

The Board of Water Commissioners Denver Water

Engineering Standards Chapter 9 – 16-inch and 20-inch Transmission Mains

9.01 GENERAL:

Denver and regions under the contract receipt of water from Denver Water are experiencing changing trends in the design of subdivisions. New developments are now commonly designed with curved streets, only one or two access roadways and many cul-de-sacs. Water mains supplying these subdivisions often cannot be sized using the hydraulic grid system common in most of Denver. In some instances the maximum water demand within these developments is exceeding the allowable design capacity of a 12-inch distribution main but is often considerably under that of a 24-inch conduit. As a result, it has become necessary to introduce two intermediate sizes: 16-inch and 20-inch transmission mains.

9.02 OTHER STANDARDS TO APPLY:

This chapter addresses only 16-inch and 20-inch transmission mains. Standards that apply to 4-inch through 12-inch mains shall additionally apply to 16-inch and 20-inch mains along with the following requirements or exceptions. In case of conflict with any other Chapter or Section in these Standards, this Chapter shall govern for 16-inch and 20-inch pipe.

9.03 DESIGN OF TRANSMISSION MAINS:

16-inch and 20-inch water transmission mains shall be sized and designed in accordance with [Chapter 5](#) with the following additional requirements:

- A. Dual Feeds:** Sixteen-inch and 20-inch lines shall be supplied by dual feeds unless otherwise directed by Denver Water.
- B. Placement:** Line valves shall be optimally placed such that service outages during repairs or construction are minimized. Generally this will require the ability to isolate and alternately supply mains extending from the transmission main; in no instance should the spacing between valves exceed 1,200 feet.

Twelve-inch gate valves conforming to [MS-5](#) and 16-inch mechanical joint or flanged end butterfly valves conforming to [MS-6](#) shall be allowed on 16-inch transmission mains. Line valves to be used on 20-inch transmission mains shall be either 16-inch or 20-inch mechanical joint or flanged end butterfly valves.

The size and type of valve to be used shall be clearly indicated on the submitted plans.

If Denver Water requires the installation of electronic monitoring and remote operation equipment, the line valve shall be a butterfly valve with a rectangular vault housing the motor operator and telemetry equipment. Each installation will require individual approval.

- C. **Restraint System:** Bends, bulkheads and fittings which require restraint due to unbalanced line thrust shall be restrained by using both a means of mechanical restraint and kickblocks in accordance with the [Standard Drawings](#). Restraint requirements shall be in accordance with line size. Other restraint systems must be approved, in writing, by Denver Water.
- D. **Head Loss:** The maximum design head loss for 16-inch mains is two feet per 1,000 feet of main. The maximum design head loss for 20-inch mains is 1-1/2 feet per 1,000 feet of main. Head loss is calculated using the maximum hour flow and using a C value of 130. The head loss criteria do NOT apply under fire flow conditions.
- E. **Blowoff Assemblies:** Blowoff assemblies as shown on [Sheet 13](#) of the [Standard Drawings](#) shall be installed at low points in transmission mains and wherever a transmission main is dead-ended unless a fire hydrant, which can serve additionally as a blowoff, is provided at these locations.
- F. **Cathodic Protection:** Cathodic protection requirements for transmission mains will be determined by Denver Water on an individual basis. Mains being installed in corrosive soils will be protected using methods as determined by Denver Water. This may consist of the installation of anodes, the bonding of pipe, polyethylene encasement or other requirements determined by Denver Water in addition to the requirements in [6.29](#).
- G. **Special Conditions:** Each transmission main shall be examined individually to determine any special condition and/or requirements (e.g., air valves, Pressure Regulating Valves, etc.).

9.04 PLANS AND SPECIFICATIONS:

Detailed Plans and Specifications for transmission main extensions shall be prepared for approval in accordance with [2.07](#) and shall contain a top of pipe profile showing the following additional requirements:

- A. Existing ground line.
- B. Official street grades where transmission mains are located beneath roadways.
- C. Proposed final ground surface where transmission mains are installed within an easement and not located in a roadway.
- D. The elevation of grade breaks, slope of pipe, location of bends and fittings and minimum clearances to interference.
- E. The elevation of crossing interference verified by pothole.

9.05 MATERIAL:

Pipe shall conform to [MS-1](#) and/or [MS-2](#).

9.06 INSTALLATION:

Denver Water may permit the Approved Applicant to have their own Contractor install a 16-inch or 20-inch transmission main. The Contractor must be pre-qualified by Denver Water for the installation of 16-inch and 20-inch pipe inside Denver and in Total Service Contract Areas. As with 4-inch through 12-inch mains inside the City and County of Denver and Total Service Contract Areas, Denver Water reserves the

right to install 16-inch and 20-inch transmission mains when to do so is in its best interests. This determination is solely at the discretion of Denver Water and the Approved Applicant shall pay the costs for extending mains whether installed by their Contractor or by Denver Water.

Sixteen-inch and 20-inch mains present a greater danger when improperly designed or installed and the nature of their supply is more important than that of smaller mains. Denver Water will, therefore, review the design and installation of these mains more closely to ensure that sound engineering and construction procedures are followed.

9.07 SEWER CROSSINGS:

The provisions of [8.28](#) shall apply to 16-inch and 20-inch transmission mains.

9.08 EASEMENT WIDTH REQUIREMENTS:

The easement width requirements in [Chapter 5](#) shall apply to the installation of 16-inch and 20-inch transmission mains with the following additional requirements:

- A. Dedicated Street:** The cross section of a dedicated public roadway must have as a minimum a 32 foot surfaced roadway flow line to flow line.
- B. Private Roadways:** The cross section of a private roadway must have as a minimum 30 feet of surfaced roadway and a 4 foot attached walk, or 34 feet of surface roadway. The easement shall have a minimum width of 34 feet.