

## SECTION 6

### 6. WATER SYSTEM STANDARDS

#### 6.01 General

The City of Castle Rock Water System Minimum Standards and Specifications are minimum base level performance, design, and construction standards used to maintain uniformity of design within the water utility.

The standards herein contained shall not supersede any other legally constituted standards that are more stringent than these standards.

Requirements for staking, trench excavation, backfill and street patch and restoration shall be as required in Section 7 Sanitary Sewer Standards. Requirements for pavement and trench restoration shall be per Section 4 – Street and Asphalt Concrete Paths and/or Bikeways Standards.

#### 6.02 Design Standards

##### A. Pipe Sizing

The minimum main size should be established by a hydraulic analysis using the appropriate land use designation to develop both domestic and fire flow requirements. The minimum size shall be 4 inches in diameter. Minimum line size where fire flows are required shall be 8 inches.

##### B. Fire Flow Requirements

###### 1. Required Minimum Flow:

Table I presents the minimum fire flow requirements applicable to the various development classifications. Additional flow above these minimums may be required by the local fire protection authority for commercial or industrial complexes or large structures with exposure hazards.

TABLE 1

**Required Minimum Fire Flow**

<b>Land Use Classification</b>	<b>Minimum Fire Flow Requirements (*)</b>
Low Density Residential	1,000 gpm
High Density Residential	1,500 gpm (**)
Commercial	1,500 gpm (**)
Industrial/Schools	2,000 gpm (**)

(\*) Minimum fire flow requirements are in addition to maximum daily domestic demand.

(\*\*) Commercial and industrial buildings may be subject to higher flow requirements when evaluated on an individual basis by the local fire protection authority.

2. Water Pressure:

Water systems shall be hydraulically designed to provide a pressure range of 30-100 psi with desired range of 40-90 psi. A minimum residual pressure of 30 psi under peak hour design flow is required at the City owned water meter or property line. A 20 psi residual pressure shall be maintained throughout the system under combined fire flow and maximum day demand conditions at the meter or property line.

3. Storage:

Storage volumes shall be sized in accordance with the requirements of the current Department of Health Water System Design Manual.

4. Hydrant Maintenance:

Public fire hydrants shall be installed in compliance with these minimum standards and located within publicly owned easements and rights-of-way. The City shall be responsible for mechanical maintenance.

5. Variance from Standard:

The local fire protection authority (LFPA) may require or allow, and shall approve, any variance in required fire flow and/or other requirements in consideration of factors not encompassed within this standard (e.g., large commercial complexes, large structures with exposure hazards, consideration of automatic sprinkler protection, etc.).

6. Other Standards:

The LFPA in conjunction with the water utility, using the Insurance Services Office's grading schedule for

municipal fire protection as a guide, may establish or require additional standards of specifications as required for water supply criteria not specifically set forth herein.

C. Valving

Valving shall be installed at all crosses and tees in a number equaling the number of connecting pipes minus 1, unless otherwise required by the City Public Works Director. In addition, unvalved lengths of pipe should not exceed 500 feet in school, commercial, or multi-family areas, and 800 feet in residential areas, where customers are being served.

D. Fire Hydrants

Installation of hydrants will be initially required on all developments of seven service connections or more, or as required below. Hydrant locations are to be specified by the local fire department and coordinated through the LFPA. Blind flange connections will be provided on distribution piping at suitable locations for future installation of fire hydrants on smaller systems once they reach seven service connections

Fire hydrants shall be connected to a 6-inch minimum diameter main. A minimum 6-inch-diameter lateral pipe is required for connecting to hydrants located 50 feet or less from the main line and a minimum 8-inch-diameter lateral pipe is required where hydrants are located more than 50 feet from an 8 inch or larger main.

Fire hydrant location shall be determined by the appropriate local fire authority. In general, hydrants shall be predicated on the location of street intersections wherever possible and located to minimize the hazard of damage by traffic. They shall have an average normal spacing of 600 feet within residential areas measured along the street frontage. In no case shall hydrants be placed farther than 700 feet apart and no building shall be more than 350 feet from file nearest hydrant. In commercial or industrial areas, the maximum hydrant spacing shall be 300 feet.

E. Facility Placement

All water mains shall be installed in accordance with the City's utility locating standard plan. In addition, all piping, pumping, source, storage, and other facilities shall be located on public rights-of-way or dedicated utility easements. Utility easements must be a minimum of 20 feet in width and piping shall be installed no closer than 5 feet from the easement's edge.

Exceptions to this minimum easement may be approved by the operating water utility. Unrestricted access shall be provided to all public water system lines and public fire hydrants that are maintained by public agencies or utilities.

- F. Pipe Cover
- A 3-foot-minimum cover and a maximum 6-foot cover are required from the finished or existing ground surface to the top of the pipe for all installed transmission, distribution, and service piping, unless otherwise approved by the Public Works Director.
- G. Air and Air-Vacuum Relief Valves
- Air or combined air-vacuum relief valves shall be situated at designated points of high elevation throughout the system.
- H. Blowoff Valves
- A blowoff assembly shall be installed on all permanent dead-end runs and at designated points of low elevation within the distribution system. The blowoff assembly shall be installed in the utility right-of-way. In no case shall the location be such that there is a possibility of back-siphonage into the distribution system.
- I. Separation Distances
- Transmission and distribution water piping shall be separated at least 10 feet horizontally from on-site waste disposal piping, drain fields, storm drain piping and/or wastewater gravity or force mains. All parallel and crossing installations of water and sewer lines shall be installed in accordance with provisions of WAC 246-290, current Department of Health Water System Design Manual and the “Recommended Standards for Water Works” – Ten State Standards.
- J. Auxiliary Power
- Unless directed otherwise by the Utility, all source and booster pumping facilities should be equipped with auxiliary power pigtail outlets and at least manual transfer switching devices.
- K. Flow Measurement
- All service lines shall be installed so that each residential, commercial, and industrial structure will have a separate metered service for domestic water received from the utility. If approved by the designated utility, domestic water consumption may be measured by a master meter for service to a complex under single ownership and where water utility line subdivision is impractical. Service lines providing fire flow will be required to be equipped with a double check valve assembly with detection or other appropriate metering devices, as directed by the designated utility. Minimum size service line from the water main to the water meter is 1” in diameter.

L. Cross Connection Control

Where the possibility of contamination of the supply exists, water services shall be equipped with appropriate cross connection control devices in accordance with WAC 246-290. The City cross-connection control program shall determine the need, size, kind, and location of the device.

**6.03 Material Specifications**

A. Introduction

All pipe, valves, meters, hydrants, fittings, and special material shall be new, undamaged and designated for use in potable water systems. Material used on water projects shall comply with each project's detailed plans and specifications. In general, all materials and specifications shall be in conformance with the most current Standard Specifications for Road, Bridge, and Municipal Construction, WSDOT and APWA, and the specification of the American Water Works Association, except as modified herein.

B. Pipe, Joints, and Fittings

1. General

Water mains shall be of the following material type unless approved otherwise:

- a. Regional Transmission mains shall be ductile iron.
- b. City transmission mains shall be ductile iron, unless conditions are such that City Engineer may approve PVC AWWA C900, minimum DR-18.
- c. Distribution mains may be ductile iron, PVC AWWA C900, DR-18 or HDPE, PE 4710, Minimum SDR 11 (200 psi).

All pipe sizes, as shown on the drawings, and as specified herein, are in reference to "nominal" diameter, unless otherwise indicated. One type of pipe shall be used throughout the entire project except as necessary to match existing piping or as otherwise specified. Where relocation or replacement of existing piping is necessary during construction, materials used shall be subject to the approval of the City.

All mechanical joint fittings and valves shall be mechanically restrained in addition to concrete thrust blocks.

2. Ductile Iron Pipe (DI)

Ductile iron pipe shall conform to the requirements of AWWA C151 specifications. Pipe thickness shall be of

Class 52, or greater if required in accordance with the criteria specified in AWWA C150.

Ductile iron pipe shall be cement lined and sealed in accordance with AWWA C104. In addition, all pipe shall have push-on rubber gasket joints and be furnished in 10 to 20 foot lengths unless design conditions dictate otherwise.

3. Polyvinyl Chloride (PVC)

PVC pipe shall be AWWA C900, Minimum DR 18.

PVC shall be installed with ductile iron fittings.

All pipe shall be furnished in 18 to 20 foot lengths unless design conditions dictate otherwise and assembled with a non-toxic lubricant.

4. Polyethylene Pipe (PE)

All polyethylene pipe 2 inch diameter and smaller shall be rated for a maximum working pressure of 200 psi with a standard dimension ratio of nine (9). This pipe shall comply with ASTM D-2239 and D-1248. The pipe shall be appropriately marked to designate the nominal pipe size, type of plastic material, pipe dimension ratio or pressure rating and ASTM or AWWA designation code. The pipe shall bear the National Sanitation Foundation seal signifying its use for potable water. The pipe shall be copper pipe size and connected with standard brass or bronze fittings by the use of pack joint with approved insert stiffeners. The pipe shall be installed with tracer wire and marking tape as approved by the City.

5. Potable Water PEX

All PEX potable water piping shall be rated for a minimum of 160 psi at 73 degrees Fahrenheit with a standard dimension ratio of nine (9). This pipe shall meet the requirements of ASTM F-876/F-877 for CTS-OD SDR 9. All fittings shall be specifically made for PEX piping. The pipe shall be installed with tracer wire and marking tape as approved by the City.

6. Fittings

All fittings shall be of the size, type, and type of joint as specified on the plans, by the designated utility, or by the pipe manufacturer.

7. Tracer wire and Marking Tape

Tracer wire and marking tape shall be installed on all piping and service piping as specified in the section and approved by the City.

C. Valves

1. Gate Valves

System gate valves shall be resilient wedge, NRS (non rising stem) with O-rings seals. Valve ends shall be mechanical joint or ANSE flanges. Valves shall conform to AWWA C509 or C515. Valves shall be Waterous, M & H, Clow or Kennedy. Existing valves shall be operated by the City of Castle Rock employees only.

Gate valves, 3 inch and larger, shall be ductile iron body, bronze-mounted, double disc, and “O”-ring stem seal. Gate valves smaller than 3 inch shall be 125 psi, non-stem rising, wedge disk, all brass or bronze valves and screwed, soldered, or flanged ends compatible with the connecting pipe. All valves shall open counterclockwise and, unless otherwise specified, shall be non-rising stem type equipped with standard AWWA 2-inch square stem operating nuts. All thread patterns shall be NPT.

2. Butterfly Valves

Valves larger than 12-inch shall be butterfly valves. Butterfly valves shall meet or exceed all AWWA C504 specifications and shall be Class 150-B with short body, which is suitable for direct bury. When they are installed they shall have a position indicator which clearly shows position of the disc. All valves shall be equipped with an underground manual operator with AWWA 2-inch square operating nut and shall open with a counterclockwise rotation.

3. Check Valves

Check valves, 3 inch or larger, shall be iron body, iron disc, bronze mounted, swing type, clearway, quiet closing, lever and spring valves with flanged ends. All valves shall comply with AWWA C508 specifications.

Check valves, 2-1/2 inches or smaller, shall be bronze body, bronze mounted, swing type with flanged or threaded ends depending upon installation.

4. Air and Air-Vacuum Relief Valves

Air and air-vacuum relief valves shall have cast iron bodies and covers and stainless steel floats. Float guides, bushings, and lever pins shall be stainless steel or bronze. Valves shall be designed for a minimum operating pressure of 150 pounds per square inch (psi).

5. Pressure Reducing Valves

This valve shall maintain a constant downstream pressure regardless of varying inlet pressure. It shall be a hydraulically operated, pilot-controlled diaphragm-type globe or angle valve. The main valve shall have a single removable seat and a resilient disc. The stem shall be guided at both ends by a bearing in the valve cover and an integral bearing in the valve seat. No external packing glands are permitted, and there shall be no pistons operating the main valve or any pilot controls.

The pilot control shall be a direct-acting, adjustable, springloaded, normally open, diaphragm valve, designed to permit flow when controlled pressure is less than the spring setting. The control system shall include a fixed orifice. All valves shall be equipped with mechanical joints or flanged ends. Pressure reducing valves shall be as manufactured by Cla-Val or approved equal.

D. Valve Boxes

All valve boxes shall be cast iron, 2-piece, equipped with suitable extension for at least a 36-inch trench depth. The top section and lid will be designed for installation in traffic areas. Lid is to be labeled "W" or "Water". Valve boxes shall be Rich Model 910, or approved equal.

E. Fire Hydrants

Fire hydrants shall conform to AWWA Standard C502 for post-type, dry-barrel, self-draining hydrants suitable for at least a 36 inch depth. Each hydrant shall be equipped with a 6" inlet, a minimum valve opening of 5-1/4", two 2-1/2-inch hose connections, and one 4-1/2-inch pumper port. All ports shall have national standard threads, and the 4-1/2-inch pumper port shall be national standard threads. All valves and caps shall open counterclockwise and have 1-1/2-inch flat point pentagon operation and cap nuts. Hydrants shall be break-away traffic models and yellow color. Fire hydrant valves shall comply with Section 6.03.C.1 or 2 and shall be provided with a valve box as specified herein. Fire hydrants shall be Waterous Pacer Model WB67-250.



F. Cross Connection Control Devices

All cross connection control devices will be specified by the City cross connection control program based on the degree of potential hazard. Such devices will comply with models currently approved by the Department of Health in accordance with WAC 246-290.

G. Tracer Wire

Tracer wire shall be installed on all water mains, hydrant leads, branch lines, and water service lines. The wire shall be attached to the lines at 10 foot intervals and shall be brought to the surface at all water meter boxes and valve boxes. Tracer wire material for water lines constructed using open cut methods shall be rated for underground feeder cable, 12 gauge, soft drawn, insulated 60 MIL PVC, rated for 600V and shall be blue in color. Heavier tracer wire as manufactured by Copperhead Industries shall be used for boring, pushing and horizontal directional drilling.

Joining ends of tracer wire for mains shall only be spliced underground at existing connections into existing tracer wire, connections at main bore locations, and approved locations per the City. Connections shall be made with an approved direct bury wire nut that is rated for underground installation. At locations where locate main wire is tested and found to be damaged and instead of replacing the entire locate wire underground, the Contractor can request to repair line with a splice underground. No splices are allowed along water services or hydrant leads. Direct bury wire nuts shall be Dryconn Direct Bury Wire Nut manufactured by King Innovation, DBY-6 or DBR-6 as manufactured by 3M, or approved equal.

Joining tracer wire from side services or other small branches to main; connections shall be made with direct bury lug designed to not cut the metal wire of the main tracer wire. These connections shall be used at all side service connections, branches and fire hydrants. Direct bury lug connections shall be Dryconn Direct Bury Lug as manufactured by King Innovation, Dryconn 3-way Direct Bury Lug as manufactured by Copperhead, or approved equal.

All tracer wire shall pass a continuity test prior to paving. Contractor responsible for passing continuity test.

H. Marking Tape

All pipe and services will be installed with continuous marking tape installed 18" to 24" under the proposed finished subgrade. The marker will be 3 inches wide, plastic non-biodegradable, metal core or backing marked sewer that can be detected by a standard metal detector. The marking tape shall indicate,

“CAUTION BURIED WATER LINE” or similar and be blue in color.

I. Meter Boxes and Lids

Meter boxes shall be high density polyethylene of one-piece molded construction for durability and impact strength and shall have a wall thickness of no less than 0.55”. The meter box, with a ductile iron cover installed shall be able to bear a 20,000 pound load in a wheel load (H-20) test. The meter box shall be black on the exterior to prevent UV degradation and bright white on the interior to reflect light and ease meter reading and service. The box shall have removable pre-cut pipe entry areas, 3” wide x 4” high, located on the center of each end of the box for single meter installations. The box shall be designed in such a way as to be securely stackable. The meter box shall be MSBCF1118-12XL as manufactured by Carson Industries or approved equal. Ductile iron cover shall be Carson Industries MSCBC-1118-R.

**6.04 Construction Standards**

A. General

Installation of water systems shall conform at a minimum to the Standard Specifications for Road, Bridge, and Municipal Construction, WSDOT, and APWA and the specifications of the American Water Works Association, Standard C600, and according to the recommendations of the manufacturer of the material or equipment concerned. Prior to construction, a service connection must be applied for and approved by the City. All requirements of the service connection approval shall become part of these specifications.

B. Fire Hydrant Installation

Hydrant installation shall conform to AWWA Standard C600 provisions. Fire hydrants shall stand plumb and be set to the finish grade. The center of the lowest outlet of the hydrant shall be no less than 18 inches above finished grade. In addition, all hydrants shall be installed with a minimum of a 36 inches unobstructed radius around the hydrant. Hydrants shall be aligned so that pumper ports face toward the road or most probable route of access, if roads are not available, as determined by the appropriate local fire protection authority.

C. Hydrostatic Pressure Test

A hydrostatic and pressure leakage test will be conducted on all newly constructed water mains, fire lines, fire hydrant leads and stub-outs in accordance with WSDOT/APWA Standard Specifications, Section 7-09, and AWWA C-600 specifications, unless specified otherwise by the City.

D. Disinfection and Bacteriological Testing

All pipe, reservoirs and appurtenances shall be flushed and disinfected in accordance with WSDOT/APWA Standard Specifications, Section 7-09.3(24) unless specified otherwise by the City.

E. Improvement Plan Design/As-built Drawings

Unless approved otherwise by the City Engineer, all water system improvements shall be designed by a licensed professional engineer in the State of Washington with sufficient experience in water system design. As-built drawings in hard copy, .pdf and AutoCAD shall be required to be submitted to the City on all improvements and the vertical datum shall be NAVD88 and the horizontal shall be NAD83/2011.

F. City Engineer Review Compensation

All Water System Improvement Plans shall be reviewed and approved by the City Engineer and/or the Public Works Director. All review costs for the City Engineer's review shall be paid by the developer.