

The Board of Water Commissioners Denver Water

Engineering Standards Chapter 1 – General

1.01 AUTHORITY:

These Standards are promulgated by the Manager/CEO of Denver Water pursuant to the authority granted by the Charter of the City and County of Denver (Denver), as amended.

The administration of these Standards including the interpretation, enforcement, revision, waiver and variance thereof is hereby delegated by the Manager/CEO to the Director of Engineering or an appointed representative.

Any variance request must be submitted to the Sales Administration Section and forwarded to the Director of Engineering, or an appointed representative, for review.

1.02 EFFECTIVE DATE OF STANDARDS:

These Standards shall be effective after they have remained posted in a conspicuous public place in the principal business offices of Denver Water for a period of 15 days; they shall supersede the former Engineering Standards of the Board of Water Commissioners, Denver, Colorado.

1.03 REVISIONS, AMENDMENTS OR ADDITIONS:

These Standards may be revised, amended or added to from time to time. Such revisions, amendments and additions shall be binding and in full force and effect when electronically posted in the manner set forth in [1.02](#).

1.04 DENVER WATER CONTROL:

These Standards shall apply to the installation, operation and maintenance of water facilities under the control of Denver Water. Such control shall be exercised in accordance with the Charter, within Denver, and by contract with Distributor Service Contract areas.

Denver Water shall NOT be restricted by or limited in the exercise of its lawful powers despite any variance from these Standards that occurred or was authorized in the past or that may be authorized in the future. No action in violation of these Standards, either direct or indirect, by any person, including any owner, operator or agent of an owner or operator of any water facility in making any connection, disconnection, repair or otherwise doing work with respect to any water facility served with water from the Denver Water system, shall continue after the discovery of such violation or the enforcement of corrective action regarding such violation.

1.05 ORGANIZATION AND INTERPRETATION OF STANDARDS:

These Standards are composed of written Engineering Standards, Materials Specifications and Standard Drawings. The interpretation of any section, or of differences between sections, when appropriate, shall be made by the Director of Engineering or an appointed representative; their interpretation shall be binding and controlling in its application.

Whenever there is a conflict between these Engineering Standards and any referenced standard, specification or code, the most stringent requirement shall apply.

1.06 DEFINITIONS:

As used in these Standards, unless the context shall otherwise require, the words defined in this paragraph shall have the meanings herein ascribed:

Air-Gap: The unobstructed vertical distance between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture or other assembly and the flood level rim of said vessels. An approved air-gap shall be permanently installed and shall be at least double the diameter of the supply pipe, measured vertically, above the top of the overflow rim of the vessel; in no case shall it be less than one inch.

American Backflow Prevention Association (ABPA) Certified Backflow Prevention Assembly Tester: An individual with the proven ability to field test backflow prevention assemblies to the satisfaction of the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research (USC FCCCHR) program. The certified individual is required to perform field tests and prepare reports on backflow prevention assemblies and shall be conversant in applicable laws, rules and regulations and experienced in plumbing or pipe fitting.

American Society of Sanitary Engineering (ASSE) Backflow Prevention Assembly Tester: An individual who has the proven ability in field testing backflow prevention assemblies to the satisfaction of the ASSE Series 5000 program. The certified individual is required to perform field tests and prepare reports on backflow prevention assemblies and shall be conversant in applicable laws, rules and regulations and experienced in plumbing or pipe fitting.

Approved Applicant for System Extension: A person, association, corporation, entity or government agency that has been granted a license by Denver Water to receive water service for premises under their control. This is often a sub-divider or developer. The licensed party shall be referred to as an Approved Applicant within these Standards.

Atmospheric Vacuum Breaker: A backflow prevention assembly that is constructed with a 90 degree elbow and a hood that allows air to enter the system through a poppet valve that drops which allows air to enter when atmospheric pressure drops; it thereby breaks the siphon. This type of assembly is NOT approved by Denver Water.

Automatic Meter Reading (AMR): A system of electronic components that permit the collection of meter readings by wireless or wired electronic communication systems. Components thereof may be attached to and become part of a customer's water meter. Other components may include central data collection units, vehicle-mounted equipment and data transmission systems; also known as Advanced Metering Infrastructure (AMI).

Auxiliary Water Supply: A water supply that is located on or is available to a customer's premises other than Denver Water's approved public potable water supply. These include: raw water, well water and a lake, pond or ditch, etc.

Backflow: The unwanted flow of water or other liquids, mixtures, gases or substances into the distribution pipes of a potable water supply from any source other than the intended source.

Backflow Prevention: The prevention of the flow of any foreign liquids, gases or substances into the pipe lines of a potable supply of water by the installation of backflow prevention assemblies or the air-gap method.

Backpressure: An elevation in pressure in the downstream piping system that can cause a reversal in the normal direction of flow at a particular point. The elevation in pressure can be caused by pumping, air pressure, steam or the elevation of piping.

Backsiphonage: A form of backflow that is a result of negative or sub-atmospheric pressure within the water system.

Board: The Board of Water Commissioners, or an authorized representative, as established by the Charter of the City and County of Denver.

Certified Welder: A skilled welder, welding operator or tacker who has had adequate experience in the method of materials to be used and is qualified under the provisions of the American Welding Society Standard (AWS) D1.1 using test position 6G.

Welders shall be qualified by an independent, local, approved testing agency within the six month period prior to beginning work. Machine and electrodes similar to those used in the work shall be used in qualification tests.

City and County of Denver: The territorial limits of the City and County of Denver inside which Denver Water has complete control of the water system, including the ownership, construction, operation and maintenance of facilities, the reading of meters and the billing of customers.

Commercial Property: Real estate zoned for business and/or industrial use that consists of six or more units with a domestic, fireline or dedicated water irrigation service tap (defined as such for cross-connection purposes).

Conduit: A 24-inch or larger diameter pipe that carries recycled or potable water to and from treatment facilities and storage reservoirs and ultimately to delivery points that supply the distribution system. They are specifically distinguished from transmission mains (16-inch and 20-inch mains) due to head loss constraints.

Consecutive System: A public water system that receives, through purchase or other means, treated water from a supply system and distributes that water without additional treatment, except disinfection, through a distribution system that it owns. A consecutive system may be included in an Integrated Water System.

Consumer: Any person, firm or corporation using or receiving water from the public water system.

Containment by Isolation: The installation of a low hazard USC FCCCHR Double Check Valve backflow prevention assembly (containment) and a high hazard USC FCCCHR Reduced Pressure Principle backflow prevention assembly (isolation). They shall be installed on a designated branch line and are acceptable as a means of protecting private plumbing and the public water supply. Installation is at the discretion of Denver Water.

Contamination: Potable water quality impairment by sewage, industrial fluids, waste liquids, compounds or other materials to a degree that creates an actual or potential hazard to public health.

Contractor: In the context of these Standards, a Contractor is one who is employed by an Approved Applicant for a water system extension.

Control Valve: A valve used to isolate conditions downstream from the meter on a specified branch line within a private plumbing system (irrigation system, boiler, fireline, etc.). This type of valve may also be referred to as an Isolation Valve.

Cross-Connection Control: An administered program that is designed to protect the public health, public drinking water supply and recycled distribution system by the regulation and monitoring of the installation and maintenance of backflow prevention assemblies on a potable water service connection.

Containment Protection: The installation of a USC FCCCHR approved backflow prevention assembly on a dedicated water service line that protects the public water system from an actual or potential cross-connection within a private plumbing system. Examples of potential cross-connections are listed in [5.05](#).

Isolation Protection: The installation of a USC FCCCHR approved backflow prevention assembly within a building or facility's private plumbing system near the source(s) of pollution or contamination in order to protect the internal plumbing from an actual or potential cross connection; refer to [5.05](#).

Degree of Hazard: Refers to a pollutant (non-health risk) or contaminant (health risk) hazard and is determined by the conditions within a system. (See Low Hazard and High Hazard)

Denver Water: The plant, facilities, system, assets and personnel controlled by the Board pursuant to its Charter authority.

Detector Check Valve: An assembly that records low-volume water usage through a fireline service that is accepted and approved by Denver Water. The Detector Check Valve may be combined with an appropriate backflow prevention assembly to form a Double Detector Check Valve Assembly or a Reduced Pressure Detector Check Valve Assembly.

Distribution Main: 12-inch or smaller diameter pipe that is installed in public streets or appropriate rights-of-way and used for the distribution of water to consumers.

Distribution Main Valves: Valves on Distribution Mains that are direct buried (as opposed to Transmission Main Valves that must be contained within a vault).

Distribution System: Mains that are composed of 12-inch and smaller diameter pipe, together with appurtenant and necessary valves, fire hydrants, taps, meters, service pipes and associated materials, property and equipment that receive recycled water or potable water from conduits and transmission mains for delivery to consumers.

Distributor: An entity that is located outside of the City and County of Denver yet inside the Combined Service Area that contracts with Denver Water for the delivery of potable water and does NOT co-mingle such water with potable water from any other source.

Distributor Contract Area: An area that is outside of the City and County of Denver that is covered by a contract that furnishes potable or non-potable water to an entity that has the authority to occupy public streets, roads and rights-of-way as a water utility. These areas are classified as [Master Meter](#) (treated or untreated water), [Read and Bill](#) or [Total Service Contract Areas](#).

Domestic Service: Pipes, fittings and appurtenances that are needed to convey water from the tap on Denver Water or a Distributor's facilities to the plumbing of licensed premises for human consumption.

Double Check (DC) Valve: An assembly composed of two independently acting approved check valves between two tightly closing resilient seated shutoff valves attached at each end and fitted with properly located resilient seated test cocks. This type of assembly is used on direct or indirect water connections through which pollutants may enter the potable water system in backflow conditions.

Dual Water Supply Agreement: An agreement between the Board and the Property Owner declaring that the premises has or may have sources of water supply other than Denver Water's potable system. The Property Owner agrees that they will NOT cause or permit the presence of any condition or uncontrolled connection, either actual or potential, at the premises documented on the agreement. The property owner shall, at their cost, install a USC FCCHR backflow prevention assembly on the domestic service line supplied to the premises and shall hire an ABPA or ASSE certified tester to test the assembly upon installation and annually thereafter. A copy of the test reports shall be submitted to Denver Water's Cross-Connection Control Section.

Engineer: The Director of Engineering, who is a member of the Manager's/CEO's Executive Staff, or an appointed representative.

Fireline: Pipe, fittings and appurtenances for the conveyance of water from Distribution Mains to the consumer for fire protection purposes, specifically for automatic sprinkler systems. For the purposes of these Standards, the fireline extends from the corporation stop or tee on the water main to the edge of the public right-of-way or easement that contains the water main.

Head Loss: The measure of the reduction in the total head of the liquid as it moves through a system. In Denver Water's system, head loss constraints are: 2 feet per thousand in distribution mains, 1.5 feet per thousand in transmission mains and 1 foot per thousand in conduits.

High Hazard: A vulnerability from a facility's private plumbing system that would constitute a health risk to the internal plumbing and/or public water system by the introduction of a contaminant such as sewage, industrial fluids, waste liquids, compounds or other materials, the introduction of which would cause a poisoning of the water supply or the spread of disease.

Hydrant Branch: The portion of piping that extends from the water main to the fire hydrant.

Hydraulic Grade Line: In pipelines flowing under pressure, the hydraulic grade line is the level to which water would rise in a vertical tube (open to atmospheric pressure) at any point along the pipeline.

Industrial Piping System: Any system used by a consumer for the transmission, confinement or storage of any fluid, solid or gaseous substance other than an approved water supply, including pipes, conduits, tanks, receptacles, fixtures, equipment and appurtenances used to produce, convey or store substances which are or may be polluted or contaminated.

Inspector: The authorized representative of the Engineer who is assigned to a jobsite.

Integrated Water System: A system comprised of two or more public water systems that have physically connected distribution systems and are operated using a common set of standards for the maintenance and protection of drinking water quality; one acts as a supply system.

Irrigation Service: Pipes, fittings and appurtenances that are used to convey water from the tap on Denver Water or a Distributor's facilities to the plumbing of licensed premises that is only used for irrigation.

Isolation Valve: A valve used to isolate conditions downstream from the meter on a specified branch line within a private plumbing system (irrigation system, boiler, fireline, etc.). This type of valve may also be referred to as a Control Valve.

Low Hazard: A vulnerability that is NOT considered a public health risk from a facility's private plumbing system. It may constitute a nuisance, be aesthetically objectionable or could cause damage to the internal plumbing and/or public water system.

Licensee: Any person, association, corporation, entity or governmental agency that owns or controls licensed premises.

Main Extensions: Extensions to the distribution system that are within the City and County of Denver or Total Service Contract Areas.

Manager/CEO: The Board designated chief executive officer of Denver Water.

Master Meter Contract Area: An area in which, by contract, the Distributor is responsible for the construction, operation and maintenance of the water distribution system to the consumer and for reading the meters of the individual customers and billing them accordingly.

Meter Inspector: An authorized representative of Denver Water's Customer Service Field Section who is responsible for ensuring that water services and metering installations, including AMR systems, comply with applicable standards.

Multi-Family Residential: A dwelling with two to five units with a domestic, fireline and/or dedicated water service tap (defined as such for cross-connection purposes).

Non-Toxic Substance: Any substance of a non-poisonous nature that may create a minor or moderate hazard to the domestic water system.

Pollution: An impairment of the quality of the water to a degree that does NOT create an actual hazard to the public health, but does adversely and unreasonably affect such water for domestic use.

Premises ID: A randomly assigned unique identifier for the individual service address of a physical location.

Pressure Vacuum Breaker: A vacuum breaker designed to prevent backsiphonage only. It consists of a spring loaded check valve, a spring loaded inlet opening, a tightly closing shut off valve on each side of the assembly and two appropriately located test cocks. This type of assembly shall NOT be subjected to backpressure.

Private Pipe Extensions: Extensions to distribution systems that are within Distributor Contract Areas and outside the territorial boundaries of the City and County of Denver.

Read and Bill Contract Area: An area in which, by contract, the Distributor is responsible for the operation and maintenance of the water distribution system to

the individual customer. Denver Water reads the meter of each customer in this type of area and bills them according to a specified rate.

Recycled Water Conduits: Recycled water conduits are 24-inch diameter and larger mains that carry recycled water.

Reduced Pressure Principle Assembly: A testable assembly comprised of two internally loaded, independently operating check valves with a hydraulic, automatic operating, differential relief valve located between the check valves. The assembly is specifically designed to maintain a continual zone of reduced pressure between the two check valves. The relief valve shall be located between two tightly closing upstream and downstream (resilient seated) shut-off valves, and four properly located test cocks for the testing of the valves. This assembly is used for the protection of the potable water supply wherever a direct or indirect connection is made to a point of use involving any substance that may present a health hazard. The unit shall be a USC FCCCHR approved backflow prevention assembly designed to protect against a non-health and/or health hazard condition.

Section and Division: The words Section and Division are used as organizational subdivisions of Denver Water (e.g., Sales Administration Section, Engineering Division, etc.).

Service Line: Pipe, fittings and appurtenances that are used for the conveyance of water from the distribution mains to the consumer for domestic use or for irrigation. For the purposes of these Standards, the service line extends from the corporation stop or tee on the water main to the first valve inside the premises after the water meter; i.e., to the stop-and-waste valve adjacent to the building for an outside meter set, the meter outlet valve for an inside meter set or the irrigation control valve for an irrigation service.

Single Family Residential: A single unit dwelling (defined as such for cross-connection purposes).

Stop Box: A valve box, service box or curb box that is set over the property line valve or curb stop on a domestic water service.

Stub-in: A tap made for the purpose of installing service lines prior to the paving of streets. Any such connection shall include the fittings that are necessary to extend the service line to the valve at the property line. The conversion of a stub-in to an active service line shall be subject to conditions of the Operating Rules and stub-in agreement.

Tap: The physical connection to a distribution main that allows for water service to a consumer coupled with an appropriate license.

Total Service Contract Area: An area in which Denver Water is responsible for the operation and maintenance of the water distribution system to the consumer, the reading of the individual consumer's meter and the billing of the customer; established by a distributor's contract.

Toxic Substance: Any substance (liquid, solid or gaseous) including raw sewage and lethal substances that may create a danger to the health and well-being of the consumer when introduced into the water supply system.

Transmission Main: A 16-inch or 20-inch diameter pipe that receives recycled or potable water from a conduit and distributes it to consumers. They are specifically distinguished from conduit mains due to head loss constraints.

Transmission Main Valves: 16-inch and 20-inch valves that must be contained within a vault (as opposed to Distribution Main Valves that are direct buried).

Water Feature: A structural design element that is NOT intended for human contact; it is supplied by potable or recycled water and is located indoors or outdoors with items ranging from fountains, pools, ponds, cascades, waterfalls and streams normally powered by pumps. The use of recycled water is subject to approval both by Denver Water and the Colorado Department of Public Health and Environment; agreements for use shall be signed in conformance with the Operating Rules.

Water Play Feature: A structural design element (e.g. interactive fountain) intended for recreational use (human contact) that is supplied with potable water normally powered by pumps. The use of irrigation, fire and/or recycled water is prohibited.

Water Main: A distribution main, transmission main or conduit.

Water – Potable: Water from any source that has been investigated by the health agency having jurisdiction and approved for human consumption.

Water – Recycled: Treated domestic wastewater that is suitable for irrigation and commercial uses; it is NOT suitable for human consumption.

Water Purveyor: The owner or operator of the public water system that supplies approved water to the public.

Water Supply – Auxiliary: Any water source or system, other than the public water supply, that may be available in the customer's building or located on the premises.

Water Supply – Unapproved: A water supply that has NOT been approved for human consumption by the official health authority having jurisdiction.

Water System – Consumer: Any water system located on the consumer's premises either supplied by a public potable water system or an auxiliary water supply.

Water Service Connections: The terminal end of a service connection from Denver Water's system (i.e., where Denver Water loses jurisdiction and quality control over the water at its point of delivery to the customer's water system). The water service connection will mean the downstream end of the meter. There should NOT be any unprotected takeoffs from the service line ahead of any meter or ahead of a backflow prevention assembly located at the point of delivery to the customer's water system. Service connections also include water service connection from a fire hydrant, fireline and any other temporary or emergency water service connection from Denver Water's potable water system.

Welder: See [Certified Welder](#).

1.07 ABBREVIATIONS:

All references to Documents or Specifications shall be the latest edition or revision thereof.

- <: Angle
- @: At
- °: Degree

- Ø: Diameter
- #: Number
- ±: Plus/Minus
- **AASHTO**: American Association of State Highway and Transportation Officials
- **ABPA**: American Backflow Prevention Association
- **AC**: Alternating Current, Asbestos Cement
- **ACS**: Access
- **ADDL**: Additional
- **ADJ**: Adjustable
- **AFBMA**: Anti-Friction Bearing Manufacturers Association
- **AG**: Air-gap
- **ALUM**: Aluminum
- **AMR**: Automatic Meter Reading (System)
- **AHR**: Anchor
- **ANSI**: American National Standard Institute
- **APPD**: Approved
- **ASC**: Automatic Sprinkler Connection
- **ASSE**: American Society of Sanitary Engineering
- **ASSY**: Assembly
- **ASTM**: American Society of Testing and Materials
- **AV**: Air Valve
- **AVE**: Avenue
- **AWG**: American Wire Gauge
- **AWS**: American Welding Society
- **AWWA**: American Water Works Association
- **BFV**: Butterfly Valve
- **BLDG**: Building
- **BO**: Blowoff
- **BOT**: Bottom
- **BP**: Backpressure
- **BFPA**: Backflow Prevention Assembly
- **BRG**: Bearing
- **BS**: Backsiphonage
- **BSP-40**: Black Steel Pipe – Schedule 40
- **BSP-80**: Black Steel Pipe – Schedule 80

- **BSTC:** Bolted Sleeve Type Coupling
- **BTWN:** Between
- **BV:** Ball Valve
- **CAD:** Computer Aided Drafting
- **CB:** Catch Basin
- **CBI:** Containment by Isolation
- **C&G:** Curb and Gutter
- **CHKV:** Check Valve
- **CI:** Cast Iron
- **CL:** Centerline
- **CLR:** Clear, Clearance
- **CPLG:** Coupling
- **CONC:** Concrete
- **CONN:** Connection
- **CONT:** Continuous
- **CNR:** Corner
- **CTR:** Center
- **CU:** Cubic, Copper
- **DBL:** Double
- **DC:** Direct Current, Double Check Valve
- **DCDA:** Double Check Detector Assembly
- **DET:** Detail
- **DI:** Ductile Iron
- **DIM:** Dimension
- **DIST:** Distance
- **DR:** Drain, Drive, Drawer
- **DW:** Denver Water
- **E:** East
- **EA:** Each
- **EL:** Elevation
- **ELB:** Elbow
- **ELEC:** Electric, Electrical
- **EMER:** Emergency
- **EQ:** Equal
- **ERT:** Encoder-Receiver-Transmitter
- **ESMT:** Easement

- **ETC:** Et Cetera
- **EXIST:** Existing
- **EXT:** Extension
- **FD:** Floor Drain
- **FIN:** Finished
- **FL:** Flow Line
- **FLEX:** Flexible
- **FLG:** Flange
- **FLR:** Floor
- **FMCT:** Fireline Meter and Compound Torrent
- **FT:** Foot or Feet
- **G:** Gas
- **GA:** Gauge
- **GV:** Gate Valve
- **GALV:** Galvanized
- **HGL:** Hydraulic Grade Line
- **HMWPE:** High Molecular Weight Polyethylene
- **HORIZ:** Horizontal
- **HS:** High Strength
- **HVY:** Heavy
- **HYD:** Hydrant
- **Hz:** Hertz
- **IBC:** International Building Code
- **ID:** Inside Diameter
- **IEEE:** Institute of Electrical and Electronics Engineers
- **IN:** Inch(es)
- **INSTL:** Install
- **INSUL:** Insulated, Insulation
- **INV:** Invert
- **IRR:** Irrigation
- **ISA:** Instrument Society of America
- **JT:** Joint
- **KB:** Kickblock
- **KVA:** Kilovolt-ampere
- **LOC:** Locate, Location
- **LP:** Lighting Panel

- **MA:** Milliamp
- **MATL:** Material
- **MAX:** Maximum
- **MECH:** Mechanical
- **MEE:** Machined Each End
- **MH:** Manhole
- **MIN:** Minimum
- **MJ:** Mechanical Joint
- **MOA:** Machined Over All
- **MSS:** Manufacturers Standardization Society of the Valve and Fittings Industry
- **MTD:** Mounted
- **MTG:** Mounting
- **MS:** Mild Steel
- **N:** North
- **N/A:** Not Applicable
- **NC:** Normally Closed
- **NEC:** National Electrical Code
- **NEMA:** National Electrical Manufacturers' Association
- **NFPA:** National Fire Protection Association
- **NO:** Normally Open, Number
- **NPT:** National Pipe Thread
- **NSF:** National Sanitation Foundation
- **OC:** On Center
- **OD:** Outside Diameter
- **OPNG:** Opening
- **OSHA:** Occupational Safety and Health Administration
- **PC:** Point of Curve
- **PE:** Plain End
- **PI:** Point of Intersection
- **PL:** Plate, Property Line
- **PRESS:** Pressure
- **PRV:** Pressure Regulating Valve
- **PSF:** Pounds per Square Foot
- **PSI:** Pounds per Square Inch
- **PT:** Point of Tangency

- **PUD/PBG:** Planned Unit Development/Planned Building Group
- **PVB:** Pressure Vacuum Breaker
- **PVC:** Polyvinyl Chloride Pressure Pipe
- **R:** Radius
- **REINF:** Reinforcing
- **REQD:** Required
- **RES:** Resistor
- **RH:** Right Hand
- **ROW:** Right(s)-of-Way
- **RPDA:** Reduced Pressure Detector Assembly
- **RP:** Reduced Pressure Principle
- **S:** South
- **SAE:** Society of Automotive Engineers
- **SAN:** Sanitary Sewer
- **SCADA:** Supervisory Control and Data Acquisition
- **SCHED:** Schedule
- **SD:** Storm Drain, Supply Duct
- **SECT:** Section
- **SHT:** Sheet
- **SLV:** Sleeve
- **SPA:** Spacing
- **SPEC:** Specification, Specified
- **SPRT:** Support
- **SQ:** Square
- **SST:** Stainless Steel
- **ST:** Street
- **STA:** Station
- **STD:** Standard
- **STL:** Steel
- **STRM:** Storm Sewer
- **SWV:** Stop & Waste Valve
- **TEMP:** Temporary
- **THD:** Thread, Threaded
- **THK:** Thickness
- **TOP:** Top of Pipe
- **TYP:** Typical

- **UBC:** Uniform Building Code
- **UMC:** Uniform Mechanical Code
- **UPC:** Uniform Plumbing Code
- **USC FCCCHR:** University of Southern California Foundation for Cross-Connection Control and Hydraulic Research
- **V:** Volt
- **VB:** Valve Box
- **VERT:** Vertical
- **WOG:** Water-Oil-Gas
- **WRA:** Water Reducing Agent
- **WSC:** Water Service Contractor
- **WSP:** Working Steam Pressure
- **WTR:** Water
- **WWF:** Welded Wire Fabric
- **W/:** With
- **W/O:** Without
- **XMTR:** Transmitter
- **YD:** Yard