

WASHOE COUNTY DEPARTMENT OF WATER RESOURCES

WATER DESIGN STANDARDS

This section of the manual contains the Washoe County Department of Water Resources' (DWR) standards for:

- Designing Water Distribution Facilities (“Design Standards”)

1.1 DESIGN STANDARDS

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1.1.00 GENERAL STATEMENT

Developers and Engineers are encouraged to contact the DWR at the earliest possible stage of development planning to gain an understanding of the DWR's new business processes; operational constraints of the existing water system; the requirements of State water system regulations; facility and feeder main charges; and ultimately, the preliminary water system facility requirements for their projects. This understanding will assist the developer in obtaining adequate project financing and facilitate the project review and approval process.

Water facilities design and hydraulic analyses shall consider both present and future demand scenarios. The DWR must be consulted for information regarding population projections and densities, per capita consumption, planned development, growth patterns and preliminary fire requirements (actual fire flow requirements are set by the Fire Department having jurisdiction in the area to be developed) to insure that water mains are adequately sized from the various sources of supply to every point in the system. Other design elements to be considered include: piping materials selection (water and soil corrosiveness considerations), the water main pressure requirements, water main location with reference to property lines and other utilities, sizing of service lines, location and size of line valves, fire hydrants, special valves, booster pumps, storage, water quality and looping/reliability issues.

All DWR Standards shall be considered as minimum guidelines, and it is the engineer's responsibility to confirm adequacy of same or provide an acceptable alternative as approved by the DWR. Nothing in DWR's Design or Construction Standards shall be construed as superseding or negating any requirements of NAC 445A.65505 to 445A.6731, inclusive.

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1.1.01 WATER DISTRIBUTION SYSTEM PRESSURE ZONES

1.1.01.01 In general, the DWR's pressure zones are designed to maintain a static pressure of 50 – 100 pounds per square inch (psi). The maximum static water pressure allowed for any service shall not exceed 100 psi.

1.1.01.02 In areas where a static pressure in excess of 80 psi is anticipated, individual pressure reducing valves are required to be installed and maintained by the owner/developer in accordance with the current code adopted by Washoe County. The Engineer will identify on the water plans the services requiring individual pressure reducing valves. Individual pressure reducing valves are also required for all services and area served by pressure reducing station per NAC 445A.

1.1.01.03 New water system facilities and pressure zones and additions to the existing system shall be designed to provide the following minimum water pressures under the various demand/flow conditions noted below:

- A. Maximum Day 40 psi
- B. Peak Hour 30 psi
- C. Maximum Day + Fire 20 psi
- D. Average Day 50 psi

Minimum water pressure requirements should be considered at the ground elevation at the point of service connection, but it is best to base the pressure at the building pad elevation if it is greater than the elevation of the service connection point. Minimum water pressure requirements shall be strictly adhered to since additional pressure losses will occur through the meter, backflow devices, customer's service line, customer's internal plumbing and also from multi-floor elevation gain if applicable.

1.1.02 WATER DISTRIBUTION MAIN SIZES

General Requirements

- A. All water mains shall be sized based on flow/demands and pressure requirements. All main sizes shall result in velocities less than five (5) feet per second (fps) under max day demand conditions and ten (10) feet per second for max day plus fire flow

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- B. The minimum water main size to be installed in the DWR's system shall be eight (8) inches in diameter (see exceptions below) unless otherwise approved by the DWR. Additionally, the DWR may establish minimum water main diameters based on other criteria.

- C. Departures from the minimum requirements will be considered only in special circumstances. Water mains in cul-de-sacs, internal streets within subdivisions, and other areas where water mains will not be extended in the future, may be six (6) inches in diameter if that size water main meets the development's water demand requirements (including fire flows). Any departure from minimum requirements identified above shall be justified by a network hydraulic analysis and approved by DWR.

1.1.02.01 Size - Fire Protection

- A. When fire protection is to be provided, system design shall be such that fire flows and facilities are in accordance with the requirements of the Fire Department having jurisdiction. All systems must be designed to provide a minimum residual pressure of twenty (20) psi at all service connection points in the system during max day plus fire flow conditions.

- B. Required fire flows and hydrant locations, both on-site and off-site, will be identified on the Project water plans and approved by the Fire Department having jurisdiction.

- C. The minimum water main size providing fire protection and serving fire hydrants shall be six (6) inches in diameter. A maximum length of one-hundred fifty (150) feet of six (6) inch main serving a fire hydrant from a single source will be allowed. A larger size main and a single check valve at the main tap location will be required for any distance greater than one hundred fifty (150) feet from the source main. Larger diameter mains will also be required, if necessary, to meet the required minimum fire flow while maintaining minimum residual pressure. A fire hydrant shall not be connected to a main that does not have sufficient fire flow capacity. Taps of DWR mains for private fire services shall include a double check detector assembly.

- D. Fire hydrants shall conform to the Standards of the Fire Department having jurisdiction.

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- E. All utility plans must have the written approval of the fire hydrant locations only from the Fire Department having jurisdiction PRIOR to submitting any plans to the DWR for water service application or approval.

1.1.02.02 Oversizing

The DWR may require the Developer to oversize some, or all, of the proposed water mains. For details regarding DWR oversizing please contact DWR.

1.1.03 WATER MAIN LOCATION

1.1.03.01 Main extensions should be located within a dedicated right-of-way or dedicated easements. Refer to section 1.121 for easement requirements.

1.1.03.02 Where street curbs are present, water mains will be designed to the extent possible with center of pipe horizontal alignment located three (3) feet from the gutter lip. In areas without curb and gutter, the water mains will be designed to the extent with center of pipe horizontal alignment located seven (7) feet from the edge of asphalt unless established otherwise by the DWR.

1.1.03.03 Water main designs shall comply with the separation requirements conveyed in Section 1.1.18., per detail WR2.2.1 and WR2.2.2. Designs shall incorporate a separation of ten (10) feet horizontally (outside to outside) from any non potable water line (reclaimed) or sewer line (sanitary or storm), and eighteen (18) inches vertically above any non potable water line or sewer line, or as otherwise provided for in Section 1.1.18. Location of other utilities in the easements should be coordinated with the DWR on an individual basis. Separation shall meet the requirements within NAC 445A.

1.1.03.04 If a vertical clearance of eighteen (18) inches between the water line that crosses over a non potable water line or sanitary or storm sewer line cannot be maintained, then the design must comply with the criteria for water/non-potable water line or sewer main crossings in Section 1.1.18

1.1.03.05 Dead-end mains shall be minimized by looping mains whenever practical or where required by the DWR and/or the Health Department. Preliminary design and layout of subdivision streets and lots should contribute to elimination of dead-end mains. All dead end mains shall terminate with a flushing device that is sufficient enough to provide a flushing velocity of at least 2.5 feet per second within the main.

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1.1.03.06 Temporary dead-ended mains that will be extended with subsequent phases of development shall be stubbed at least twenty feet beyond the edge of pavement or 40 feet beyond last mainline valve which ever is greatest and shall be terminated with a flush valve assembly.

1.1.04 FULL FRONTAGE EXTENSION

At the DWR's discretion, the developer may be required to install the water main along the entire length of at least one property line frontage of the property to be developed whenever future line extension is possible. The property line frontage is that portion of the property along the public right-of-way. If a parcel to be developed has more than one property line frontage, the DWR may require a water line to be installed along the other frontage(s). The minimum pipe diameter required in the frontage street shall be in accordance with Section 1.1.02, or as required by the DWR.

1.1.05 WATER MAIN JOINT DEFLECTION

Designs for the maximum allowable water main joint deflection and bending radius for water mains shall not exceed the pipe manufacturer's recommendations or AWWA specifications. PVC pipe shall not be deflected at a fitting or joint. Requirements in excess of the deflections or bending radii identified shall require installation of fittings.

1.1.06 DEPTH OF COVER

Designs shall call for a minimum depth of cover to be maintained for all pipe unless otherwise specified and approved by the DWR. The installation of mains in locations where there is not an established final grade shall only be allowed with the prior approval of and at the sole discretion of the DWR. Design drawings shall specify a sixty (60) inch minimum depth of cover over any pipe where there is not an established street grade. The Engineer shall consider possible and probable future development and grading.

Where there is an established street grade, the minimum depth of cover of thirty-six (36) inches from final grade to top of pipe shall be specified and included in the design drawings. Depth of cover shall be 42-inches for elevations higher than 5000 ft.

Pipe locator ribbon will be required in accordance with DWR standards.

Designs within NDOT Right-of-Way shall meet NDOT requirements.

1.1.07 PIPE CASING

1.1.07.01 Steel Casing

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Design drawings shall call for steel casings to be required on all pipe installed using jack and boring and micro-tunneling methods, where approved by the DWR and required to meet specific Railroad and/or NDOT requirements, to provide structural support, or as required under other special conditions. The pipe casing shall be designed to be laid true to line and grade with no bends or changes in grade for the full casing length. The casing material used shall be a minimum of one-quarter (¼) inch thick steel (design calculations must be submitted by the developer's engineer) and conform to ASTM A283, Grade B, C, or D. All joints shall be welded. Interior joints shall be ground to a smooth finish. All welding shall be performed in accordance with AWWA C206, "AWWA Standard for Field Welding of Steel Water Pipe". Coatings for steel casings are not required. Other casing materials may be utilized for applications other than boring when approved by the DWR.

1.1.07.02 Pipe Spacers

The design drawings shall include details specifying the pipe to be symmetrically supported about its centerline inside the casing at each joint end with a DWR approved polyethylene spacer, sized and designed per manufacturer recommendations.

1.1.07.03 Casing End Caps

Design drawings of the water main casing shall call for the ends to be sealed.

1.1.07.04 The annular space shall be left open and not backfilled with any material.

1.1.07.05 Pipe Material: All pipes shall be restrained joint pipe.

1.1.08 VALVES

1.1.08.01 Valve Location

Design drawings shall include valves to be placed on water mains to minimize inconvenience, degradation of fire protection and sanitary hazards during repairs. Valves shall be generally located as follows, unless otherwise approved by the DWR:

A. At intervals to isolate no more than two (2) fire hydrants at any time.

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- B. At intervals not greater than eight hundred (800) feet and preferably attached to a flanged fitting (i.e. elbow, cross, tee, etc)
- C. Valves shall not be located in street gutters, valley gutters, or in driveways, unless approved by DWR.
- D. A valve is required at the end of all temporarily dead-end mains. The valve location is to be a minimum of twenty (20) feet upstream of the cap or blow off assembly and at least 5 feet downstream of the last service line connection.
- E. A shut off valve immediately adjacent to the water main shall be provided for all service laterals greater than four (4) inches and greater in diameter, and for all fire hydrant laterals.
- F. A minimum of two valves shall be installed at all branch tees. A minimum of three valves shall be installed at all crosses. The DWR may require additional valves depending upon the project design.

1.1.08.02 Gate Valves

- A. Designs will provide for gate valves to be installed on all water mains up to, and including, twelve (12) inches in diameter. If pressures may exceed 100 psi, or if a gate valve is otherwise required by the DWR. Butterfly valves manufacturers shall be approved by DWR, shall meet the requirements of AWWA C504, AWWA C550 and DWR Standards.
- B. Gate valves shall be installed in the vertical position with non-rising stems in all locations per detail WR-2.3, except vaults unless otherwise specified by the DWR.
- C. All gate valves shall have resilient seats and meet the requirements of AWWA C509, AWWA C550, DWR standards and installed per detail WR-2.3.

1.1.08.03 Butterfly Valves

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Butterfly valves shall be used for water mains fourteen (14) inches in diameter and larger; unless a tapping (gate) valve is required. If pressures may exceed 100 psi, or if a gate valve is otherwise required by the DWR. Butterfly valves manufacturers shall be approved by DWR, shall meet the requirements of AWWA C504, AWWA C550 and DWR Standards.

1.1.08.04 Valve Stem Extensions

Design drawings must specify steel valve stem extensions to within two (2) feet of finished grade where the distance from the top of the valve box to the top of the operating nut exceeds four (4) feet.

1.1.08.05 Valve Boxes

Adjustable valve boxes shall be included on design drawings for all buried valves per detail WR-2.3. Valve boxes shall be installed in accordance with DWR's Construction Standards.

1.1.08.06 Special Valves

- A. Air release and/or combination air release valves will be required on pipelines' high points and changes in grade. Air valves shall be sized and detailed by the design engineer. Installed per DWR details WR-2.7 and WR-2.8 and shall include above grade, screened riser vent pipes located within the PUE or right-of-way and protected by pipe bollards.

- B. Pressure regulating valves (PRV) will be required where it is necessary to reduce pressure to a maximum value as defined in Section 1.1.01. Individual pressure reducing valves will be required on individual service lines in a pressure zone served by a pressure regulating station. Individual pressure reducing valves will be owned and maintained by the property owner. Materials, trim, seats, coating, lining and options shall be in accordance with DWR Standards and per DWR details WR-2.7 and WR-2.8.

- C. Check valves are to be used where water flows in one direction only and shall be enclosed within vault per DWR standards. Check valves shall be installed with isolation valves and a separate valved bypass line to facilitate maintenance or emergencies, if required by DWR. A flushing device shall be installed on the checked side of the valve. Materials, trim, seats, coating, lining and options shall be in accordance with DWR Standards and details.

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- D. Flush valve assemblies are required on all permanent dead-end pipe runs and may be required at stub-out locations. Flush valves shall be sized to provide a minimum velocity of 2.5 feet per second (fps) in the main. Flush valve assemblies for these locations shall be installed in accordance with DWR's Construction Standards and details.

1.08.07 Valve Retirement

- A. For valve retirement, the following methods shall be utilized and the following note shall appear on the design drawing:

RETIRED VALVES

All valves to be retired shall be abandoned in the closed position, filling the bottom of the box with a minimum of eight (8) inches of sand, the remaining portion of the valve box shall be filled with concrete.

1.1.09 CAPPING

A cap or plug may be used with dead end thrust blocks per DWR detail WR-2.12, or as otherwise approved by the DWR.

1.1.10 THRUST AND ANCHOR BLOCKS

Thrust blocks are required at all caps, valves, reducers, tees, fittings, etc. used to change the pipe direction, and shall be placed in accordance with DWR Standard Details. Thrust blocks for each location shall be designed by the design engineer to account for allowable soil bearing capacity, main size, main pressure and change in direction. If the allowable soil bearing capacity is unknown, thrust block design shall be based on maximum soil bearing capacity of 1,500 psf; however, the design engineer must verify soil conditions at the time of construction and make adjustments as required. Thrust block design shall provide suitable support under test pressure conditions (the greater of 150 psi or two times the working pressure of the main). Vertical and horizontal thrust blocks shall be made of concrete having a compressive strength of not less than 4000 psi after 28 days. A thrust block schedule shall be included on all water main design drawings, or the plans shall clearly state that the DWR's thrust block schedule, or noted portions thereof, are suitable for the project. If uncompacted or unclassified backfill material is present; then mechanical restraint joints shall be required in addition to a thrust block. Vertical reaction blocks shall have corrosion resistant hardware; additional coating prior to backfill may be required by field inspector.

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1.1.11 MECHANICALLY RESTRAINED JOINTS

Mechanically restrained joints may be used in lieu of thrust blocks or as required by the DWR. The restrained pipe length distance on either side of fittings where restrained joints are required should be clearly identified on drawings and calculations shall be submitted to DWR. Restrained joints are required on all fittings at vertical offsets; and design engineer shall provide restrained pipe calculations. The DWR may also require ductile iron with restrained joints for pipelines installed across drainage ways, within carrier pipe, on natural grades in excess of 10 percent, or other conditions determined by DWR.

1.1.12 SERVICE LATERALS

Service laterals shall be designed and sized to provide peak hour capacity without excessive pressure losses taking into account anticipated losses through the meter, setter, and backflow prevention device. Service lateral sizes are subject to the review and approval of the DWR. Service lateral materials shall be furnished and installed in accordance with DWR Standards.

1.1.12.01 Location

- A. All service laterals shall be installed in the public right-of-way or public utility easement unless other provisions have been approved by the DWR.
- B. The full service lateral length between a water main and water meter shall be installed at ninety (90) degrees to the water main horizontal alignment unless otherwise approved by the DWR.
- C. For service laterals two (2) inches in diameter and smaller, service saddles shall not be closer than twenty-four (24) inches from the end of the main or any pipe joint, nor closer than eighteen (18) inches to an adjacent service saddle when the service taps are on opposite sides of the main, nor closer than twenty-four (24) inches to adjacent service saddles when the service taps are located on the same side of the main.
- D. The sewer and water laterals leading into the property shall be separated horizontally by a minimum of four (4) feet, the sewer lateral must be a minimum of one and one half (1.5) feet lower than the water lateral, and the laterals shall be located in separate trenches, per NAC 445A requirements (also see "Section 1.1.18").

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- E. All service laterals shall be located a minimum of ten (10) feet from septic tanks, and a minimum of twenty-five (25) feet from leach beds and/or seepage pits.

1.1.12.02 Water Service Lateral Installation

- A. Water service laterals shall be installed per DWR detail WR-2.10
- B. Minimum service lateral diameters for meter sizes up to four (4) inches shall be as follows:

<u>Required Meter Size (in.)</u>	<u>Minimum Lateral Size (in.)</u>
3/4	1
1	1
1-1/2	1-1/2
2	2
3	4
4	4

- C. All service laterals four (4) inches and larger will require a tee and gate valve at the source main and the lateral shall be a material approved by, and in accordance with, the DWR's Standards. Distribution taps (hot tap) are acceptable.
- D. Service laterals will not be allowed or installed for future lots unless otherwise approved by the DWR.

1.1.12.03 Water Service Lateral Removal

- A. When retiring existing water service assemblies sized two (2) inches and smaller, the following note shall appear on the drawing:

RETIREMENT OF EXISTING SERVICE LATERALS (≤2")

The Contractor shall notify the DWR two (2) full business days prior to the requested removal time to allow the DWR to take the final meter reading. The Contractor may then begin removal procedures for the affected

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service as follows:

Existing service laterals to be retired from existing water mains shall have the corporation stops turned off at the main, a minimum of twelve (12) inches of the lateral cut out near the corporation stops and a brass cap/plug installed on the corporation stop. If the corporation stop is damaged beyond repair or pulled from the existing water main, the main shall be repaired at the Contractor's expense in a manner approved by the DWR. If it is discovered the corporation stop is not water tight, through no fault of the Contractor, the Contractor shall notify the DWR for further direction. The existing meter(s) and all appurtenances shall be removed and delivered to the DWR.

- B. For existing water service assemblies four (4) inches and larger that are to be retired, the following note shall appear on the drawing:

RETIREMENT OF EXISTING SERVICE LATERALS (≥4")

The Contractor shall notify the DWR two (2) full business days prior to the requested removal time to allow the DWR to take the final meter reading and to notify the DWR's Inspector of the impending work. The Contractor may then begin removal procedures for the affected service as follows:

All valves to be retired shall be abandoned in the closed position, unless shown otherwise, then filling the bottom of the box with a minimum of eight (8) inches of sand, the remaining portion of the valve box shall be filled with concrete.

If the valve is to be abandoned in the closed position, the lateral must be cut within three (3) feet of the abandoned valve, or as shown on plans, and capped. Where a joint or coupling in the existing pipe is uncovered at the cut and cap locations, the installation of a plug may be permitted with DWR approval. The Contractor shall install a concrete thrust block in accordance with the provisions of the DWR's Standards at all cap or plug locations. If the valve to be retired has a flanged outlet, a blind flange may be installed in lieu of cutting and capping the pipe.

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The contractor shall remove existing meter(s) and meter pit or vault and meter shall be delivered to the DWR.

1.1.12.04 Lateral Relocation

- A. All existing laterals that are to be relocated must first be disconnected from the existing pipeline following retirement procedures, (See "Section 1.1.13.03"). The relocated service installation shall comply with DWR's current standards.
- B. If meter box relocation is required, Section 1.1.13.01.B still applies.

1.1.13 METERS

1.1.13.01 Size

The size for all domestic services shall be based on continuous flow meter capacities under Peak Hour Demand flow. Maximum meter flow capacities may be used for maximum domestic demands, when calculated utilizing the applicable plumbing code or other applicable criteria, when associated pressure losses are accounted for in the system design.

1.1.13.02 Meters

All meters shall be Sensus brand meters with ICE registers and installed by developers' contractor and remain DWR's property.

1.1.13.03 Installation

- A. All meter pits for new residential meter installations shall incorporate a single check valve at the outlet side of the meter. Per current plumbing code, a means for controlling thermal expansion will be provided in the residential plumbing system design. The maintenance of the thermal expansion protection device shall be the responsibility of the home owner.
- B. Meter shall be installed on the opposite side of the gas and electrical service locations on a lot.

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- C. All services shall be installed in accordance with the DWR's Standards. Meters will not be allowed at locations not contiguous to the property served. Meters two (2) inches and smaller may be installed by the DWR upon payment of applicable fees. For meter services three (3) inches and larger, the following note(s) shall appear on the drawing.

INSTALLATION OF METER AND VAULT

The meter(s) and vault(s) with traffic/non-traffic bearing cover(s) shall be installed in accordance with the DWR's Standards. Precast vaults approved by the DWR may be used in lieu of cast-in-place vaults. The designation of pre-cast or cast-in-place must be made prior to plan approval.

Any block wall or other fence material shall be designed and constructed around the outside of the easement(s), to allow the DWR direct access to the vault(s) and inlet piping from the adjacent right-of-way.

Easements shall be clearly marked or staked prior to the start of construction.

- C. All meter and meter vaults for meters three (3) inches and larger shall be located within the Public Utility Easement (PUE) or within water facility and access easement even if there is adequate space for the vault within the right-of-way, unless otherwise specified by the DWR.

1.1.13.04 Meter Enclosures

- A. Designs shall provide for meter enclosures to be located in landscaped area, or within a designated easement in accordance with the DWR's Standards. No meter enclosures shall be located in a potential traffic area .
- B. All meters two (2) inches and smaller shall be installed in an approved meter enclosure, per the DWR's Standard details.
- C. All meters three (3) inches and larger shall be housed in a vault. Refer to the DWR's Standard details for dimension and construction details.
- D. Provisions for remote reading devices per DWR Standard Details for all vaults and boxes are required.

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1.1.14 BACKFLOW

Any connection to the DWR's distribution system shall be made in a manner that protects the public potable water supply from contamination or pollution. Containment shall be achieved by the use of an DWR approved backflow assembly that isolates, within the customer's internal distribution system(s) or the customer's private water system(s), such contaminants or pollutants that could potentially backflow into the public water system due to back pressure or back siphonage due to loss of system pressure. The DWR does not own or maintain a customer's backflow device. Installation of backflow prevention devices shall comply with the DWR's Standard details and shall conform to NAC 445A requirements and report shall be received within 10 days after actual water service has been established.

1.1.14.01 Application

No water service connection to any premises shall be approved, installed, or maintained by the DWR unless the water supply is protected as required by State laws, State regulations, and DWR Standards. Water service to any premises shall not be activated by the DWR if the DWR determines the water service requires a backflow assembly and any of the following conditions exist:

- A. The backflow assembly is not installed or has been removed after installation.
- B. The backflow assembly has been by-passed.
- C. The backflow assembly is in any way altered.
- D. Any cross-connection or possibility of cross-connection.

1.1.14.02 The required backflow prevention assembly type shall be determined by facility use. The DWR may require all services to a facility or parcel have an equal level of backflow protection. Facilities shall be evaluated by DWR for backflow prevention requirements on a case by case basis.

1.1.14.03 Any backflow prevention assembly required herein shall be a model and size approved by the DWR and be on the USC approved backflow device list. The term "Approved Backflow Prevention Assembly" shall mean an assembly meeting the DWR's specifications.

1.15 FIRE HYDRANTS

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1.1.15.01 Location and Spacing

- A. All fire hydrants, permanent or temporary, will be installed in accordance with the DWR's Standard details.
- B. Hydrant spacing and location must be approved and conform to the requirements of the Fire Department having jurisdiction.

1.1.15.02 Materials

Fire hydrants shall be approved by, and conform to the requirements of, the Fire Department having jurisdiction.

1.1.15.03 Hydrant Drains

- A. Hydrant drains shall not be plugged, and a gravel pocket shall be provided.
- B. Hydrant drains shall not be connected to, or located within ten (10) feet of, sanitary sewers or storm drains.

1.1.15.04 Fire Department Approval

Approval by the Fire Department having jurisdiction is required PRIOR to submitting a water service application to the DWR and prior to submitting plans to the DWR for final water plan approval. Approval shall also include relocation and abandonment of fire hydrants.

1.1.16 WATER AND SEWER/STORM MAIN CROSSINGS AND CLEARANCES

1.1.16.01 Parallel Separations (Mains)

- A. "Sewer" as used hereinafter, includes sanitary sewers, storm drains, all non-potable water mains and any unidentified. In all cases, utility pipes shall be installed in separate trenches. The following

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separations must be maintained between all sewer lines which parallel water lines.

- 1) At least ten (10) feet of separation measured horizontally from exterior pipe walls shall be maintained between water and sewer mains.
- 2) Sewer lines shall be placed lower than water mains whenever possible.

B. Where the required ten (10) feet separation is not practicable, the engineer may petition the Health Department for approval of one of the following options:

- 1) Less than ten (10) feet horizontal separation, but with eighteen (18) inches vertical separation, the following will apply:
 - a. Pipes shall be installed in separate trenches.
 - b. Horizontal separation shall be at least five (5) feet between exterior pipe walls and from sewer structures.
 - c. Vertical separation shall be at least eighteen (18) inches between exterior pipe walls with the water main being placed above the sewer main.
- 2) Where the required ten (10) foot horizontal separation or the five (5) horizontal plus the eighteen (18) inch vertical separation with the water line above the sewer cannot be met, the following provisions will apply:
 - a. All efforts will be made to place the water line above the sewer main.
 - b. Horizontal separation shall not be less than five (5) feet from exterior pipe walls and sewer structures.
 - c. The sewer line will be constructed using one of the following options:

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- i. The sewer main will be constructed of SDR 35 PVC pipe with integral elastomeric gasketed joints meeting the requirements of ASTM D3212.
- ii. Existing sewer mains may be totally encased with a minimum of four (4) inches of cement slurry (300 PSI +/-).

1.1.16.02 Crossing Separations (Mains)

The following separations must be maintained between all sewer mains which cross water mains.

- A. Sewer mains shall be placed below water mains and shall be separated vertically by at least eighteen (18) inches between exterior pipe walls.
- B. Where the water main is below the sewer main, or where the water main is above the sewer main with a vertical separation less than eighteen (18) inches, the following provisions shall apply:
 - 1) A reasonable effort must be made to place water and sewer pipeline joints an equal/maximum distance from the crossing point. This requirement does not apply to welded joints.
 - 2) A vertical separation of no less than twelve (12) inches must be maintained and structural support for the Sewer and/or water main be determined by the Engineer and approved by the DWR.
 - 3) The sewer main will be constructed using one of the following options, in the following priority:
 - a. The sewer main will be constructed of SDR 35 PVC pipe with integral elastomeric gasketed joints meeting the requirements of ASTM D3212.
 - b. The sewer main (depending on field conditions) shall be totally encased in a minimum of four (4)

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inches of cement slurry (300 PSI +/-) for a distance of ten (10) feet on each side of the crossing.

- c. The sewer main or water main may be installed in a sleeve of water quality pipe which extends, without joints, ten (10) feet on each side of the main.

1.1.16.03 Service Lateral Crossings and Clearances

For purposes of this section "service laterals" are those sewer and water lines extending from a main and terminating at the point of service. They are generally of smaller diameters (water: 1" to 4"; sewer: 4" to 6").

A. Parallel Separation (Service Laterals)

- 1) Water and sewer service laterals shall be installed a minimum of forty-eight (48) inches apart in separate trenches. Water laterals shall be a minimum of twelve (12) inches above the sewer lateral.
- 2) For maintenance purposes, service laterals shall be installed a minimum of forty-eight (48) inches from the exterior of manholes.

B. Crossings (Service Laterals)

- 1) Where a water service lateral crosses a sewer main or sewer lateral, it shall be above the sewer with a vertical separation of at least eighteen (18) inches. Any relocation of existing water laterals to achieve these clearances must be performed with the approval of and in accordance with the procedures and standards of the DWR.
- 2) When a sewer main or sewer lateral must cross over or under a water lateral or water main with less than eighteen (18) inches clearance all NAC 445A requirements must be met.

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1.1.17 TAPS 4 INCHES AND LARGER

1.1.17.01 Materials

- A. Full circle, stainless steel tapping sleeves with flanged tapping valves shall be included in designs for hot/wet taps where the tap diameter is at least one nominal pipe size smaller than the nominal pipe diameter being tapped. All tapping materials and methods are subject to the review and approval of the DWR.

1.1.17.02 Identification

The steel cylinder thickness, as well as the mortar lining and coating thickness, must be noted on all project plans where the mains to be tapped are Concrete Steel Cylinder Pipe or Mortar Lined and Coated Steel Pipe (MLCP).

1.1.17.03 Installation

- A. Hot/wet taps shall be in accordance with the DWR 's requirements and per DWR detail WR-2.13.

1.1.18 LINE STOPS

Line stops may be required by the DWR, with or without by-pass, to ensure continuous operation of the water system. Line stops are used to temporarily shut down a pipeline system to complete modifications or repairs and allow a system to operate without any interruption of service. Line stops performed for the purpose of subsequently cutting and removing a section of main shall not be allowed without first installing adequate temporary thrust restraint on the section of pipe to remain pressurized. All thrust blocking for the line stop shall be designed for the soil bearing capacity.

1.1.19 EASEMENTS

1.1.19.01 General Requirements

- A. Easements, where identified and allowed by the DWR, are required whenever a water main, service lateral, meter, or any associated appurtenances are not located in a public right-of-way. All easement locations shall be identified on the water plan, as well as any area(s) dedicated as public utility easements to be occupied by water facilities, to facilitate field verification.

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- B. Trees, shrubs, or decorative rocks, and any block wall or other fence material, shall be designed and constructed around the easement(s) to allow the DWR direct access to the vault(s), backflow assemblies, and piping from the adjacent right-of-way.
- C. The area within the easement shall be graded to provide drainage away from the vault and/or backflow assembly(ies) to prevent vault flooding and provide access for maintenance.
- D. The area within the easement shall not contain any grades or materials such as large rocks (greater than two inches) that would hinder or restrict maintenance of the facilities.
- E. The final grade within the easement shall match back of sidewalk or right-of-way to allow safe ingress/egress to facilities. Retaining walls shall be provided when required, and a minimum clearance of five (5) feet must be provided from the edge of the pad(s) or vault to any fence or wall.
- F. Where the DWR has approved a main extension in an easement, the easement shall be a minimum of 30 feet in width, free of all obstructions, landscaping, fences and other improvements and shall be provided with a 12-foot wide all-weather surface to allow vehicular and equipment access to the full length of the easement. Grass shall not be utilized for an all-weather surface, unless grass pavements blocks are utilized and have prior approval from DWR. If road grade exceeds eight percent, the road surface shall be paved. In no case should road grades exceed ten percent unless specifically approved by the DWR. Water lines shall be located five (5) feet from the property line or easement edge or as specified by the DWR for the entire water main length. Such easements shall terminate at public right-of-ways with gated vehicle/equipment access provided on each end.
- G. The DWR may identify other specific requirements or limitations for easements.

1.1.19.02 Size

- A. The easement size required for a water main will be a minimum of 30 feet in width or as specified by the DWR.

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- B. The minimum easement dimensions for various size meter configurations will be as specified by the DWR based on facility requirements, service lateral configuration and backflow requirements and as required for maintenance and access.

- C. The minimum easement dimensions for various size and number of backflow assemblies will be as specified by the DWR based on facility requirements and service lateral configuration and as required for maintenance and access.

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