Connections shall be 150-pound flanges. The meters shall have an accuracy of 0.5% of the measured reading. A Badger Recordall® Reclaimed-Disc Turbo Meter with Remote Readout shall be provided. The meter shall be supplied with a lavender lid with the word "REUSE" cast or engraved on the meter's body, printed on the register dial, and cast or engraved on the bronze covers or bottoms. A non-potable symbol shall be placed on the register lid, and the chamber assembly shall be designated as non-potable only. The signal converter shall be remotely mounted within 300 feet of the meter. A local indication shall be displayed on the flow computer. The meter shall be sized to meet the flow demands for accurate readings.

The meter shall be capable of having a control signal installed to deliver the meter reading to a remote location through radio signals. The meter output shall be 4 to 20 mA.

6.9 Excavation, Bedding, and Backfill

6.9.1 General

Trench excavation shall be performed in accordance with the requirements of the latest revision of the City of Aspen's Engineering Standards.

All bedding and backfill material shall be free of frozen material, organic material, and debris. The materials to be used in each trench zone are indicated on the Water Main Trench Cross-Section Detail as shown on the Water Distribution System Standards Installation Details drawing; these materials are described herein.

6.9.2 Bedding/Pipe Zone

The bedding zone shall consist of all material placed below the pipe invert. The pipe zone shall consist of all material placed above the pipe invert to the specified elevation. The bedding/pipe zone material shall be placed for the full length of the pipeline. The

bedding/pipe zone material shall be $\frac{3}{4}$ " screened rock that has been hauled in for bedding – not native excavated material. The material shall extend from 6" below the pipe and bells to 12" above the top of the pipe and bells, and it shall extend for the full width of the excavated trench. Tamping equipment shall be used to thoroughly tamp the material to a minimum of 95% maximum dry density or 75% relative density. The moisture content of the material shall be within 2% of optimum.

6.9.3 Backfill Zone

The backfill zone shall consist of all material above the pipe zone. Fabric shall be installed between the screen rock and all other backfill material. Follow CDOT, Pitkin County, and City of Aspen ROW specifications for backfill and compaction within the ROW or where asphalt is to be placed above the pipeline trench.

Compaction shall be completed by mechanical tamping of 12"-maximum loose lifts using mechanical tampers or vibratory rollers. All other means must be approved in writing by the engineer. All backfill shall be compacted to 95% of maximum laboratory dry density (ASTM D698) or to 75% relative density (ASTM D2079). The material shall be within 2% of optimal moisture content.

The contractor may request approval of alternate means of compaction. Such a request must be submitted to the engineer in writing. The engineer will approve the compaction method in writing only. Use of specified or approved compaction methods does not relieve the contractor from providing a completed project that meets the intent of this specification.

Native backfill material shall consist of suitable material from the excavated earth. No rocks or boulders shall be allowed in the first 24" of the trench above the pipeline. The backfill material above the first 24" of the trench shall have no boulders larger than 6" in any dimension and shall be carefully placed so that no damage will be done to the pipeline. Native backfill shall be used to finished grade if trench excavation occurs in open-field conditions.

Engineered backfill material shall be road-base, Class 6 aggregate base course.

6.9.4 Testing and Inspection

Prior to backfilling, all waterlines and appurtenances shall be inspected and approved by the City.

All materials shall be subject to gradation and compaction tests prior to approval. The test results shall be submitted to the City for approval and verification of their accuracy. The contractor shall bear the costs of these tests.

Compaction requirements shall conform to the measurements of maximum dry density according to ASTM D698 (Moisture-Density Relations of Soils [Standard Proctor]). Should ASTM D698 not be suitable for the material placed, the compaction requirements shall conform to ASTM D2049 (Test for Relative Density of Cohesionless Soils).

When the City requires it, the contractor shall excavate backfilled trenches for the purpose of performing compaction tests at the required locations and depths. The contractor shall be responsible for reinstalling and compacting the test excavations at no additional cost to the City.

Minimum compaction testing frequency for pipelines shall be one compaction test per 150 linear feet of piping and wherever piping is within 2-feet of structures. A compaction single test shall contain two samples per lift.

6.9.5 Road-Base Material Specification

The road-base material shall be Class 6 aggregate base course, as specified by the State of Colorado Department of Transportation (CDOT); the material shall meet the following gradation:

Aggregate Base Course – CDOT Class 6 Gradation	
Sieve Size	Total Percentage Passing By Weight
3/4"	100%
# 4	30% – 65%
# 8	20% – 55%
# 200	3% – 12%

6.9.6 Screened Rock Material Specification

Granular or granular backfill material shall be imported crushed rock or angular surfaced gravel and shall meet the following gradation (ASTM D448, m 67):

Granular Bedding Gradation	
Sieve Size	Total Percentage Passing By Weight
3/4"	100%
3/8"	22% – 55%
# 4	10%
# 8	5%

6.10 Testing and Flushing

6.10.1 Fusion Quality

The contractor shall ensure the field setup and operation of the fusion operator's fusion equipment and procedure while on site. Upon the owner's request, the contractor shall verify field fusion quality by making and testing a trial fusion. The trial fusion shall be allowed to cool completely; test straps shall then be cut out and bent-strap tested in accordance with ASTM D 2657. If the bent-strap test of the trial fusion fails at the joint, the field fusions represented by the trial fusion shall be rejected. The contractor, at his or her expense, shall make all necessary corrections to the equipment and the setup, operation, and fusion procedures; the contractor shall then remake the rejected fusions.

6.10.2 Reuse Water Pipeline Testing

New pipelines shall be flushed and tested before connection to the existing system. When new pipelines are allowed to be connected to an existing pipeline, the following sequence shall be followed: flushing, leakage and pressure tests, and conductivity tests. Failure at any step shall require that each item be repeated until all are accepted. The City's Water Department shall be notified at least 48 hours before the pipe is to be tested so that Water Department personnel may witness the test.

6.10.3 Leak Testing

Lines shall be tested to a minimum of 150% the anticipated working pressure of the line, with a minimum test pressure of 150 psi. The contractor shall remove all air prior to testing the line. Testing shall be performed at the high point of the line unless otherwise approved.

6.10.4 Pipeline Flushing

The contractor shall flush the pipelines as the work progresses in accordance with good practices to ensure that sand, rocks, and other foreign materials are not left in the pipelines. If possible, the flushing shall be made through an open pipe end; otherwise, use of the service line may be acceptable – but only with the engineer's approval.

7 APPENDICES

7.1 HYDROSTATIC TESTING

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Contractor's Material and Test Certificate for Underground Piping

PROCEDURE

Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.

A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

Property name

Date

Property address

Plans

Accepted by approving authorities (names)

Address

Installation conforms to accepted plans

☐ Yes

☐ No

Equipment used is approved

☐ Yes

☐ No

If no, state deviations

Instructions

Has person in charge of fire equipment been instructed as to location of control valves and care and maintenance of this new equipment?
If no, explain

☐ Yes

☐ No

Have copies of appropriate instructions and care and maintenance charts been provided to the owner or owner's representative?
If no, explain

☐ Yes

☐ No

Location

Supplies buildings

Underground pipes and joints

Pipe types and class

Type joint

Pipe conforms to _____ standard

☐ Yes

☐ No

Fittings conform to _____ standard

☐ Yes

☐ No

If no, explain

Joints needing anchorage clamped, strapped, or blocked in accordance with _____ standard
If no, explain

☐ Yes

☐ No

Test description

Flushing: Flow the required rate until water is verified to be clear of debris at outlets such as hydrants and blow-offs. Flush at one of the flow rates as specified in 10.10.2.1.3.

Hydrostatic: All piping and attached appurtenances subjected to system working pressure shall be hydrostatically tested at 200 psi (13.8 bar) or 50 psi (3.4 bar) in excess of the system working pressure, whichever is greater, and shall maintain that pressure ± 5 psi (0.34 bar) for 2 hours.

Hydrostatic Testing Allowance: Where additional water is added to the system to maintain the test pressures required by 10.10.2.2.1, the amount of water shall be measured and shall not exceed the limits of the following equation (for metric equation, see 10.10.2.2.6):

$$L = \frac{SD\sqrt{P}}{148,000}$$

L = testing allowance (makeup water), in gallons per hour (lpm)

S = length of pipe tested, in feet (m)

D = nominal diameter of the pipe, in inches (mm)

P = average test pressure during the hydrostatic test, in pounds per square inch (gauge) (bar)

Flushing tests

New underground piping flushed according to CoA Water Dept. standard by (company)
If no, explain

☐ Yes

☐ No

How flushing flow was obtained

☐ Public water

☐ Tank or reservoir

☐ Fire pump

Through what type opening

☐ Hydrant butt

☐ Open pipe

Lead-ins flushed according to _____ standard by (company)

☐ Yes

☐ No

If no, explain

How flushing flow was obtained

☐ Public water

☐ Tank or reservoir

☐ Fire pump

Through what type opening

☐ Y connection to flange and spigot

☐ Open pipe

Hydrostatic test	All new underground piping hydrostatically tested at _____ psi (bar) for _____ hours		Joints covered <input type="checkbox"/> Yes <input type="checkbox"/> No
Leakage test	Total amount of leakage measured _____ gallons (liters) _____ hours		
	Allowable leakage _____ gallons (liters) _____ hours		
Forward flow test of backflow preventer	Forward flow test performed in accordance with 10.10.2.5.2: <input type="checkbox"/> Yes <input type="checkbox"/> No		
Hydrants	Number installed	Type and make	All operate satisfactorily <input type="checkbox"/> Yes <input type="checkbox"/> No
Control valves	Water control valves left wide open If no, state reason		<input type="checkbox"/> Yes <input type="checkbox"/> No
	Hose threads of fire department connections and hydrants interchangeable with those of fire department answering alarm		<input type="checkbox"/> Yes <input type="checkbox"/> No
Remarks	Date left in service		
Signatures	Name of installing contractor		
	Tests witnessed by		
	For property owner (signed)	Title	Date
	For installing contractor (signed)	Title	Date

Additional explanation and notes

City of Aspen Water Department Representative

Name (typed & signed)

Title

Date

7.2 CITY OF ASPEN WATER UTILITY EASEMENT TEMPLATE

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CITY OF ASPEN EASEMENT AGREEMENT

This Easement Agreement is entered into this ____ day of _____, 20__, by and between THE CITY OF ASPEN ("City"), a Colorado municipal corporation and home rule city, and _____, whose address is _____ ("Grantor").

Recitals

WHEREAS, the City owns and operates the City of Aspen municipal water distribution system; and

WHEREAS, the City operates, maintains, repairs and replaces the primary water mains and other infrastructure (excluding individual service lines) required for the distribution of water.

WHEREAS Grantor owns certain real property legally described as follows (the "Subject Property"):

WHEREAS, in order to use, operate, maintain, repair and replace said water mains and other infrastructure, the City requires an easement from Grantor; and

WHEREAS, Grantor is willing to grant and convey an easement to the City on the terms and conditions herein provided;

THEREFORE, IN CONSIDERATION of the promises and agreements set forth below, and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties agree as follows:

1. Grant of Easement. Grantor does hereby grant and convey to the City a perpetual non-exclusive easement and right of way (the "Easement") for the purposes of excavation, installation, operation, use, maintenance, repair, and replacement of the City's water mains, lines, and associated facilities located within the easement premises. The Easement is described on Exhibit A, which is attached hereto and incorporated herein by reference. The Easement, and access thereto, are granted over, upon, across, in and through Grantor's real property described on Exhibit B, and referred to herein as the "Subject Property". This grant of easement shall run with the land for the benefit of the City, and shall be binding upon and inure to the benefit of the City, and its successors and assigns.

1. Use of Easement Premises By City. The City's agents, employees, contractors and other designated persons may go upon the Easement at all reasonable times to undertake routine use, operation and maintenance of the City's water distribution system and associated facilities. In the event the City plans major repairs or replacement of infrastructure within the Easement premises, it shall provide Grantor with reasonable advance notice of the work to be

undertaken, and the estimated time of completion. Notwithstanding the foregoing, the City may go upon the Easement premises at any time in the event of any emergency situation or condition, and undertake such repair or replacement activities as it deems necessary to properly resolve the emergency situation.

After the exercise of any of its rights hereunder, the City shall grade, re-seed or re-sod if necessary to restore the surface of the ground to its former condition and contour, *provided* however, that the City shall not be required to restore or replace any trees, bushes, brush, gardens or other vegetation on the Easement premises, nor any structures or paving thereon.

2. Use of Easement Premises by Grantor. Grantor shall retain the right to use and enjoy the Subject Property including the Easement premises so long as such use and enjoyment do not interfere with the City's rights hereunder, and provided that Grantor shall not install or allow any obstructions or permanent encroachments on the Easement premises, including but not limited to fences, buildings, gates, or other structures, or trees, bushes, brush, gardens, or pavement, and shall not obstruct or permit obstruction of access to the Easement premises. In the event any such obstructions or encroachments are erected, installed, or permitted to remain upon the Easement premises notwithstanding this paragraph, Grantor understands and agrees that such obstructions or encroachments may be removed by the City at Grantor's cost, and that the City shall have no responsibility or liability for any damage or destruction thereto.

In the event Grantor discovers an emergency condition pertaining to the City's water distribution system located on, over, in or through the Easement premises, Grantor shall make reasonable attempts to promptly notify the City of such condition.

3. Liability to Others. Each party shall be responsible for any and all claims, demands, actions, losses, liabilities, or expenses of whatever sort, including attorneys fees, that are incurred by any person or entity arising out of or in connection with such party's use or occupation of the Easement premises, or the use or occupation the Easement premises by its agents, employees, contractors, invitees or licensees, *provided*, however, that nothing herein shall be construed to abrogate or diminish any protections and limitations afforded to the City by the Colorado Governmental Immunity Act, C.R.S. § 24-10-101 *et seq.* as amended, or other law. In the event the City and Grantor, or their respective officers, directors, members, employees, agents, contractors, representatives, heirs or assigns may be held jointly and severally liable under any statute, decision, or other law providing for such joint and several liability for their respective activities on the Easement premises, the obligations of each to respond in damages shall be apportioned, as between the City and Grantor, in proportion to the contributions of each as measured by the acts and omissions of each which in fact caused such legal injury, damage or harm and the City and Grantor shall indemnify each other to the extent necessary to assure such apportionment.

4. Notices. All notices required to be given shall be deemed given upon deposit in the United States mail, first class postage prepaid, properly addressed to the person or entity to whom directed at its address shown herein, or at such other address as shall be given by notice pursuant to this paragraph. Copies of such notices shall also be sent in the same manner to the

City Attorney, 427 Rio Grande Place, Aspen, Colorado 81611. Notwithstanding the foregoing, Grantor may notify the City of emergency conditions as provided in paragraph 3 above by direct delivery of notice to the City Water Department at 500 Doolittle Drive, Aspen, Colorado, or by telephone or email communication with the City Water Department. The City Water Department telephone number is (970) 920-5110, and email _____.

5. Binding Agreement - Recording. This Agreement is binding upon the parties hereto, their successors and assigns, and any sale of the Subject Property, or any portion thereof shall be subject to this Agreement. This Agreement shall be recorded with the Pitkin County Clerk and Recorder, and shall impose an easement and covenants running with the land upon the Subject Property. Deeds to subsequent owners of the Subject Property shall provide notice of this Agreement and the obligations contained herein.

6. Governing Law; Venue; Attorneys' Fees. This Agreement and the rights and obligations of the parties hereunder shall be governed by and construed in accordance with the laws of the State of Colorado. Venue for all actions arising under this Agreement shall be Pitkin County, Colorado. In the event legal remedies must be pursued to resolve any dispute or conflict regarding the terms of this Agreement or the rights and obligations of the parties hereto, the prevailing party shall be entitled to recover costs incurred in pursuing such remedies, including expert witness fees and reasonable attorneys' fees.

7. Authorization of Signatures. The parties acknowledge and represent to each other that all procedures necessary to validly contract and execute this Agreement have been performed and that the persons signing for each party have been duly authorized to do so.

8. Counterparts. This Agreement may be signed using counterpart signature pages, with the same force and effect as if all parties signed on the same signature page.

IN WITNESS WHEREOF, the parties have executed this Agreement the date and year first above written.

