

CITY OF BOULDER
DESIGN AND CONSTRUCTION STANDARDS

**CHAPTER 5
WATER DESIGN**

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
5.01 GENERAL	1
(A) INTENT	1
(B) TREATED WATER MASTER PLAN	1
(C) REFERENCE STANDARDS	1
5.02 UTILITY REPORT	1
(A) REQUIREMENT	1
(B) REPORT	1
(C) PRELIMINARY PLAN.....	2
(D) CONNECTION AND ISOLATION PLAN.....	2
5.03 WATER MAIN EXTENSIONS	3
(A) TREATED WATER MASTER PLAN	3
(B) MAIN EXTENSION AGREEMENTS	3
5.04 DESIGN FLOW	3
(A) WATER DISTRIBUTION MAINS	3
(B) WATER SERVICES	4
5.05 MATERIALS AND INSTALLATION	4
5.06 CORROSION PROTECTION	4
5.07 TRANSMISSION MAINS	5
(A) SPECIFICATIONS	5
(B) TAPS.....	5
(C) VALVES	5
(D) RELIEF VALVES.....	5
5.08 DISTRIBUTION MAINS	6
(A) SPECIFICATIONS	6
(B) TAPS.....	6
(C) VALVES	6
(D) LOOPING AND TERMINAL MAINS	7
(E) EXTENSIONS.....	7
(F) FUTURE CONNECTIONS	7
5.09 WATER SERVICES	8
(A) GENERAL.....	8
(B) DOMESTIC SERVICES	8
(C) IRRIGATION SERVICES.....	9
5.10 FIRE PROTECTION	9

(A) FIRE HYDRANTS	9
(B) FIRE SPRINKLER LINES	10
5.11 CROSS-CONNECTION REGULATIONS	11
(A) PURPOSE	11
(B) ADDITIONAL REGULATIONS	11
(C) GENERAL REQUIREMENTS	11
(D) INSTALLATION REQUIRED	12
(E) DUTY TO INSPECT, TEST AND REPAIR	12
(F) SPECIFICATIONS	12
(G) RECORDS AND REPORTS	14
(H) BACKFLOW PREVENTION ASSEMBLIES	14
(I) CERTIFIED TESTER CRITERIA	14

LIST OF TABLES

<u>Table Number</u>	<u>Page</u>
Table 5-1: Average Day Water Demands	4
Table 5--2: Water Demand Peaking Factors for Forecasting Demands	4

5.01 General

(A) Intent

The Water Design Standards establish minimum design standards for providing and maintaining the public water utility distribution system.

(B) Treated Water Master Plan

All improvements proposed to the City's public water utility system shall conform with the goals, policies, and standards adopted in the Treated Water Master Plan.

(C) Reference Standards

Where not specified in these Standards or the B.R.C. 1981, to protect the public health, safety, and welfare, the Director of Public Works will specify the standards to be applied to the design and construction of public water utility improvements and may refer to one or more of the references listed in the References Section of these Standards.

5.02 Utility Report

(A) Requirement

The Director of Public Works may require the preparation of a utility report in order to assess the impacts and service demands of any project or development proposal connecting to the public water distribution system. The utility report shall be prepared by the Engineer and include a technical report, preliminary plan, and connection and isolation plan as outlined in the following subsections.

(B) Report

The utility report shall provide an overview of the proposed project or development, proposed water utility improvements, water service demands, system impact and feasibility, and basic design requirements, and include the following information:

- (1) **Water Demands:** Include estimated water demands based on projected land use, occupancy and building type for the following conditions:
 - (a) Maximum-Hour (gallons-per-minute),
 - (b) Maximum-Day (gallons-per-minute).
 - (c) Average-Day (gallons-per-minute),
 - (d) Insurance Service Office (ISO) Fire Flows (gallons-per-minute), and
 - (e) Irrigation (gallons-per-minute).
- (2) **Conformance with Treated Water Master Plan:** Describe how the proposed water utility improvements conform with the adopted Treated Water Master Plan.
- (3) **System Layout:** Describe the proposed distribution system layout, including locations for connections with the existing water utility system.
- (4) **Network Analysis:** Include a distribution network analysis as required by the Director,

performed through computer simulation or appropriate manual calculation, identifying any systems impacts based on proposed demands and providing design solutions to ensure perpetuation of future water utility system growth and maintain system pressures and flow rates.

NOTE: Computer simulations of hydraulic analyses are to be performed using electronic input data for the existing water system provided by the City on software compatible with the “H2ONET” network analysis program. Computer analyses are to be submitted in both hard copy and electronic format.

- (5) **Main Sizing:** Indicate the required sizing of proposed distribution mains based on water demands.
- (6) **Design Alternatives:** Discuss alternative system layouts and methods of providing water service, including an evaluation of each alternative and reasons for selecting the recommended design.
- (7) **Special Conditions:** Identify any special conditions, such as the presence of erosive soils, conflicts with other utilities, unusual installation depths or oversizing requirements, that require special provisions for improvements construction.

(C) Preliminary Plan

A preliminary plan shall be included in the utility report to provide a plan view and reference for the proposed improvements, and identify issues addressed in the report. The preliminary plan is to include the following:

- (1) **Preliminary Design:** Illustrate proposed methods and alternatives for providing site water distribution and service.
- (2) **Property Boundaries:** Reflect legal boundaries of the proposed project or development site, including existing and proposed property and lot lines, existing and proposed rights-of-way and utility easements, and boundaries of abutting properties.
- (3) **Topography:** Include site topography at 2-foot interval contours, and the elevation and location of City-recognized benchmarks with reference to local, USGS and NGVD data.
- (4) **System Area:** Define and delineate the system area included in the network analysis.
- (5) **Existing Utilities:** Illustrate existing water utilities, including fire hydrants and valves, within 400 feet of the proposed development.
- (6) **Unusual Features:** Identify unusual features, such as creeks, drainage facilities, railroads, and irrigation ditches, that might influence the location of underground utilities.
- (7) **Proposed System Layout:** Illustrate the general layout of the proposed water distribution mains, valves, and fire hydrant locations, including construction phasing.

(D) Connection and Isolation Plan

A connection and isolation plan shall be provided in the utility report to identify proposed connection points with the existing water systems and design conditions for providing required system isolation for maintenance and flushing. The connection and isolation plan is to include the following:

- (1) **Valve Locations:** Identify all valves necessary to isolate a point of connection for the proposed water system onto the existing system. Existing system valves should be inspected for location and accessibility.

- (2) **Thrust Restraint:** Determine and include design and construction requirements for sufficient thrust restraint for existing water mains and valves at proposed connection points (“stub outs” and terminal extensions) to allow construction while the existing water system remains in service.
- (3) **System Isolation:** Identify water main sections that can be isolated within the proposed and existing water systems that provide for emergency maintenance and identify discharge points for system flushing.

5.03 Water Main Extensions

(A) Treated Water Master Plan

Where major water distribution mains, 12 inches or larger in diameter, are proposed to be constructed in the Treated Water Master Plan, an applicant for construction approval shall provide for the construction of the main as part of any development proposal, when the major distribution main is:

- (1) Located within a proposed development.
- (2) Located within 1,000 feet of a proposed development and it is feasible to include construction of this main in the proposed development.
- (3) Required to provide adequate distribution service for the proposed development.

(B) Main Extension Agreements

- (1) When construction of a major distribution main is required, and the diameter of the major distribution main is larger 12 inches and the minimum diameter required for local distribution mains to serve the proposed development, an applicant for construction approval may enter into a "main extension agreement" with the City for reimbursement of public improvements costs associated with the over-size construction of the major distribution main, as prescribed under Sections 11-1-42, “Agreement to Extend Water Mains,” and 11-1-43, “Reimbursement of Costs for Water Main Extension,” B.R.C. 1981.
- (2) When construction of an offsite major or local water distribution main is required to extend water service to a proposed development, an applicant for construction approval may enter into a "main extension agreement" with the City for reimbursement of offsite public improvements, as prescribed under Sections 11-1-42, “Agreement to Extend Water Mains,” and 11-1-43, “Reimbursement of Costs for Water Main Extension,” B.R.C. 1981.

5.04 Design Flow

(A) Water Distribution Mains

- (1) The water distribution system (mains and looping) shall be designed to provide a minimum residual pressure of 20 pounds per square inch (psi), at ground surface, under maximum-day demand flow, plus the required ISO fire flow.
- (2) The water distribution system shall be designed to provide a minimum of 40 psi under maximum-hour demand flow, without fire flow.
- (3) Pressure and flow capacity data for both existing and future conditions for the City’s major water distribution system is to be obtained from the Utilities Division for use in the design and analysis of proposed improvements.

- (4) Table 5-1 indicates water demand forecasting for average-day conditions.

Table 5-1: Average Day Water Demands

Development Type	Average-Day Demand
Residential Low Density Medium Density High Density	180 gpcd 150 gpcd 75 gpcd
Commercial	10,000 gpad
Industrial	12,000 gpad

- (5) Table 5-2 indicates water demand peaking factors for forecasting demands.

Table 5-2: Water Demand Peaking Factors for Forecasting Demands

Development Type	Maximum/Hour	Maximum/Day
Residential Low Density Medium Density High-Density	5.1 5.0 5.0	5.1 2.5 2.0
Commercial	2.5	2.5
Industrial	1.5	1.5

- (6) Water design flows that reduce the water system pressures below acceptable levels specified in this section or elsewhere in these Standards are considered detrimental to the overall system. In these situations, the Director will deny project approval, or require the developer to provide additional water system improvements, both onsite and offsite, to ensure no reduction in levels of service.

(B) Water Services

Design flows for water services shall be determined in conformance with the most current Uniform Plumbing Code (UPC), adopted by the City of Boulder.

5.05 Materials and Installation

Construction of water-related public improvements shall be in compliance with these Standards. All pipe shall be of adequate strength to support the trench and AASHTO HS-20 highway loadings. The type of pipe to be installed shall comply with these Standards, and shall be based upon applicable design flows, pressures, site conditions, corrosion protection, and maintenance requirements.

5.06 Corrosion Protection

Corrosion protection will be required for all water system improvements where corrosive soil conditions are encountered. The Engineer shall perform a soils resistivity survey to evaluate the corrosion potential of soils in proposed projects or developments, and recommend any necessary corrosion protection measures, such as alternative pipe type or cathodic protection. The Director will review the soils resistivity survey and Engineer's recommendations and the service history for water system corrosion in the area, and determine the pipe type or protection to be used prior to construction plan approval.

5.07 Transmission Mains

(A) Specifications

- (1) **Size:** All water mains 14 inches or larger in diameter shall be classified as “transmission mains.”
- (2) **Location:** All transmission mains shall be installed in public rights-of-way or easements, as prescribed in Section 4.03, “Easements,” of these Standards.
- (3) **Depth:** All transmission mains shall have no less than 4.5 feet and no more than 10 feet of cover, measured from the top of pipe to the final surface grade.
- (4) **Separations and Crossings:** All transmission main separations and crossings of other City utilities shall be designed in compliance with Section 4.05, “Separation of Utilities,” of these Standards.

(B) Taps

- (1) **Minimum Tap Size:** No main extension or fire hydrant taps smaller than 6 inches in diameter shall be installed in any transmission main.
- (2) **Service Line Taps Prohibited:** Service line taps shall not be installed in any transmission main.
- (3) **Pressure Taps:** Unless approved by the Director, all taps installed onto a transmission main shall be made under “wet tap” conditions, using a tapping tee and valve, to allow the transmission main to remain in service.

(C) Valves

- (1) **Separation:** Valve separation along transmission mains shall be no greater than 1,200 feet, measured along the alignment of the transmission main.
- (2) **Valve Locations:** Valves shall be installed at the following locations:
 - (a) At all connections with transmission mains. Where a distribution main connects with a transmission main, a valve shall be installed on the distribution main at the transmission main.
 - (b) Where necessary to ensure that no more than three valves must be closed to isolate any section of a transmission main. Two valves shall be installed at all tee-type connections, and three valves shall be installed at all cross-type connections.
 - (c) Where possible, valves shall be aligned with extensions of property lines or right-of-way lines. Valves shall not be placed in locations that may be subject to routine parking or storage and shall not be placed within public sidewalks, multi-use paths, or on-street bike lanes.

(D) Relief Valves

- (1) **Air and Vacuum Release Valves:** Air and vacuum release valves shall be installed in transmission mains at all high points where an elevation differential of 20 feet exists along the main.

- (2) **Pressure Blow-Off Assemblies:** Pressure blow-off assemblies shall be installed in transmission mains at all low points where an elevation differential of 20 feet exists along the main.

5.08 Distribution Mains

(A) Specifications

- (1) **Size:** Distribution mains shall be at least 8 inches in diameter.
- (2) **Locations**
 - (a) All water mains shall be installed in public rights-of-way or easements, as prescribed under Section 4.03, "Utilities Easements," of these Standards.
 - (b) All platted lots, whether existing or proposed as part of a subdivision, shall front on a distribution main.
- (3) **Depth:** All distribution mains shall have no less than 4.5 feet and no more than 10 feet of cover, measured from the top of pipe to the final surface grade. Where final grades have not been established, mains shall be installed deep enough to ensure acceptable cover below the future grade based on the best available information. Under no condition shall a main be installed with less than 5 feet of cover.
- (4) **Separations and Crossings:** All distribution main separations and crossings of other City utilities shall be designed in compliance with Section 4.05, "Separation of Utilities," of these Standards.

(B) Taps

- (1) **Pressure Taps:** All taps approved onto a distribution main shall be installed under "wet tap" conditions, using a tapping tee and valve, which allows the distribution main to remain in service at all times.
- (2) **Tap Installation:** All taps approved onto an existing distribution main will be made by the City of Boulder Utilities Division, and shall be paid for by the applicant.

(C) Valves

- (1) **Where Required:** Valves shall be installed as necessary on distribution mains to ensure that:
 - (a) No more than 600 feet of water main will be located between isolation valve zones (i.e., sections of main that may be taken out of service for maintenance activities).
 - (b) No more than two fire hydrants will be located between isolation valve zones.
 - (c) No more than three valves will require closure to isolate any section of a distribution main. Two valves shall be installed at all tee-type connections, and three valves shall be installed at all cross-type connections.
 - (d) Valves are to be aligned with extensions of property lines or right-of-way lines where possible. Valves shall not be placed within public sidewalks, multi-use paths, or on-street bike lanes.
- (2) **Emergency Access:** Valves shall be located to provide maximum accessibility for

emergency access. Valves shall not be placed in locations that may be subject to routine parking or storage operations.

(D) Looping and Terminal Mains

- (1) **Looping Required:** All distribution mains shall be looped into the existing and proposed water distribution system to ensure at least two feed sources and to maintain system strength, except as allowed under Section 5.08(E) below.
- (2) **Maximum Terminal Length:** Where allowed, terminal (dead-end) distribution mains shall not be more than 600 feet long, measured along the entire centerline length of the terminal main from the connection main to the terminus.
- (3) **Fire Hydrant on Terminal Mains:** All terminal mains shall have a fire hydrant at the terminus. Fire hydrant installations shall be offset from the terminus to ensure that the hydrant can be removed for maintenance while the terminal main remains in service.
- (4) **Service Taps:** Service taps along terminal mains shall not be located closer than 3 feet to the terminus nor located between the fire hydrant connection and the terminus.

(E) Extensions

- (1) **Standards:** Water distribution main extensions are subject to the requirements in Section 11-1-41, "Extensions of Water Mains," B.R.C. 1981, and these Standards.
- (2) **System Perpetuation:** Water mains shall extend to the far edge of the property being served or to the edge of the platted subdivision, whichever is greater, to ensure perpetuation of the water distribution system. The location, size, and configuration of the proposed development or subdivision, with respect to the existing water distribution system, may dictate that water mains be extended to the far edge of more than one property or subdivision boundary to accommodate system perpetuation.
- (3) **Exceptions:** Exceptions to this subsection may be granted only if development of the adjacent property is not contemplated within 5 years or is classified as Area III under the Boulder Valley Comprehensive Plan. In these cases, an easement for extending the system shall be granted by the property owner.

(F) Future Connections

- (1) **Isolation Valve Required:** When future main extensions are provided for by "stub out" or terminal connections, the stub out or terminal main extension shall be valved so that only one valve must be closed when the future main is extended. The valve shall be restrained to the existing distribution main to allow closure of the stub out or terminal main section without creating a pressure separation of the valve from the in-service distribution main.
- (2) **Valve Restraint:** Valve restraint may be ensured by the use of a direct swivel connector or adapter, or by providing a pipeline extension that can restrain the valve through frictional resistance. All future connections designed at perpendicular angles to the existing distribution main shall include a valve on the extension that is directly attached to the existing main. Where valve restraint through frictional resistance of extended pipe line sections is proposed, the Engineer shall determine the necessary pipe length required to provide adequate frictional resistance, subject to review and approval by the Director.
- (3) **Testing:** When future connections are made, the entire main beyond the stub out or terminal

main extension shall be flushed, chlorinated, and pressure tested.

- (4) **Service Taps Prohibited:** No service taps shall be allowed on a stub out or on a terminal main beyond the isolation valve.

5.09 Water Services

(A) General

- (1) **Standards:** Water services are water system extensions that are tapped onto the distribution system to provide water to consumers. Water services are subject to the requirements of these Standards and Section 11-1-20, "Taps or Connections to Water Mains," and Section 11-1-21, "Water Service Lines," B.R.C., 1981.
- (2) **Water Meters:** Water services shall include the installation of a meter and shall be subject to the requirements of these Standards and the conditions of Sections 11-1-34, "Meter and Appurtenances to be Purchased by User," Section 11-1-35, "Meter Size Requirements," and Section 11-1-36, "Location and Installation of Meters; Maintenance of Access to Meters," B.R.C. 1981.
- (3) **Separate Services to Lots:** All platted lots, whether existing or proposed as part of a subdivision, shall front on and have a separate water service connection to a distribution main without crossing adjacent lots.
- (4) **Service Alignment:** When the water service is located in the public right-of-way or easement, the service shall be installed perpendicular to the distribution main, up to and including the meter and pit. Where this is not possible, the water service alignment shall be subject to the determination of the Director.
- (5) **Pressure Boosters Prohibited:** No pressure booster of any kind is allowed on any water service.

(B) Domestic Services

- (1) **Separate Services to Structures:** Each principal structure shall be served by a separate water service line and meter connected to the distribution main. Where more than one principal structure is proposed on a single lot, an additional water service line and meter will be required for each additional principal structure.
- (2) **Accessory Buildings:** An accessory building or structure (as defined under Subsection 9-1-3(1), "Definitions," B.R.C. 1981, may draw limited service from a principal building or structure without a separate water service, subject to the following:
 - (a) The accessory structure is limited to the following plumbing fixtures and contains no water closet (toilet) or bathtub/shower fixtures:
 - (i) Sink (one fixture),
 - (ii) Clothes washer connection (one set),
 - (iii) Hose bib or sill cock (one fixture),
 - (iv) Floor drain (one fixture), and
 - (v) Interceptor (one fixture).
 - (b) The accessory structure is proposed to have a sink and toilet, contains no

bathhtub/shower fixtures, may not be used as a separate dwelling unit, and is located on a property that cannot be further subdivided into separate lots, except in an approved owner's accessory unit.

- (c) The Director of Public Works may permit water hookups and meters separate from a principal detached dwelling unit upon finding that topography or other physical circumstances make utility connections to the principal structure impractical
- (3) **Services Crossing Lots:** Domestic water services crossing one lot to provide service to an adjacent lot may be approved if all of the following conditions are met:
 - (a) The service crossing is part of a proposed subdivision creating only two lots.
 - (b) A utility easement at least 10 feet wide is provided across, and situated entirely within, the boundaries of the proposed subdivision. The easement is to be granted to the City for the benefit of the property owner being served and is to be occupied by the water service line only, or by the water and wastewater service lines only if the water and wastewater service lines are installed in compliance the UPC.
 - (c) The Director determines that a water main extension is not necessary to perpetuate the system, or that future development of abutting properties cannot benefit from a main extension.
 - (d) The water service line is to be centered in the easement and be at least 5 feet from other utilities, except for a combined water/wastewater service installation as allowed under the UPC.

(C) Irrigation Services

- (1) **Separate Service:** With the exception of single-family residential properties, all irrigation services shall have a separate service line and meter.
- (2) **Property to be Served:** Irrigation service lines shall serve no more than one individual property, unless approved by the Director under the provisions of a homeowners association. Where irrigation services serve more than one individual property, the plant investment fee (PIF) and associated credit shall apply to the individual property where the water meter is located and the service originates.
- (3) **Building Connection Prohibited:** Irrigation service shall not connect with any building or structure or with any other consumptive-use water service.
- (4) **Reduced Pressure Assembly Required:** All irrigation systems with a separate, metered service line shall have a reduced pressure principle assembly installed in compliance with all applicable City regulations and standards.

5.10 Fire Protection

(A) Fire Hydrants

- (1) **Standards:** All fire hydrants shall be installed in compliance with these Standards.
- (2) **Easements:** All fire hydrants shall be installed within public rights-of-way or easements as prescribed in Section 4.03, "Utilities Easements." Easements shall be a minimum of 25 feet in width and extend at least 10 feet beyond the hydrant assembly.
- (3) **Placement:** The placement of fire hydrants shall comply with the Uniform Fire Code, as

adopted with local amendments under Chapter 10-8, "Fire Prevention Code," B.R.C. 1981, and the following requirements:

- (a) Fire hydrants shall be placed at the entrance or intersection for each street, with a hydrant place on each side of any divided roadway.
- (b) In a single-family residential area, there shall be no more than 500 feet of fire access distance between hydrants. No dwelling unit shall be over 250 feet of fire access distance from the nearest hydrant.
- (c) In all other areas, there shall be no more that 350 feet of fire access distance between hydrants. No exterior portion of any building shall be over 175 feet of fire access distance from the nearest hydrant.

NOTE: Fire access distance means the distance between two hydrants, or the distance from a hydrant to any external portion of any building, measured along public or private (but accessible to fire equipment) roadways or fire lanes, as would be traveled by motorized firefighting equipment.

- (4) **Alignment with Property Lines:** Hydrants shall be aligned with an extension of the property line when located midblock.
- (5) **Horizontal Clearances:** Hydrants shall be placed no farther than 5 feet behind the curb, outside of any fenced area, and have a 10-foot radius of clearance to adjacent obstacles (fences, walls, shrubs, trees, etc.).
- (6) **Vertical Clearances:** Hydrants shall have the lowest water outlet not less than 18 inches or more than 30 inches above the final ground elevation.
- (7) **Colors:** Designated hydrant colors shall be "Restful Green Bonnet" for barrels and "Reflective White" for caps.

(B) Fire Sprinkler Lines

- (1) **Dedicated Line:** A fire sprinkler line for any structure or building, other than a single-family or duplex residential structure, which is either required to be installed by the Boulder Fire Department or installed voluntarily by the applicant, shall be a separate dedicated fire sprinkler line tapped at the water distribution main.
- (2) **Maintenance Responsibility:** The property owner shall be responsible for maintaining all dedicated fire sprinkler lines beyond the water tap at the main distribution line.
- (3) **Service Taps Prohibited:** No taps will be approved onto a fire sprinkler line for any purpose other than the fire sprinkler system. Combination fire sprinkler/service lines for domestic or irrigation services will not be approved, except as allowed in Subsection (B)(4), below.
- (4) **Combination Line:** A single-family or duplex residential structure may have a combination fire sprinkler/domestic service line from the City's water distribution main to the water meter, if the following conditions are met:
 - (a) The combination line shall be sized to convey maximum domestic service and fire sprinkler protection service flows. The maximum combination line size is 2 inches; otherwise, the combination line shall be separated into a dedicated fire sprinkler line and separate domestic service line, each tapped at the distribution main.
 - (b) The combination line shall separate at the water meter pit into a domestic service line

(with meter) and a dedicated fire sprinkler line (without meter, but with oriseal shutoff).

- (c) Beyond the water meter pit, both the domestic and fire sprinkler water service lines may be placed in the same trench. However, they may not be tied back together in any manner, and they may not have any type of cross-connection either inside or outside the structure.
- (d) The property owner is responsible for maintaining the domestic service and the fire sprinkler lines beyond the water meter pit.

NOTE: Section 5.11, "Cross-Connection Regulations," of these Standards, identifies the requirements for cross-connection control and backflow prevention as they apply to fire sprinkler systems.

5.11 Cross-Connection Regulations

(A) Purpose

The purpose of these standards is to protect the city water system from contamination or pollution by backflow due to cross connections from owner water systems, and to a continuing program of cross connection control to prevent the contamination or pollution of the city water system. For the purpose of this section, "Contamination" means any impairment of the quality of the potable water by pollution from sewage, industrial fluids or waste liquids, compounds or other materials to a degree which may create a hazard to the public health through poisoning or through the spread of disease.

(B) Additional Regulations

- (1) Sections 11-1-3 and 11-1-25, B.R.C. 1981.
- (2) The Colorado Cross Connection Control Manual

(C) General Requirements

- (1) If a backflow prevention assembly is required by the city, the Director of Public Works may give notice in writing to the owner to install an approved backflow prevention assembly at each service connection to the premises. The owner shall install an approved assembly at each service connection to the premises at the owner's own expense.
- (2) No provision of this section exempts the owner from the cross connection control provisions for internal water distribution systems as contained in the ~~Uniform Plumbing Codes~~ adopted by the B.R.C. 1981, or state or federal regulations regarding cross-connections.
- (3) No person shall operate an industrial fluids system, auxiliary water supply, or an owner water system that allows for the occurrence of a cross connection to the water utility.
- (4) There shall be no unprotected branches from the service line ahead of any meter or backflow prevention assembly located at the point of delivery to the owner's water system.
- (5) No person owning, managing, installing or repairing any water system shall fail to comply with any of these rules.

(D) Installation Required

- (1) An backflow prevention assembly approved by the Director of Public Works shall be installed immediately inside the structure being served, after the meter on private property, and before the first branch line leading off the service line wherever any of the following conditions exist:
 - (a) If a property has an auxiliary water supply which is not or may not be of safe bacteriological or chemical quality and which is not acceptable as an additional source by the Director of Public Works, the water utility shall be protected against backflow from the premises by installing a backflow prevention assembly in the service line appropriate to the degree of hazard.
 - (b) If a non-residential property that contains any liquid processes or fluids system or any other unapproved water system, the water utility shall be protected against backflow from the premises by installing a backflow prevention assembly in the service line appropriate to the degree of hazard.
 - (c) In all premises that contain internal cross connections that cannot be permanently corrected and controlled, or that contain intricate plumbing and piping arrangements, or where entry to all portions of the premises is not readily accessible for inspection purposes making it impracticable or impossible to ascertain whether or not dangerous cross connections exist, the water utility shall be protected against backflow from the premises by installing a backflow prevention assembly in the service line.
- (2) Installation shall be as approved by FCC and URC, USC list including vertical and horizontal assembly orientation.
- (3) Backflow prevention assemblies shall be installed in an accessible location to facilitate inspection, testing and maintenance without removal of the device. An adequate drainage area for the assembly must be provided for in the event that water is released. Installation clearance requirements shall meet requirements of the Colorado Cross-Connection Control Manual and allow removal of all parts from the assembly. Pit and vault installations are prohibited.

(E) Duty to Inspect, Test and Repair

The owner shall have certified inspections and operational tests made on the backflow prevention assembly upon installation and at least once per year thereafter. The Director of Public Works may require certified inspections at more frequent intervals. These inspections and tests shall be made at the expense of the owner. A backflow prevention assembly shall be repaired or replaced at the expense of the owner whenever an assembly is found to be defective.

(F) Specifications

- (1) After written notification by the Director of Public Works, any property with a backflow incident shall be responsible for installation, inspection and testing, or repair of a backflow prevention assembly within 10-days. Backflow prevention devices shall be air-gap (“AG”) or reduced pressure principle assembly (“RP”) except for Solar heating systems with make-up water which shall be “RP” devices.

(2) After written notification by the Director of Public Works, the owners and operators of the following types of existing facilities shall be responsible for installation, inspection and testing, or repair of a backflow prevention assembly within 30-days of such written notice. Backflow prevention devices shall be air-gap ("AG"), or reduced pressure principle assembly ("RP") unless otherwise noted.

- | | | |
|---|---|---|
| • Automotive service station or repair shop | • Kennel - boarding only | • Photographic studio and laboratory |
| • Auxiliary water supply | • Laboratory - clinical and chemical | |
| • Commercial service line greater than four-inch diameter | • Laundry or dry cleaning service | • Sewage treatment plant |
| • Carwash | • Manufacturing and industrial facility (to be determined on an individual basis) | • School with laboratory |
| • Food processing and Packing plant | • Medical office | • Shell business development space |
| • Greenhouse | • Morgue and mortuary | • Solar heating system with make-up water ("RP Only") |
| • Hospital, inpatient and outpatient care | • Multi-storied buildings (4 stories or more) | • Swimming pool |
| • Hotel or lodging facility | | • Veterinary office or clinic |
| | | • Water treatment plant |

(3) Prior to Final Inspection of any new structure or alteration requiring a building permit, the owners and operators of the following types of facilities shall be responsible for installation, inspection, testing, or repair of a backflow prevention assembly. Backflow prevention devices shall be air-gap ("AG"), or reduced pressure principle assembly ("RP") unless otherwise noted. Double Check Valve Assembly ("DC") devices shall only be permitted where specifically approved below.

- | | | |
|--|---|--|
| • Any establishment with a backflow incident | • long-term facility | • Photographic studio and lab |
| • Automotive Service station or repair shop | • Hotel and lodging | • Sewage treatment plant |
| • Auxiliary water supply | • Kennel - boarding only | • School with laboratory |
| • Commercial service line greater than 4-inch diameter | • Laboratory -- clinical and chemical | |
| • Carwash | • Laundry and cleaning service | • Shell business development space |
| • Fire line -- no chemicals added (AG, RP, or DC) | • Manufacturing and industrial facility (to be determined on an individual basis) | • Solar heating system with make-up water system ("RP" Only) |
| • Fire line -- chemicals added | • Medical office | • Swimming pool |
| | • Morgue and mortuary | • Veterinary office |
| • Food processing and packing plant | • Multi-storied building (4 stories or more) | • Water treatment plant |
| • Greenhouse | | |
| • Hospital, outpatient care and | | |

(4) Any building or facility not listed in the foregoing table may be required by the Director of Public Works to install a backflow prevention assembly. The compliance period and assembly required shall be determined by the Director of Public Works based on the degree of hazard.

(5) The compliance periods listed above may be modified by the Director of Public Works for good cause shown, and after submittal and approval by the Director of Public Works of a compliance plan.

- (6) Compliance plans shall be enforceable against subsequent owners of non-residential property. If no approved compliance plan exists, then the property must be in compliance with this rule prior to any sale of the property.

(G) Records and Reports

A certified tester shall record the results of all inspections, tests and maintenance on a form prescribed by the Director. This report shall be submitted to the Director and the owner within ten days following the completion of the inspection, test, or maintenance of the assembly. The certified tester shall also attach a card to the backflow prevention assembly following each inspection, test, or maintenance activity to document and date the activities performed. Records of all inspections, test, or maintenance activities, including materials and parts changed, shall be kept by the certified inspector and the owner.

(H) Backflow Prevention Assemblies

- (1) The term "approved backflow prevention assembly" or "approved assembly" means any of the following:
 - (a) an assembly that is in conformance with the laboratory and field performance specifications of the Foundation for Cross Connection Control and Hydraulic Research (FCC and HR) of the University of Southern California; or
 - (b) an assembly which has been approved, inspected and installed to the satisfaction of the Director of Public Works.
- (2) All backflow prevention assemblies shall have a unique serial number attached to the assembly by the manufacturer.
- (3) Backflow prevention assemblies currently installed which are not approved shall be replaced with an approved assembly within 30 days of written notice by the city. If the assembly fails an annual operational test or inspection, it shall be repaired or replaced with an approved assembly within 30 days of written notice by the city.

(I) Certified Tester Criteria

- (1) Testing of backflow prevention assemblies on fire sprinkler systems shall require the certified Cross Connection Control and Backflow Prevention Device Tester to also be a certified Fire Sprinkler System Installer, or be supervised by a certified Fire Sprinkler System Installer registered with the City of Boulder Fire Department.
- (2) Certified Cross Connection Control and Backflow Prevention Device Testers shall also be required to provide the following information in order to be listed on the Backflow Prevention Program's list of certified testers in the area. Such information shall be sent or faxed directly from the laboratory to the Backflow Prevention Program office at 5605 N. 63rd St., Boulder, Colorado 80301 ; FAX: 303-530-1137.

- (a) Copy of a current Cross Connection Control and Backflow Device Tester certificate.
- (b) Test kit calibration certificate from an authorized manufacturers calibration/ repair laboratory or an ISO 9002 certified calibration/repair laboratory for instrument repairs or measurements. Documented calibration must be National Institute of Standards and Technology (NIST) traceable and meet the current ASME/ANSI B40.01 standards. The certified calibration report shall include the following:
 - (i) Indicate minimally the descending reading at 10, 7, 5, 2, 1 and 0 PSID with a minimum required tolerance range of ± 0.1 PSID;
 - (ii) data as found (data prior to any adjustment of the test kit);
 - (iii) after calibration data or returned information documented (data after adjustment, if required.)
- (c) Provide a certificate signed by a qualified agent of an insurance company that meets minimum limits required by Section 4-1-8(a) and (b), B.R.C. 1981.