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WATER DISTRIBUTION

5-1 DESIGN

5-1.01 GENERAL

Extension or modification to the City's water system shall be made strictly in accordance with the construction plans prepared in accordance with these Standards, the Snohomish Municipal Code, and the City's Water Comprehensive Plan, and approved by the City Engineer. Additionally, all construction of water system extensions shall conform to these Standards, applicable American Water Works Association (AWWA) Specifications and the current WSDOT/APWA Standard Specifications.

These Standards do not include design of the City's general facilities such as wells, pump stations, in-ground reservoirs, storage tanks, or treatment plant. The City's general facilities require special design and will be reviewed and approved by the City Engineer on a case-by-case basis.

5-1.02 HYDRAULIC REQUIREMENTS

Distribution System Pressure

All water mains shall be sized following a hydraulic analysis based on flow demands and pressure requirements. Per the DOH design manual current edition, during fire suppression events, the water system must be able to provide 20-psi minimum pressure at ground level at all points throughout the distribution system. The water system must be able to provide this minimum pressure under fire-flow conditions plus the MDD rate when all equalizing and fire flow storage is depleted (WAC 246-290-230(6)). The required working pressure in the City of Snohomish distribution system should be approximately 40 to 80 psi, not less than 30 psi when all equalizing storage is depleted, and not greater than 90 psi due to the age and condition of the current infrastructure. Higher pressures in unusual circumstances shall be submitted to the City Engineer for review. Individual pressure reducing valves (PRV) are required when the static pressure at the service level exceeds 60 psi.

Distribution System Velocities

Per the DOH design manual current edition, "DOH recommends a maximum velocity of no more than 8-feet per second (fps) under PHD conditions, unless the pipe manufacturer specifies otherwise. Maximum velocities greater than 8 fps may occur under fire flow conditions, for short main sections, or piping in pump and valve station facilities.

Engineers should conduct a hydraulic transient (water hammer) analysis for distribution piping designed to exceed 10 fps during PHD or fire flow conditions (Walski et al. 2003; AWWA 2004)."

Distribution System Fire Flow

Fire flow requirements shall be determined by the City Fire Marshall. The available fire flow will be determined by the City Engineer using the water system hydraulic model.

5-1.03 WATER MAIN EXTENSION

Residential

Water main extensions shall be required when a parcel does not front an existing water main. All residential water main extensions shall be extended to a point 10 feet beyond the farthest property corner where practical as determined by the City Engineer. In addition, water mains shall be installed through all internal streets and looped to all adjacent mains that will, in the City Engineer's opinion, extend past or through the property in the future; and stub to the property line where it is likely that they will be needed to connect to future mains. Depending on the property size, shape and the Water Comprehensive Plan, the City may require mains to be constructed on more than one, and up to all, sides of the property. The City Engineer may also require that extra service lines be installed to be used for sampling stations.

If a proposed water main extension is located in 2 or more pressure zones, the City Engineer may require installation of pressure reducing stations, isolation valves, check valves, and/or booster pump stations.

Dead-end mains shall be kept to a minimum by making appropriate looping and tie-ins whenever practical in order to provide increased reliability of service, assist with water quality and reduce head loss.

If a water main extension directly benefits multiple property owners, a latecomer reimbursement agreement in accordance with SMC Chapter 15.17 may be appropriate.

Non-Residential Properties

Water main extensions shall be required when a parcel does not front an existing water main. All non-residential water main extensions shall be extended to a point 10 feet beyond the farthest property corner where practical as determined by the City Engineer, and/or stub or connect to present and future mains or as directed by the City Engineer. The City Engineer may also require that extra service lines be installed to be used for sampling stations.

If the proposed water main extension is located in 2 or more pressure zones, the City Engineer may require installation of pressure reducing stations, isolation valves, check valves, and/or booster pump stations.

Dead-end mains shall be kept to a minimum by making appropriate looping and tie-ins whenever practical in order to provide increased reliability of service, assist with water quality and reduce head loss.

If a water main extension directly benefits multiple property owners, a latecomer reimbursement agreement in accordance with SMC Chapter 15.17 may be appropriate.

5-1.04 WATER MAIN LOCATION

Water mains and appurtenances should be installed within the right-of-way of public streets and roads. Water mains may be installed within City easements across private properties. Water mains within public right-of-way shall be located on the north and east sides of the centerlines. Water mains shall be in the shoulder of the roadway for rural roads, and approximately 6 feet from the street centerline for urban streets. See Standard Plan 322.

The City Engineer may approve exceptions to this requirement in order to minimize the cutting and replacing of pavement, to avoid conflicts with other underground utilities, to permit sanitary sewers to be installed on the "low side" of streets, or for other appropriate reasons. As nearly as practical, mains shall be installed on a particular street with the distance from the property line and/or centerline varied as little as possible. Water mains shall not be located under or behind parking lanes, curbs, gutters, or sidewalks. Valve boxes shall be located outside the normal wheel track whenever possible.

If there is an easement across a paved area on private property, the water main shall be installed in the driving lanes (not under parking stalls).

Water mains may be laid along road/street curves by using bends. Pipe joint deflection may be allowed upon approval by the City Engineer but the deflection shall not exceed one half of the manufacturer's recommended deflection.

5-1.05 HORIZONTAL SEPARATION

Water mains shall be laid at least 10 feet horizontally from any existing or proposed sanitary sewer, storm drain, and septic tank and/or absorption field. The distance shall be measured edge to edge. If the City Engineer determines it is not practical to maintain a 10 foot separation, the City Engineer may approve deviation on a case-by-case basis using criteria from the Washington State Department of Ecology (DOE). Such deviation may include installation of the water main closer to a sanitary sewer provided that the water main is laid in a separate trench or on undisturbed earth shelf located on one side of the sanitary sewer at such an elevation that the bottom of the water main is at least 18

inches above the top of the sewer. Water service connections and side sewers shall have minimum horizontal clearance of 10 feet unless otherwise approved by the City Engineer.

Minimum horizontal clearances from water mains:

Utility	Minimum Horizontal Clearance in feet
Cable	5
Gas	5
Power	5
Telephone, Fiber Optic	5
Storm Drain	10
Sanitary Sewer	10
Septic Tanks/Drainfields	10

5-1.06 VERTICAL SEPARATION

Wherever practical, water mains shall cross other utilities at right angles. If this is not practical as determined by the City Engineer, the crossing angle shall be maintained between 45 and 90 degrees. Water mains crossing sanitary and storm sewers shall be laid to provide a minimum vertical clearance of 18 inches between the outside of the water main and the outside of the sewer. Where a water main crosses sanitary and storm sewers, one full length of water pipe shall be used with the pipe centered over the sewer for maximum joint separation. When the above conditions cannot be met and in accordance with applicable DOE criteria, the City Engineer may approve a variance, but shall require that the sewer be constructed of ductile iron pipe and be pressure tested before being activated, and/or be encased.

Minimum vertical clearances from water mains:

Utility	Minimum Vertical Clearance in feet
Cable	1
Gas	1
Power	1
Telephone, Fiber Optic	1
Storm Drain	1.5
Sanitary Sewer	1.5

When it is not practical to maintain this minimum separation between the water main and sanitary and storm sewers, the vertical clearance may be less than 6 inches and Ethafoam pads are required. The water main may also be encased per Section 5.1.11 Steel Casing.

5-1.07 SETBACK DISTANCE FROM BUILDINGS

Water mains shall be located a minimum of 5 feet from covered parking, 10 feet minimum from building and retaining walls. A 20 foot wide minimum easement shall be provided for a water main between buildings.

5-1.08 WATER MAIN SIZING

Transmission mains and specific areas outlined in the City's Water Comprehensive Plan require 12 inch or larger water mains.

When serving fire hydrants and for local distribution mains in residential areas, 8 inch or larger pipe is required.

6 inch pipe shall not be used as part of the distribution system except as fire hydrant runs not longer than 50 feet.

5-1.09 PIPE MATERIAL

Water mains shall be cement mortar lined ductile iron pipe (DIP) Class 52 unless otherwise approved by the City Engineer.

5-1.10 PIPE FITTINGS

Pipe shall be furnished with mechanical joints or rubber gasket push-on joints (Tyton joint only) unless flanged joints or restrained joints are required. Horizontal or vertical bends shall be used when joint deflection would exceed one-half of the pipe manufacturer's recommended maximum deflection. Restrained joints are required on all hydrant runs, steep slopes, non-bearing soils and in other conditions as determined necessary by the City Engineer.

5-1.11 STEEL CASING

Ductile iron pipe shall be encased in a steel casing when crossing: (1) under rockeries over 5 feet high; (2) under retaining wall footings over 5 feet wide; and (3) under reinforced earth retaining walls (both wall and reinforcing material). Casings shall extend a minimum of 5 feet past each edge of the structure, or a distance equal to the depth of pipe, whichever is greater. Minimum vertical clearance between the bottom of the wall or footing and top of the pipe or casing shall be 2 feet. The pipe trench at the casing shall be backfilled with gravel backfill material when the vertical clearance is less than 3 feet.

Ductile iron pipe shall be encased in a steel casing when crossing under a railroad or State/County highway. Casings and carrier pipe shall be installed in accordance with applicable other local, State, and/or Federal laws and/or regulations. In the case of

railroad crossings, the project shall also comply with regulations established by the railroad company.

The carrier pipe shall be supported by casing spacers. Casing spacers shall be placed under the carrier pipe to ensure approximate centering within the casing pipe and to prevent damage during installation. See Standard Plan 522.

Steel casings may also be required when water mains cross creeks or wetlands.

5-1.12 COVER DEPTH

A cover depth of 3 feet above the top of water mains shall be maintained if possible. The cover depth shall not be less than 3 feet or more than 5 feet without the approval of the City Engineer.

If the water main is within the State or County right-of-way, the cover depths shall be in accordance with the State or County requirements.

5-1.13 SLOPES

Where the longitudinal slopes are 20% or greater, all pipe joints shall be restrained. Anchor blocks shall be used in conjunction with joint restraint where slopes are 20% or greater. Timber baffle/hill holders shall be required on unpaved slopes that exceed 20%. Maximum spacing between the holders shall be 18-foot on center with a minimum of 1 holder for each pipe length.

5-1.14 POLYETHYLENE ENCASEMENT

The City Engineer may require that ductile iron pipe and fittings be protected by 8-mil polyethylene encasement in areas of severely corrosive soils or in accordance with AWWA/ANSI C105/A21.5.

5-1.15 CONCRETE BLOCKING

When using horizontal and vertical concrete blocking, show locations and type of blocking on the plans as shown on Standard Plans 505 and 506. Concrete blocking is required on all fittings including restrained joint fittings.

An 8 inch pipe at a vertical bend shall be restrained a minimum of 36 feet (2 joints) from each side of a bend. A 12 inch or larger pipe at a vertical bend shall be restrained a minimum of 54 feet (3 joints) from each side of a bend. No change in horizontal direction or diameter shall occur within 36 feet of the vertical bend. Special blocking or joint restraint designs may be required for poor soil, conflicting utility, etc.

5-1.16 ASBESTOS CONCRETE PIPE CROSSING

When a proposed water main crosses existing asbestos concrete (A.C.) pipe, the City shall require removal and replacement of the A.C. pipe with ductile iron pipe at the expense of the person or entity responsible for the water main project. The A.C. pipe removal and disposal shall be performed in accordance with all applicable Puget Sound Clean Air Agency (PSCAA) requirements, including but not limited to obtaining a permit from PSCAA for the removal work, and other applicable State and/or Federal laws and regulations. A permit from PSCAA to perform the A.C. pipe removal is required prior to construction drawing approval. Ductile iron pipe crossings shall be connected to the existing A.C. main with Romac extended range transition couplings.

5-1.17 VALVES

Sufficient valves shall be provided on water mains so that interrupted service and sanitary hazards will be minimized during repairs. Valves shall be located at no more than 300 foot intervals in commercial, industrial and multi-family areas and at no more than one block or 600 foot intervals in other areas. At water main intersections, valves shall be placed on 4 legs at each cross and 3 legs at each tee (unless tapping an existing water main). The valves shall be spaced so that no more than one fire hydrant is removed from service with any separate main shut down.

An auxiliary valve shall be installed on each hydrant run at the tee. A valve shall be installed on a water main at each end of an easement for the main. Additional valves may be required for area isolation and unidirectional flushing. Valves on water mains shall, where practical, be located within paved area of the street. A valve box or chamber shall be provided for every valve.

Generally valve sizes shall be the same as the water main. All valves 12 inch and smaller shall be resilient seated gate valves unless minimum cover cannot be achieved. If minimum cover cannot be achieved a butterfly valve shall be installed. All valves larger than 12 inch shall be butterfly type if approved by the City Engineer. When butterfly valves are installed, the operation nuts shall be on the north or east sides of the water mains. If a valve is installed in gravel or unpaved area, a concrete pad shall be set around each valve box at finished grade per Standard Plan 512.

5-1.18 FIRE HYDRANTS

Fire hydrants shall be installed for buildings where water is served by the City. The final number of hydrants and their locations shall be approved by the City Fire Marshal.

The maximum spacing of fire hydrants serving single-family dwellings or duplex dwellings on individual lots shall be 600 feet and not more than 300 feet from the front property line of the main body of a lot. Required distances shall be measured along the normal fire department hose laying route.

Fire hydrants serving multi-family and commercial lots shall be located not more than 300 feet on center and shall be located so that at least one hydrant is located within 150 feet of all structures or uses. Fire hydrants shall not be closer than 50 feet from multi-family or commercial buildings. On arterial streets without residential access, maximum hydrant spacing shall be 600 feet.

Any hydrant run exceeding 50 feet in length shall be 8 inches in diameter unless otherwise approved by the City Engineer. The joints of hydrant runs shall be restrained. No domestic or fire sprinkler service shall be tapped on any hydrant run. Fire hydrants shall be installed at the ends of each dead end line more than 300 feet in length. Said fire hydrants may be removed to conform to standard spacing requirements when the main is again extended with the City's approval. Hydrant valves shall be no more than one pipe length and no closer than three feet from the hydrant it serves. Fire hydrant installation is shown in Standard Plan 507.

5-1.19 COMBINATION AIR VACUUM RELIEF VALVES

Combination air vacuum relief valves as shown in Standard Plan 511 shall be installed on high points of new water mains where the elevation difference between the high point and the next low point exceeds one (1) pipe diameter, or as otherwise required by the City Engineer. The air valves shall be located outside the traveled portion of the roadway, preferably behind the curb or sidewalk and within the public right-of-way and the public utility easement. If possible, the water main profile shall be adjusted to eliminate the use of the air valves.

5-1.20 BLOW-OFFS

Each dead-end main shall be provided with a fire hydrant if flow and pressure are sufficient or with an approved flushing hydrant or a blow-off assembly shown in Standard Plan 510 for flushing purposes. Flushing devices shall be sized to provide flows that will give a velocity of at least 2.5 feet per second in the water main being flushed. No flushing device shall be directly connected to any sewer. Blow-off assemblies shall be located outside the traveled portion of the roadway, behind the curb or sidewalk, and within the public right-of-way or public utility easement.

A 2 inch blow-off assembly shall be required for testing and disinfection of new water mains, where hydrants are not available.

5-1.21 CONNECTION TO EXISTING SYSTEM

Connections to existing water mains 8 inches and larger shall be via a wet tap shown in Standard Plan 513 unless cut-in is required by the City Engineer in order to install additional valves. Connections to existing water mains smaller than 8 inch diameter shall be made by cutting in a tee, unless otherwise approved by the City Engineer.

5-1.22 EASEMENTS

All water mains, valves, fire hydrants, meters, sampling stations, air vacuum relief valves, blow-offs, and other appurtenances not in public right-of-way shall be within public utility easements designated on submitted plans to provide the City with permanent access to these mains and appurtenances, as well as easements for future line connections, as required. Unless otherwise approved by the City Engineer, the easement for the water mains shall be 20 feet in width and 10 feet on all sides of the pipe lines, a minimum of 5 feet on each side of fire hydrants and other appurtenances (such as meters, sampling stations, air/vacuum valves, blow-offs, etc). Easements shall be fully executed and recorded with the Snohomish County Auditor prior to project acceptance by the City. The form of easement documents shall be subject to the approval of the City Attorney. Easement drawings and legal description shall be included as exhibits to each easement.

If off-site easements are required on properties not owned by the party responsible for the project, the responsible party shall acquire the easements at his/her expense before construction plans will approved by the City Engineer.

5-1.23 SERVICE CONNECTIONS

Service connections, including saddle, service line, meter box and appurtenances, shall be installed as part of the construction of all new water system extensions. A fire sprinkler meter per City Standards shall be provided if required by the City Fire Marshal. All service connections must be protected by a Washington State Department of Health (DOH) approved backflow prevention assembly in accordance with WAC 246-290-490. See Standard Plans 501 through 504a.

For residential developments, meter boxes shall be located in front of the lot to be served unless otherwise approved by the City Engineer. Meter boxes shall be close to the property line, behind the sidewalk, in a landscape area within public right-of-way or public utility easement, but not in paved areas such as sidewalk or driveway. An easement shall be established and recorded for placement of the water service if the required location is outside of the right-of-way or established public utility easement. Meters for two neighboring lots shall be installed near the common lot line to ease meter reading. Meters located close to driveways shall use boxes with traffic rating. The distance from the water main to the meter box shall not exceed 50 feet unless otherwise approved by the City Engineer. Meters shall be located in or as close to the public right-of-way as possible. Service lines shall be perpendicular to the water main if possible. See Standard Plan 502 for single family services and 503 and 504 for multi-family or commercial.

For commercial and multi-family developments, meters shall be located behind the back of a curb or sidewalk and not behind parking space or other obstructions. Meters shall be located for ease of reading.

Minimum allowable service lines from mains to meters shall be 1 inch for a single family residential buildings and 2 inch for multi-family or commercial buildings. All duplexes,

triplexes and fourplexes must have separate services and meters for each unit. Multifamily buildings with five or more units must have separate services and meters for each building. Irrigation and fire sprinkler systems shall also be served by separate services and meters unless otherwise approved by the City Engineer. Each irrigation and fire sprinkler system shall be equipped with an approved backflow preventer. A minimum pressure of 30 psi at the meter shall be maintained when service is flowing at anticipated maximum flow rates. If friction losses will cause the pressure at the building to drop below the minimum, the service line size shall be increased to an appropriate size to maintain the required minimum pressure level.

The standard meter size is ⅝ inch x ¾ inch for a single family residential house. Non-residential services and meter sizes (minimum ⅝ inch x ¾ inch) shall be determined by the engineer or architect per the current Uniform Plumbing Code and subject to the approval of the City Building Official, and the plans shall show the locations and sizes of the services and meters.

Static service pressures at ground floor elevation shall be determined at all lots/buildings to ensure compliance with system pressure standards. Plans shall identify lots/buildings where the builder/owner will be required to install individual pressure reducing valve (PRV) when service pressures exceed 60 psi. A PRV shall be located on the customer side of the meter, outside of the public right of way, and a minimum of 3 feet from the water meter box.

5-1.24 EXISTING WATER MAIN ABANDONMENT

Existing water mains that are out of service shall be removed or abandoned as required by the City Engineer. If water mains are to be abandoned, the ends of the abandoned water mains shall be plugged by filling with Class 2500 concrete for a minimum length of 12 inches.

5-1.25 PRESSURE REDUCING STATIONS

If the proposed water project shall be located in two or more pressure zones, pressure reducing stations may be required by the City Engineer.

5-1.26 CROSS-CONNECTION CONTROL

The City strictly prohibits interconnection of other water supplies with the City's water system.

A backflow prevention device is required for all irrigation systems, fire sprinkler systems, commercial service connections and other water uses which may cause contamination of the City water system. Approved backflow prevention assemblies shall meet the requirements of the WAC 246-290-490 ("Cross Connection Control Regulation in Washington State"), and the recommendations of the PNWS-AWWA Cross Connection Control Manual and the City of Snohomish Cross Connection Control Program. The

types of backflow prevention devices to be used for a specific project shall be determined by the City's Cross Connection Specialist.

Fire sprinkler system connections to the City's water system shall be owned and maintained by the property owner, beginning immediately at the valve where the fire sprinkler system connects to the City's water main.

The backflow prevention assembly on fire sprinkler system connections shall be located as close to the serving water main as possible, either on the owner's property or in an easement.

5-1.27 PRIVATE WELLS

To receive water services from the City, the property owner shall either:

(1) decommission the existing well(s) in accordance with WAC 173-160-381. The owner shall provide a copy of the decommission report to the City Water Division.

OR

(2) physically separate all domestic water supply piping from well(s) piping and permanently cap all terminations so that the two systems cannot be intertied. A double check valve (DCV) assembly shall be installed at the water meter and annual DCV testing requirements shall be meet and reports submitted to the City's Water Division.

However, if the property is undergoing development such as, but not limited to, platting or subdivision, all well(s) shall be decommissioned in accordance with WAC 173-160-381 and a copy of the decommission report shall be delivered to the City Water Division.

5-2 MATERIAL

5-2.01 GENERAL

All materials shall be new and undamaged. The same manufacturer of each item shall be used throughout the work. All materials not specifically referenced shall comply with applicable sections of ANSI, ASTM, AWWA or the current WSDOT/APWA Standard Specifications and approved by the City Engineer.

When specific manufacturers or models are specified in these Standards, no substitutions will be allowed without prior approval by the City Engineer. If required by the City Engineer, the Contractor shall furnish certification from the manufacturer of the materials being supplied that the inspection and all of the specified tests have been made and the results thereof comply with the requirements of the reference Standards.

5-2.02 DUCTILE IRON PIPE

Ductile iron pipe shall be Class 52 (Tyton joint only) and cement mortar lined unless otherwise specified and shall conform to AWWA/ANSI C151/A21.51. Standard thickness of cement mortar lining shall be in accordance with AWWA/ANSI C104/A21.4.

5-2.03 HIGH DENSITY POLYETHYLENE PIPE

High density polyethylene (HDPE) pipe shall conform to AWWA C900.

5-2.04 WATER SERVICE PIPE

Water service pipe shall be Driscopipe CTS Class 200 Hi-Mol Poly pipe. Driscopipe shall conform to ASTM D-27370SDR9 (PE3408). CTS 110 SS liners for polypipe shall be used.

5-2.05 FITTINGS AND JOINTS

All fittings for ductile iron pipe shall be ductile iron compact (short body) fittings conforming to AWWA/ANSI C153/A21.53 and shall be cement mortar lined conforming to AWWA/ANSI C104/A21.4.

Joints shall be mechanical joints or rubber gasket push-on joints (Tyton joints only) unless flanged joints or restrained joints are required and shown in the plans. Pipe with push-on joints shall be suitable for use with mechanical joint fittings. Ductile iron pipe fittings shall have a pressure rating of 350 psi for push-on or mechanical joint fittings and 250 psi for flange joint fittings drilled in accordance with AWWA/ANSI C111/A21.11, unless otherwise noted.

Rubber gaskets for push-on joints (Tyton joint only) or mechanical joints shall be in accordance with AWWA/ANSI C111/A21.11. Gasket material for flanges shall be neoprene, Buna N, chlorinated butyl, or cloth inserted rubber.

5-2.06 RESTRAINED JOINTS

Where restrained joints are required, they shall be either bolted or boltless design, flexible after assembly, and can be disassembled without special tools. Any device utilizing round point set screws shall not be permitted. All couplings installed underground to connect ductile iron pipe shall be manufactured of ductile iron.

Restrained joints shall be Meg-A-Lug Series 1100, TR Flex, Grinnell 595 shackle clamp, or approved equal.

5-2.07 COUPLINGS

Flexible coupling and transition coupling cast components shall be ductile iron. Bolts and nuts shall be in accordance with ASTM A536-80, Grade 65-45-12. Bolts shall be high strength, low alloy steel track head bolts with national course rolled thread and heavy hex nuts. Gaskets shall meet AWWA/ANSI C111/A21.11 composition specifications.

5-2.08 BOLTS AND NUTS

Bolts, nuts and washers used for securing fittings shall be of similar materials. Steel bolts shall meet the requirements of ASTM A307 or ASTM F568 for carbon steel or ASTM F593 or ASTM F738 for stainless steel. Nuts shall meet the requirements of ASTM A563 for carbon steel or ASTM F594 or ASTM F836 for stainless steel. Iron bolts and nuts shall meet the requirements of ASTM A536, grade 65-45-12.

5-2.09 GATE VALVES

All gate valves shall be resilient seated gated valves conforming to the latest revision of AWWA C509 or C515. All gate valves shall be epoxy coated and turn counter clockwise to open. All gate valves shall have ANSI flanges or mechanical joints ends.

Buried gate valves shall be non-rising stem suitable for installation with the type and class of pipe being installed. Operating stems shall be equipped with standard 2 inch operation nut, and O-ring stem seals.

5-2.10 BUTTERFLY VALVES

Butterfly valves shall be used only when adequate cover cannot be achieved with gate valves.

5-2.11 VALVE MARKER POSTS

Valve marker posts shall be Carsonite blue plastic markers and labeled “WATER” or approved equal. See Standard Plan 509.

5-2.12 VALVE BOXES

Valve boxes shall be installed on all buried valves. Ears (lugs) on all valve boxes shall be placed in alignment with the pipe. The box and lid shall be cast iron, two piece slip type. The cover shall have the word “WATER” cast in the upper surface. Valve boxes, lids and extensions shall be East Jordan Ironworks deep style lid. All castings shall be coated with asphaltic varnish.

A valve operating nut extension shall be furnished and installed on all valves where the finished grade is more than 36 inches above the valve operating nut. Extensions are to be

a minimum of 12 inches long with only one extension per valve. The operating nut extension shall extend into the top section of the valve box. See Standard Plan 512.

5-2.13 VALVE VAULTS

Valve vaults shall be dimensioned and sized for valve removal and replacement. Vaults shall be furnished in pre-cast concrete sections with sufficient strength to withstand H-20 traffic loading together with access frames and covers.

5-2.14 COMBINATION AIR VALVES

Combination air valves shall be designed to operate with potable water under pressure to permit discharging a surge of air from an empty line when filling and relieve the vacuum when draining the system. The air valves shall also release an accumulation of air when the system is under pressure. This shall be accomplished in a single valve body designed to withstand a pressure of 300 psi.

The body and cover shall be cast iron conforming to ASTM A48, Class 30. Floats shall be stainless steel conforming to ASTM A 240 and designed to withstand 1,000 psi. Seats shall be Buna N rubber. Internal parts shall be stainless steel or bronze. Combination air valves shall conform to AWWA C512. Air valves shall have double concrete meter boxes Fogtite 2T with solid steel lid. See City of Snohomish Standard Plan 511.

5-2.15 BLOW-OFF ASSEMBLIES

Blow-off assemblies shall be as shown in Standard Plan 510.

5-2.16 FIRE HYDRANTS

Fire hydrants shall be 5 ¼ inch MVO "Traffic Model" type with approved breakaway features, and meet or exceed the requirements of AWWA C502 as well as have the following:

1) A standard 5 inch Storz pumper port and two 2½ inch NST side ports, all opening by turning counter clockwise with 1½ inch operating nut;

2) Be painted with two coats of hi-gloss equipment yellow enamel paint, with the distance from the foot valve stenciled on the hydrant; and

3) A 5 inch Storz adaptor.

Fire hydrants shall be M&H 929 Reliant, Mueller Super Centurion 250 only or AVK Series 2780 Nostalgic.

5-2.17 TAPPING SLEEVES

Tapping sleeves shall be used in lieu of cut-in tees except as otherwise approved by the City Engineer. Tapping sleeve valves shall be epoxy coated and resilient seat. Acceptable sleeves include:

Pipe Material	**Type of Tapping Sleeve**
Ductile Iron or Cast Iron Pipe	Epoxy Coated Fabricated Steel
Asbestos Cement	Fabricated Stainless Steel Full

5-2.18 SADDLES AND CORPORATION STOPS

Service saddles shall be ROMAC, Ford or equal and shall have stainless steel double straps. See Standard Plans 501 and 502.

Corporation stops shall be the ball valve type and shall be Ford or Mueller. Corporation stops for use with the saddle shall be of bronze in accordance with AWWA Standard C800 with AWWA IP inlet by compression outlet.

5-2.19 METER BOXES

Meter boxes used for meters, sampling stations, and blow-offs shall be high density polyethylene meter boxes with solid ductile iron hatches with 2 inch touch read hole manufactured by Mid States Plastics, Inc., or an equivalent as approved by the City Engineer. Refer to Standard Plans 501 and 502 for sizes and part numbers.

5-2.20 PRESSURE REDUCING STATION

Any pressure reducing station for a specific project shall be designed by a qualified, licensed engineer. The design shall be submitted to the City Engineer for approval. A typical pressure reducing station is shown in Standard Plan 520.

5-2.21 REDUCED PRESSURE BACKFLOW ASSEMBLY

All reduced pressure backflow assemblies (RPBA) shall be as listed on the most current edition of the "Approved Backflow Prevention Assemblies" published by DOH. The assembly shall include a tightly closing resilient seated shut-off valve on each end of the body and each assembly shall be fitted with four properly located resilient seated test cocks. The RPBA shall be installed in an above ground enclosure. The enclosure shall be Hot Box, or an equivalent as approved by the City Engineer. See Standard Plans 517 through 519.

5-2.22 DOUBLE CHECK VALVE ASSEMBLY

All double check valve assemblies (DCVA) shall be as listed on the most current edition of the "Washington State Approved Backflow Prevention Assemblies" published by DOH. The assembly shall include a tightly closing resilient seated shut-off valve on each end of the body and each assembly shall be fitted with four properly located resilient seated test cocks. See Standard Plans 514 through 516.

5-2.23 STEEL CASING

Steel casing shall be black steel pipe conforming to ASTM A53. Casing shall be as specified in Standard Plan 522.

5-2.24 CASING SPACERS AND END SEALS

Casing spacers and end seals shall be sized for pipe being installed and shall be manufactured by Advance Products & Systems, Cascade Waterworks, Pipeline Seal and Insulators Co., or an equivalent as approved by the City Engineer. See Standard Plan 522.

5-2.25 CONCRETE

Thrust blocking, encasement, or slope anchor concrete shall be mixed from materials acceptable to the City Engineer and shall have a 30-day compressive strength of not less than 2,500 psi. See Standard Plans 505 and 506.

The mix shall contain five (5) sacks of cement per cubic yard and shall be of such consistency that the slump is between 1 inch and 5 inches. All concrete shall be mechanically mixed.

5-2.26 BEDDING MATERIAL

Bedding material shall be as specified in Section 9-03.12(3) “Gravel backfill for Pipe Zone Bedding” of the WSDOT/APWA Standard Specifications. See Standard Plan 524.

5-2.27 CONTROLLED DENSITY FILL

Controlled Density Fill (CDF) shall be a mixture of Portland Cement, admixture (optional), FlyAsh, aggregates and water. It shall be proportioned to provide a grouty, non-segregating, free flowing, self-consolidating and excavatable material that will result in a non-settling fill which has measurable unconfined compressive strength.

Controlled Density Fill (CDF) shall conform to the requirements of Section 2-09.3(1)E of the current WSDOT/APWA Standard Specifications.

5-3 CONSTRUCTION STANDARDS

5-3.01 GENERAL REQUIREMENTS

All work shall be constructed as shown in the plans and in accordance with these Standards.

Materials shall be installed in compliance with the manufacturer's instructions and specifications, except where a higher quality of workmanship is required by the plans and these Standards.

All work shall also be done in accordance with all applicable Federal, State, County and other local laws and regulations. The Contractor shall arrange for inspection by these agencies and shall submit evidence of their approval if requested by the City.

5-3.02 MATERIAL SUBMITTALS

Material submittals shall be submitted to the City Engineer for approval after the plans are approved for construction.

Five (5) sets of material submittals are required. The City Engineer shall either approve or otherwise indicate the reasons for disapproval. Disapproved submittals shall be resubmitted to the City Engineer for approval.

The City Engineer's review of material submittals covers only general conformance to the plans and these Standards and not for quantity determination. No material quantities shall be verified by the City.

Each "Material Submittal" section shall follow a cover page and state the category of the materials that are submitted for review. Each submittal must have the specific part number(s) checked or highlighted along with its specific purpose. The following shows the preferred order to list the material categories:

1) Pipe, Fittings, Pipe Restraints and Casing.

2) Valves (Gate Valves, Air Valves, Blow-off, and Valve Boxes).

3) Hydrants and Attachments.

4) Service Fittings, Service Pipe, Saddles, Ball Valves, Corps, Sleeves, etc.

5) Boxes for Meters, Sampling Stations, Blow-offs, and Air Valve Assemblies.

6) Cross Connection Control Assemblies (DCDA, RPBA, RPDA, DCVA).

7) Bedding Material with Sieve Analysis.

8) Other items if required.

5-3.03 PRE-CONSTRUCTION CONFERENCE

The party responsible for the project shall contact the City Public Works Inspector (360-282-3193) to schedule a pre-construction conference after the plans, material submittals, grading, and right-of-way permits are approved. The conference shall include the party responsible for the project, design engineer, and contractor, representatives from the permit agencies, other utility companies, and City staff. An on-site tailgate meeting between the contractor and the Public Works Inspector shall be arranged by the contractor at least 48 hours prior to commencing construction.

5-3.04 CONSTRUCTION SCHEDULE

The party responsible for the work shall provide the City Engineer with the water system extension construction schedule a minimum of five (5) business days prior to start of water system extension construction to arrange staking inspection and to give permitting agencies and customers two (2) business days notice.

5-3.05 EASEMENT

Prior to start of water system extension construction, the party responsible for the project must acquire and record all necessary public utility easements for construction, installation and maintenance of any water mains or facilities not located in the public right-of-way, in City easements, or on the party's property.

5-3.06 PERMITS

The party responsible for a water system extension project shall obtain at their expense all necessary permits from the City and other appropriate State and Local agencies and entities. The party responsible for the work shall provide the traffic control plan prepared by themselves, the design engineer or the Contractor.

5-3.07 HANDLING OF PIPE

All types of pipe shall be handled in a manner that prevents damage to the pipe, pipe lining or coating. Pipe shall be bagged or plugged from the manufacturer or supplier before unloading at the site. Pipe and fittings shall be loaded and unloaded using forks or cable choker in a manner to avoid shock or damage, and under no circumstances shall they be dropped, skidded, or rolled against other pipe. Damaged pipe will be rejected, and all damaged pipe shall be placed apart from the undamaged pipe and shall be removed from the project site within 24 hours.

Pipe shall be stacked in such a manner as to prevent damage to the pipe, to prevent dirt and debris from entering the pipe, and to prevent any movement of the pipe. The bottom tiers of the stack shall be kept off the ground on timbers, rails or other similar supports. Pipe on succeeding tiers shall be alternated by bell and plain end. Timbers of 4"×4"

dimensions shall be placed between tiers and chocks shall be placed at each end to prevent movement. Each size of pipe shall be stacked separately.

Threaded pipe ends shall be protected by couplings or other means until the pipe is installed. Dirt or other foreign material shall be prevented from entering the pipe or pipe joints during handling and installation. When pipe installation is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the City Engineer to ensure cleanliness inside the pipe.

5-3.08 STAKING

Staking shall be performed by or under the direct supervision of a land surveyor licensed in the State of Washington. Two (2) business days notice shall be provided to the City to inspect construction staking before construction begins.

Staking shall be placed in 50 foot intervals and at all fittings on base line or edge of easement with stationing, hub elevations, and cuts to top of pipe.

5-3.09 DEVIATION FROM PLANS

No deviations from the approved plans and these Standards shall be allowed without the City Engineer's approval. Minor changes may be approved by the Public Works Inspector. If major changes are required, the design engineer shall revise, sign and submit the plans for the City Engineer's approval prior to restart of construction.

5-3.10 INSPECTION AND TESTING

The City Public Works Inspector shall have access to the project site for the purpose of inspections and testing at all times. Proper facilities shall be provided for such access, inspection, and testing.

If any work is covered without approval or consent of the City Public Works Inspector, it must be uncovered for inspection if required by the City Public Works Inspector.

Before a pressure test is to be observed by the City Public Works Inspector, the party responsible for the work shall make whatever preliminary tests are necessary to ensure that the material and/or equipment are in accordance with the plans and these Standards. Written and/or verbal notices of deficiency shall be given to the party responsible for the work. The party responsible for the work shall correct such deficiencies before final project inspection by the City Public Works Inspector.

5-3.11 WATER QUALITY

Water pollution controls shall be implemented and maintained until the project is accepted by the City Engineer. The party responsible for the project shall familiarize

themselves with the requirements of DOE and other regulatory agencies having jurisdiction over such matters.

Water with chlorine residual must be dechlorinated using City-approved means and discharged into the environment when the water has zero chlorine residual. Dechlorinated water discharged into the environment shall be done so without causing erosion or impact to the environment. With the approval of the City Engineer, water with chlorine residual may be discharged into the City's sanitary sewer system. Water containing chlorine residual shall not be discharged into the storm drainage system or any waterway.

The oil and chemical storage site for the project shall be approved by the City Engineer and the area shall be diked. There shall be no disposal of waste oil or oil products on the project site. A waste oil disposal tank shall be provided if deemed necessary by the City Engineer.

5-3.12 CONSTRUCTION ON EXISTING EASEMENTS

All work within public utility easements shall be performed in accordance with terms and conditions of the respective easement. Each easement area shall be restored to equal to or better than the condition of the easement area that existed prior to the work. Work shall not be performed within any public utility easement area unless such work is specifically authorized by the City Engineer. The party responsible for the project shall provide advance written notification to and shall coordinate the authorized work with the persons and/or entities owning property that is adjacent to the easement area.

5-3.13 PRE-CONSTRUCTION PHOTOS

Prior to commencement of work, photographs shall be provided to the City that clearly show the conditions of the project site immediately before the anticipated start of the work. Photographs will be obtained as follows:

1) 50 foot interval in easements up station and down station.

2) Any other locations as directed by the Public Works Inspector.

The photographs shall be 4 inch x 6 inch, color prints, contained in albums, catalogued, and cross-referenced. A digital copy of each photograph shall also be provided to the City Engineer.

5-3.14 UNDERGROUND UTILITIES

The plans shall show the approximate locations of various existing utilities known to the design engineer such as gas lines, water mains, storm drainage, power lines, telephone lines, TV cables, fiber optics, and other obstructions based on information obtained from various sources. The party responsible for the project is responsible to check for interferences and obstructions by inquiry from the different utilities and by underground exploration before commencing excavation.

The party responsible for the project shall request field locating and notify the owners of underground utilities about the scheduled commencement of excavation through the one-call system (1-800-424-5555).

Notice shall be made to owners of underground utilities not less than two (2) business days or more than ten (10) business days prior to scheduled date of commencement of excavation. Test pits, for the purpose of locating underground utilities or structures in advance of the construction, shall be excavated and backfilled. Test pits shall be backfilled immediately after their purpose has been satisfied and the surface restored and maintained in a manner satisfactory to the City or applicable agency.

Excavation around and under active utilities shall be performed with special care to ensure that utility service is not interrupted. Where it is necessary to cut, move or reconnect any service lines, arrangements shall be made with the respective utility owners.

The party responsible for the work shall coordinate with all utility owners and arrange for the movement or adjustment, either temporary or permanent, of utility conflicts and shall also notify the City, in advance, of any conflicts affecting the work.

The party responsible for the project shall indemnify, defend and hold harmless the City from any claim for damage of utilities and/or disruption to services resulting from project activities/operations. The form of the indemnification agreement shall be subject to the approval of the City Attorney.

5-3.15 TRENCH EXCAVATION

Trench excavation and backfill operations within State right-of-way: All excavation and backfill within the State right-of-way shall adhere to the current *WSDOT/APWA Standard Specifications*.

Trench excavation and backfill operations within County right-of-way: Excavation within Snohomish County right-of-way shall conform first to Snohomish County Road Standards, and secondly to current *WSDOT/APWA Standard Specifications*.

Trench excavation and backfill operations within City right-of-way: Excavation within the City right-of-way shall conform to these Standards.

Clearing and grubbing limits may be established by the City or governing agency for certain areas. Debris resulting from the clearing and grubbing shall be appropriately disposed of in accordance with applicable local and State laws and regulations.

Trenches shall be excavated to the line and grade shown in the plans or as designated by the City Engineer. Higher pressure class pipe or special bedding may be required because of excess trench width.

Unsuitable material below the depth of the bedding shall be removed to the extent approved by the Public Works Inspector and replaced with materials approved by the City Engineer.

The length of trench excavation in advance of pipe laying shall be kept to a minimum and shall not exceed more than 100 feet without prior written approval of the City Engineer.

When trenching operations take place in public right-of-way, the pavement and all other improvements shall be restored as required by the right-of-way permit.

When excavation of rock is encountered, all rock shall be removed to provide a clearance below and on each side of all pipe, valves, and fittings of at least 6 inches for pipe sizes 24 inches or smaller and 9 inches for pipe sizes 30 inches and larger. Material removed shall be replaced with appropriate backfill material, which shall be compacted to 95% standard proctor. See Standard Plan 525.

5-3.16 SHEETING AND SHORING

Sheeting and shoring shall be provided and installed as necessary to protect workers, the work and existing utilities and other properties in compliance with OSHA and WISHA requirements. All sheeting and shoring above the pipe shall be removed prior to backfilling. Sheeting below the top of the pipe may be cut off and left in place. Removal of the sheeting and shoring shall be accomplished in such a manner that there will be no damage to the work or to other properties.

5-3.17 TRENCH DEWATERING

Sufficient pumping equipment shall be provided and maintained on the project site to keep the trench free from standing water. Surface runoff shall not be allowed to flow into the trench. The trench water or other deleterious materials shall not be allowed to enter the pipe at any time. If water is found to be entering the new water main at any time, the water main shall be plugged and all work shall stop until the trench water is completely pumped out or otherwise controlled to the satisfaction of the Public Works Inspector. Any dewatering method used shall be in accordance with the specifications and requirements of the City and DOE.

5-3.18 PIPE BEDDING

Bedding material, when required by the City, shall be as specified in these Standards and the current WSDOT/APWA Standard Specifications. For the type of pipe (rigid or flexible) to be installed, pipe zone bedding is defined as 6 inches below the pipe and around the pipe, and 12 inches above the pipe. Native material may be used for bedding of ductile iron pipe if judged to be suitable by the City Engineer. Gravel backfill for pipe zone bedding shall be select granular material free from wood waste, organic material, and other extraneous or objectionable materials and shall have a maximum dimension of 1½ inches. Pipe zone bedding up to 12 inches over the top of the pipe shall be evenly

and carefully placed. Gravel backfill for pipe zone bedding shall be compacted to 95% maximum dry density per ASTM D1557 by approved methods (hand-held tools), so as to provide firm and uniform support for the full length of the pipe, valves, and fittings. See Standard Plan 524.

5-3.19 CONCRETE THRUST BLOCKING

Bends, tees, plugs, reducers, and caps, unless otherwise specified, shall be blocked in accordance with Standard Plans 505 and 506. All poured in place blocking shall have a minimum measurement of twelve inches 12 inches between the pipe and the undisturbed soil. Concrete blocking shall have a minimum of ¼ square foot bearing against the fitting. Blocking shall be adequate to withstand full test pressure as well as to continuously withstand operating pressure under all conditions of service. All concrete shall be 2,500 psi minimum and mechanically mixed.

Blocking shall, unless otherwise shown or directed, be placed so that pipe and fittings will be accessible for repair. Eight-mil polyethylene sheets shall be installed around all fittings and all bolts, nuts, and glands for future dismantling.

In the event of a shut down where time does not permit the proper setting of the concrete blocking, ecology blocks shall be installed with concrete poured around the connection point of the fitting and the blocks with the approval of the Public Works Inspector.

5-3.20 TRENCH BACKFILL AND COMPACTION

Trench backfill shall be done above the pipe zone bedding. All backfill material shall be free from cinders, ashes, refuse, vegetable or organic material, boulders, rocks or stones, frozen soil, or other unsuitable material. Trench backfill material shall be as specified in these Standards and the current WSDOT/APWA Standard Specifications.

Compaction of the backfill shall, at the minimum, be accomplished by mechanical tamper, by vibrating, by rolling, or by a combination of these methods, as approved by the City Engineer. Water settling is not permitted. A testing laboratory acceptable to the City Engineer shall be used to perform on-site density tests to show that the specified density has been obtained. The approval of the compaction method and the achievement of the specified density shall in no way relieve the Contractor of responsibility for all repairs caused by settlement of the backfill prior to acceptance and during the two year period after acceptance of the project.

Prior to backfilling, form lumber and debris shall be removed from the trench. Sheeting used by the Contractor shall be removed just ahead of the backfilling. Backfill shall not be deposited in the trench in any manner which will damage or disturb the pipe or the initial backfill. Care shall be taken to prevent any damage to the pipe or its protective coating. After the initial backfill is placed, the remaining backfill material shall be placed in successive layers not exceeding 1 foot, (12 inches) in loose thickness, and each layer shall be compacted to the density specified below.

Asphalt pavement restoration shall either be by a patch or overlay method as required and noted on the right-of-way permit. When a patch method is used, the trench limits shall be saw cut prior to the final patch.

All pavement cuts shall be made by saw cuts. The saw cuts shall be 1 foot outside the trench width. If the permit requires an overlay, then the Contractor may use a jackhammer for cutting the existing pavement. Grinding may be required.

All trenching shall be backfilled in accordance with Standard Plan 525. All trench backfill materials shall be compacted to 95% maximum dry density, as determined by ASTM D1557.

Native material may be used for backfill upon approval of the City Engineer or the permitting agency.

When the trench is perpendicular to the traveled lane or any driveways, the full depth shall be backfilled with crushed surfacing top course material. When the trench is parallel, the top 4 feet must be backfilled with crushed surfacing top course material. Controlled Density Fill (CDF) may be required by the City Engineer or the permitting agency.

Backfill compaction shall be performed in 8 to 12 inch lifts. Compaction tests shall be performed in 4 foot vertical increments maximum. The test results shall be given to the City Engineer for review and approval prior to paving. Tests shall be performed at maximum intervals of 50 feet along the length of the trench.

If the area is unpaved and not subject to vehicle traffic, the backfill shall be compacted to a minimum of 90% of maximum dry density as determined by ASTM D-1557.

5-3.21 LAYING DUCTILE IRON PIPE

Work shall be accomplished in accordance with AWWA C600 and the manufacturer's recommendations.

Depths of pipe shall conform to approved plans. The typical cover depth of pipe is 36 inches measured from finished grade to top of pipe.

The bottom of the trench shall be finished to grade in such a manner that the pipe will have bearing along the entire length of the barrel. Bolts on mechanical pipe and fittings shall be tightened uniformly with a "Torque" wrench which measures the torque for mechanical joints as follows:

2 inch to 3 inch pipe sizes ⅝ inch bolts 40 to 60 foot pounds

4 inch to 24 inch pipe size ¾ inch bolts 60 to 90 foot pounds

Except where restrained joint systems are required, mechanical or push-on Tyton joints shall be used. Installation of push-on joint pipe shall be in accordance with the manufacturer's instructions.

When it is necessary to deflect pipe from a straight line in either the horizontal or the vertical plane, the amount of joint deflection shall not exceed one half (½) of the maximum deflection recommended by the pipe manufacturer. The pipe manufacturer's joint deflection recommendations shall be provided to the City Engineer prior to pipe installation as a part of the Material Submittals.

Where field conditions require deflection or curves not anticipated on the plans, an appropriate plan revision shall be prepared by the design engineer and submitted to the City Engineer for approval.

Whenever it becomes necessary to cut a length of pipe, the cut shall be done in conformance with all safety recommendations of the cutting equipment manufacturer. Cutting shall be done in a safe manner without creating damage to the pipe or cement mortar lining. The cut shall be made by an abrasive pipe saw or an approved pipe cutter.

The outside of slip joint pipes shall be beveled and smoothed so that good connections can be made without gasket damage.

All parts of the pipe ends, couplings, fittings and appurtenances shall be cleaned to remove oil, grit, or other foreign matters from the joints. Care shall be taken to keep the joints from contacting the soil.

5-3.22 POLYETHYLENE ENCASEMENT

Installation of polyethylene encasement shall be in accordance with the latest AWWA Standard C105. All ductile iron pipe and fittings installed in highly corrosive soils shall be wrapped in a manner approved by the City Engineer except as specifically excluded in the approved plans or in these Standards.

5-3.23 FIRE HYDRANT INSTALLATION

Fire hydrants shall be set as shown in Standard Plans 507 through 509 and AWWA Standard C600. The portion of the hydrants above the ground shall be painted with 2 coats of high gloss equipment yellow paint. The entire hydrant run shall be restrained joint.

All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the curb or at the City Fire Marshall's discretion, with pumper nozzle facing the curb. Hydrants shall be set to the established grade. Hydrants shall be installed so that the breakaway flange is 2" to 6" inches above finished grade per Standard Plan 507.

When a dry barrel hydrant is set, drainage shall be provided at the base of the hydrant by placing 1½ inches of washed drain rock from the bottom of the trench to at least 12 inches above the drain port opening in the hydrant and to a distance of 2 foot around the elbow. Fire hydrants shall not be located within 10 feet horizontally of a sanitary sewer main or side sewer.

When a hydrant is installed in an unpaved area, a concrete fire hydrant pad shall be installer per Standard Plan 508.

Additional information regarding placement of hydrants can be found in AWWA Manual M17.

When fire hydrants are located in parking lots, or other areas where vehicles may have access, hydrant guard posts shall be installed. Guard posts shall be installed according to the minimum dimensions shown in Standard Plan 509.

Reflective pavement markers for fire hydrants are required.

5-3.24 VALVE INSTALLATION

Prior to installation, valves shall be inspected for approved part/manufacturer's numbers; cleanliness of valve ports, especially seating surfaces, handling damage, and cracks.

When butterfly valves are installed, the operation nuts must be on the north or east sides of the water mains or as directed by the Public Works Inspector.

The valve and valve box shall be set plumb and centered on the valve. Valves 12 inches or larger shall be supported by a concrete block (16 inches x 16 inches x 4 inch solid concrete) on a sufficiently tamped trench bottom so that the pipe will not be required to support the weight of the valve. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.

Valves shall be installed in the closed position. Where the valve operating nut is more than 3 feet below finished grade, a valve stem extension conforming to the Standard Plans must be installed. See Standard Plan 512. Tapping valves shall be water tested prior to tapping water main.

A valve box or vault shall be provided for every valve. Valve box top sections shall be adjusted flush with the finished pavement, and in those areas to be excavated for future roadway grades, enough adjustment shall be provided in the valve box to allow the top of the box to be adjusted to the required grade.

Backfill around valves shall be carefully tamped in 6 inch lifts for the full depth of the trench with the valve box in place. A minimum of 2 feet x 2 feet x 4 inch concrete pad shall be provided for a single valve box and a minimum of 4 feet x 4 feet x 4 inch concrete

pad shall be provided for multiple valve boxes installed in gravel or unpaved areas as shown in Standard Plan 512.

5-3.25 COMBINATION AIR AND VACUUM RELEASE VALVE

Location of the air/vac shown in the plans is approximate. Air valves shall be set at the high points of the water main. The water main profile may need adjustment so that the high point and air/vacuum valve is installed in a convenient location with the Public Works Inspector's approval. Installation shall be as shown in Standard Plan 511.

5-3.26 BLOW-OFF ASSEMBLIES

Blow-off assemblies shall be installed as shown in Standard Plan 510. A valve marker post shall be installed when the gate valve is installed in unpaved area or as directed by the Public Works Inspector.

5-3.27 VALVE MARKER INSTALLATION

Marker posts shall be set for all valves located in unpaved areas and as directed by the City Engineer except auxiliary hydrant valves. Installation shall be as shown in Standard Plan 509.

5-3.28 SERVICE LINES

New Service Installations

Generally, corporation stops are located at ten o'clock or two o'clock positions on the circumference of the pipe. Taps shall be accomplished by saddle tap only. No direct taps shall be allowed. Taps shall be installed with double strap stainless steel saddles. When more than one tap in an existing cast iron pipe is necessary to deliver the required flow, the taps should be staggered around the circumference at least 12 inches apart (not in line). The service line shall be pressure tested before placing in service. Service installation shall be as shown in Standard Plans 501 through 504a.

Reconnecting Existing Services

Service connections shall be installed as shown in the approved plans and Standard Plans. Service lines shall be installed in paved areas by boring, and under sidewalks and curbs by boring and tunneling. Damages shall be repaired by the Contractor. A 30 inch minimum cover shall be provided on service lines. Service lines shall be installed 90 degrees horizontally to the main to intercept the existing meters. Installed service lines shall be flushed prior to connection to the meter.

Angle ball meter valves, check valves and setters (if required) and boxes shall be installed as shown in the Standard Plans or as directed by the City Engineer.

Existing service connections shall not be transferred to the new mainline until the new mainline has been successfully flushed, disinfected, tested and approved by the Public Works Inspector. When transferring services from the existing mainline to the new mainline, sanitary precautions shall be taken as necessary to protect the potable water supply in both the existing and new mains.

5-3.29 PRESSURE REDUCING STATION

Pressure reducing stations shall be installed as shown in Standard Plan 520, in approved plans, and in accordance with the manufacturer's recommendations. The pressure reducing valves, strainers, pressure relief, pipe and fittings shall be constructed in accordance with the applicable AWWA and Uniform Plumbing Code requirements. Pressure reducing valves 6 inches or larger shall be supported by pipe supports. Supports shall be bolted to the vault floor.

Pressure relief discharge pipe shall be placed in a location that will not be subject to damage or erosion during discharge of water. The pressure reducing valve manufacturer's representative(s) shall be present during the start up of the pressure reducing station.

5-3.30 CONNECTION TO EXISTING WATER MAIN

Points of connection to existing water mains shall be exposed prior to trenching of the new mains, and not less than 48 hours prior to the anticipated connection time. Unless specifically provided for elsewhere in these Standards, at least five (5) business days notice shall be given to the City Engineer prior to the anticipated connection time. The City Engineer shall be responsible for notifying the City Fire Chief and customers affected by the shut-off. Water main shut-off shall not be scheduled to take place on Fridays, or on the day before a holiday, unless otherwise approved by the City Engineer.

The party responsible for the project shall ensure that existing fittings are in accordance with the approved plans and that the connection will be made in accordance with the plans. If the connection cannot be made in accordance with the plans, the City Engineer shall be so notified. The design engineer shall submit revised plans that provide appropriate connection to the City Engineer for approval.

Connection to the existing water system shall be done only after the new mains are flushed and have passed pressure and purity tests. All connections to the existing water system must be approved by the City Engineer and shall be made in the presence of the City Public Works Inspector. Only authorized City representatives shall operate the valves in the existing water system.

Connections to existing water system may be made under pressure with a tapping machine by determining the size and type of pipe and installing a tapping tee with a tapping gate valve. Tapping tees shall be installed as shown in Standard Plan 513. Work shall not start until all materials, equipment, and labor are ready. The tapping tee and

valve shall be installed in a horizontal position so that the valve stem is vertical. Where cut-ins are required in existing pipes, the work shall be conducted so as to minimize the interruption of service. Necessary pipe, fittings and gate valves shall be assembled at the site ready for installation prior to the shut-off of water in the existing main. Once the water main has been shut off, the work shall be promptly completed and shall not be halted until the water main is back in service.

The interiors of all pipe and fittings, particularly couplings and sleeves, to be used in final cut-in connection shall be swabbed or sprayed with a 200 mg/L hypochlorite solution prior to installation.

Flushing shall start as soon as repairs or connections are completed and shall be continued until discolored water is eliminated. Flushing shall be done in the presence of the City Water Quality Control Specialist.

5-3.31 SCHEDULE OF TESTS

The Public Works Inspector and the Water Quality Control Specialist shall be notified at least two (2) business days before a section of water main is ready for inspection and test. The Water Quality Control Specialist shall inspect and observe the hydrostatic test. The City Engineer shall be notified at least two (2) business days prior to purity test and flushing. The party responsible for the project shall be present at the project site when the Water Quality Control Specialist takes water samples. Sufficient manpower and resources shall be provided by the responsible party to accomplish the work in a timely manner. Flushing shall be done under direct supervision of the Water Quality Control Specialist.

5-3.32 HYDROSTATIC PRESSURE TESTS

Water main, appurtenances and service connections shall be tested in sections of convenient lengths under a hydrostatic pressure of 220 psi for 15 minutes.

Pumps, gauges, plugs, saddles, corporation stops, miscellaneous hose, piping, and measuring equipment necessary for performing the test shall be furnished and operated by the party responsible for the project.

Sections to be tested shall normally be limited to a maximum of 1,000 feet. The pipe shall be backfilled sufficiently to prevent movement of the pipe under pressure. Thrust blocking shall be in place for an adequate time for concrete to cure before testing. Where permanent blocking is not required, temporary blocking shall be furnished and installed prior to and removed after testing.

An approved double check valve assembly (DCVA) shall be provided to fill the new water mains for testing and flushing. The new water mains shall be filled and remain under 200 psi to 210 psi pressure for 24 to 48 hours to allow air to escape and the lining of the pipe to absorb water.

The pressure test shall be accomplished by pumping the main up to 200 psi to 210 psi, stopping the pump for 15 minutes, and pumping the main up to the test pressure again. During the test, the section being tested shall be observed to detect any visible leakage.

A clean container shall be used for holding water for pumping up pressure on the main being tested.

The quantity of water required to restore the pressure shall be accurately determined by pumping through a positive displacement water meter. The meter shall be approved by the City Water Quality Control Specialist. Acceptability of the test will be determined as follows: The quantity of water lost from the main shall not exceed the number of gallons per hour as determined by the formula:

$$L = \frac{SD\sqrt{P}}{266{,}400}$$

in which,

L	=	allowable leakage (gallons/hour)
D	=	nominal diameter of the pipe (inches)
P	=	test pressure during the leakage test (psi)
S	=	gross length of pipe tested (feet)

There shall not be an appreciable or abrupt loss in pressure during the 15 minute test period. Any visible leakage shall be corrected regardless of the allowable leakage specified above. Should the tested section fail to meet the pressure test successfully as specified, the defects shall be located and repaired and the pipeline retested.

Tests shall be made with the hydrant auxiliary gate valves open and the hydrant valve in the closed position. Once the new line is successfully tested, each valve shall be tested by closing each in turn and relieving the pressure behind it. The mains shall be tested between valves. As possible, no hydrostatic pressure shall be placed against the opposite side of the valve being tested. This test of the valve will be acceptable if there is no immediate loss of pressure on the gauge when the pressure comes against the valve being checked. The pressure differential across the valve shall not exceed the rated working pressure of the valve.

All service lines shall be flushed prior to contacting the Water Quality Control Specialist for a pressure test. All necessary equipment shall be ready and available for set up but not connected until the Water Quality Control Specialist is present for operation.

Defective materials or workmanship discovered as a result of hydrostatic field test shall be replaced or repaired and the hydrostatic test shall be repeated to the satisfaction of the City Engineer.

5-3.33 DISINFECTION AND FLUSHING OF WATER MAINS

Before being placed into service, new water mains and repaired portions of existing mains shall be chlorinated and a satisfactory bacteriological report obtained. Disinfection of water mains shall be accomplished in accordance with the requirements of the Washington State Department of Health, AWWA Standard C651, and in a manner satisfactory to the

City Engineer. Sections shall be disinfected between adjacent valves unless otherwise approved by the City Engineer. All filling and flushing shall be done through a meter with a DCVA provided by the party responsible for the project. Valves shall only be operated by authorized City employees.

Flushing

Where dry calcium hypochlorite is used for disinfection of the pipe, flushing shall be done after disinfection. If a hydrant is not installed at the end of the water main, the Contractor shall provide a tap large enough to develop a flow velocity of at least 2.5 feet per second in the water main.

The flushing period must be approved by the City Engineer. The source water used for disinfection and pressure testing shall be flushed prior to its use to ensure that contaminants or debris are not introduced into the new pipe.

Taps for temporary or permanent release of air, chlorination or flushing purposes shall be provided as a part of the construction of the water mains.

Chlorination

The section to be tested shall be chlorinated so that a chlorine residual of no less than 25 mg/l (parts per million or ppm) remains in the water after standing 24 hours in the pipe. The initial chlorine content of the water shall not be less than 50 mg/l. The forms of chlorine that may be used in the disinfection operations are liquid chlorine and calcium hypochlorite granules.

Liquid Chlorine: Chlorine shall be applied by solution fed at one end of the section with a valve or hydrant at the opposite end open sufficiently to permit a flow through during chlorine application. The chlorine solution shall be fed into the pipeline already mixed by an automatically proportioning applicator to provide a steady application rate no less than 50 mg/l (ppm) chlorine. Hydrants along the chlorinated section shall be open during application until the presence of chlorine has definitely been detected in each hydrant run. When a chlorine concentration of no less than 50 ppm has been established throughout the line, the valves shall be closed and the line left undisturbed for 24 hours.

Dry Calcium Hypochlorite: Calcium hypochlorite conforming to AWWA B300 is available in granular tablet form and must contain approximately 65% available chlorine by weight. This procedure is allowed only when the extension has been kept clean and dry. If piping has been submerged, or is unclean, refer to AWWA Standard C651.

Granulated chlorine: Dry calcium hypochlorite at 65% - 70% chlorine shall be placed in the pipe to yield a dosage no less than 50 mg/l. The number of ounces of 65% test calcium hypochlorite required for a 20 foot length of pipe equals 0.00843ld, in which "D" is the diameter in inches (see current WSDOT Standards and Specifications). The main shall be filled with water at a rate to ensure that the water within the main will flow at a

velocity no greater than 1 foot per second. Precautions shall be taken to ensure that air pockets are eliminated. When a chlorine concentration of not less than 50 ppm has been established throughout the line, the valves shall be closed and the line left undisturbed for 24 hours. If the water temperature is less than 41 degrees F, the water shall remain in the pipe for at least 48 hours.

After chlorination in accordance with the above, the line shall be thoroughly flushed and water samples taken. Flushing shall be done in a manner that avoids damage to surrounding property and that conforms to these Standards.

5-3.34 FINAL FLUSHING AND TESTING

Following chlorination, chlorinated water shall be flushed from the new water main until the replacement water throughout its length shows an absence of chlorine. In the event chlorine is normally used in the source of supply, the tests shall show a residual not in excess of that normally carried in the water supply system (never to exceed 2 mg/l).

After final flushing and before the new water main is connected to the distribution system, a sample collection test shall be scheduled with the City Engineer a minimum of two (2) business days in advance of test. The number of samples from the source and the number of representative sample points required will be determined by the Water Quality Control Specialist. Appropriate sample taps shall be furnished by the party responsible for the project. No hose or fire hydrant shall be used in the collection of samples.

At least one set of samples shall be collected from every 1,200 feet of the new water main, plus one set from the end of the line and at least one set from each branch. All samples shall be tested for total coliform bacteria and for heterotrophic bacteria by the heterotrophic plate count (HPC) analysis. The maximum allowable coliform content of the flushed sample shall be zero. The maximum allowable HPC population count in all source samples shall be 80/ml. Any source sample that exceeds a count of 80/ml shall be ruled as an indeterminate test and a new set of source and construction samples for analysis shall be required. The maximum allowable HPC population count from any construction sample shall be no greater than twenty (20) counts above the highest source HPC population count.

Before placing the lines into service, a satisfactory report shall be provided to the Water Quality Control Specialist from the certified laboratory evidencing successful tests on samples collected from representative points in the system extension.

Should the initial test result in an unsatisfactory bacteriological test, additional chlorination using the above procedure shall be repeated until satisfactory results are obtained. Treated water flushed from the mains shall be disposed of in accordance with applicable State and local laws and regulations.

Chlorinated water shall never be flushed into the storm drain or a body of water. This includes lakes, rivers, streams, stormwater drainage systems, and any waters where fish or other natural aquatic life can be expected to be present.

5-3.35 ADJUST EXISTING STRUCTURE TO GRADE

Existing Structure Adjustment

Existing structures, including valve box covers affected by a pavement overlay, or adjustment in surface grade, shall normally be adjusted to grade within three (3) business days after the pavement overlay. The City Engineer may require immediate adjustment if the structure is critical to operations.

Valve Box Adjustment in Paved Areas

Raising the existing valve box shall be accomplished by adjusting the existing top section of the valve box or replacing the valve box. If the valve box base section needs to be extended, a 4 inch diameter cast iron soil pipe shall be installed with the bell end of the soil pipe inserted over the top of the existing valve box base section. The spigot end of the soil pipe shall be located a minimum of 6 inches and a maximum of 9 inches below finished grade. The valve box top section shall be slipped over the soil pipe and adjusted to the final grade. A polyethylene sheet, 8-mil thick, shall be placed between the valve box and soil pipe to prevent metal to metal contact where the sections overlap. In asphalt concrete pavement and overlay areas, excavation of the valve box to be raised shall be accomplished by saw cutting or neat line jack hammering the pavement a minimum of 12 inches around the perimeter of the valve box. The final adjustment of valve boxes shall be done within 24 hours after paving. Paving, repaving, and patching shall be completed within 72 hours.

Valve Box Adjustment in Unimproved Areas

Adjustment of valve box covers located in unpaved areas shall be the same as in paved areas.

5-3.36 ABANDONING FACILITIES

Abandonment of Water Main

Water mains no longer in service shall be removed and disposed of by the party responsible for the project. The water main may be abandoned in place with the approval of the City Engineer. When water mains are abandoned, the ends of the pipe and fittings shall be plugged by filling with Class 2500 concrete a minimum length of 12 inches on each pipe end. The City Engineer may require that the abandoned water mains be filled with sand or cement grout depending on the size, material, and location of the water main.

Removal of Service Lines

Service lines that are no longer in service and associated corporate stops shall be removed and disposed of by the party responsible for the project. Saddles shall be plugged with MIPT brass plugs.

Abandonment of Structures

Abandonment of structures shall be completed only after water facilities have been properly removed and/or abandoned. All valves and valve boxes shall be removed on abandoned valves.

5-3.37 LANDSCAPING AND LAWN REMOVAL AND REPLACEMENT

During the construction and installation of a water distribution system, the party responsible for the project shall minimize the disturbance and damage to any landscaping and lawn within the project area and shall restore the landscaping and lawn area to conditions prior to construction and installation.

5-3.38 BORING UNDER ROOTS

Boring under the root systems of trees that cannot be removed shall be accomplished by excavating a trench or pit on each side of the tree, being careful to avoid root injury, and then hand digging or pushing the pipe through the soil under the tree. The pit walls shall be a minimum of 7 feet from the center of the tree and shall have sufficient depth to lay the pipe at the grade shown on the plan and profile. Trees shall be removed unless otherwise directed by the City Engineer.

5-3.39 BORING AND JACKING

The vertical and horizontal location of existing utilities shall be verified by the party responsible for the project. If required to avoid conflicts and maintain minimum clearances, adjustment shall be made to the grade of the casing.

The pipe shall be bored and jacked where shown on the plans. All obstructions encountered shall be removed or penetrated. If groundwater is found to be a problem during boring operations, all necessary measures shall be taken to control the flow sufficiently to protect the excavation, pipe and equipment so that the work is not impaired. Any pipe damaged during the boring and jacking operation shall be repaired in a manner approved by the City Engineer.

The installation of the bored and jacked pipe shall be done in manner to ensure that no settlement or caving is caused to the above surface. Any such caving caused by the placement of the pipe shall be repaired by the party responsible for the project as directed by the City Engineer.

During the jacking operations, particular care shall be exercised to prevent caving ahead of the pipe which will cause voids outside of the pipe. If voids exist, the party responsible for the project shall drill through the wall of the pipe and fill the voids by pumping cement grout. All voids shall be filled to the satisfaction of the Public Works Inspector.

The carrier pipe shall be installed in the casing as shown in the City Standard Plans. The carrier pipe shall be supported with casing spacers as shown in the Standard Plans. The casing spacers shall conform to these Standards. The material shall be resistant to abrasion and sliding wear. There shall be a minimum of two spacers per length of pipe, and the spacing between spacers shall be as shown in Standard Plan 522. Spacers shall be installed per manufacturer's instructions.

Boring and receiving pits shall be backfilled with select native material approved by the City Engineer and compacted to 95% maximum dry density as determined by ASTM D-1557. A sufficient amount of select backfill material shall be provided to make up for the rejected material.

All disturbed ground shall be restored to its original condition or better.

5-3.40 WORKING WITH ASBESTOS CEMENT PIPE

When working with asbestos cement pipe, the work shall be done in manner that minimizes workers' exposure to asbestos material at or below the exposure limit as prescribed in WAC 296-62- 07705 State and Federal Guidelines and Certification and PSAPCA requirements.

5-3.41 ASBESTOS CEMENT WATER MAIN CROSSINGS

Where a new utility line crosses below an existing asbestos cement (A.C.) water main, the A.C. water main shall be replaced with ductile iron pipe to a minimum of 8 feet on either side of the pipe crossing. Where directed by the City Engineer, the trench shall be backfilled with CDF from the bottom of the trench to the bottom of the A.C. main. All DIP crossings shall be constructed using ROMAC extended range transition couplings.

5-3.42 CONTROLLED DENSITY FILL

Controlled Density Fill (CDF) shall be used only by approval of the City Engineer. CDF can be proportioned to be flowable, non-segregating, or excavatable by hand or machine. Desired flowability shall be achieved with the following guidelines:

Low Flowability	below 6 inch slump
Normal Flowability	6 – 8 inch slump
High Flowability	8 inch slump or greater

CDF shall be placed by any reasonable means into the area to be filled. CDF patching, mixing and placing may be started if weather conditions are favorable, when the temperature is at 34 degrees F and rising. At the time of placement, CDF must have a temperature of at least 40 degrees F. Mixing and placing shall stop when the temperature is 38 degrees F or less and falling. Each filling stage shall be as continuous as possible. CDF shall not be placed on frozen ground.

Trench section to be filled with CDF shall be contained at either end of the trench section by bulkhead or earth fill.

When used to support existing A.C. pipe, the flowable CDF shall be brought up uniformly to the bottom of the A.C. pipe, as shown on the plans, or as directed by the City Engineer. Steel plates shall be provided and installed to span the utility trenches and prevent traffic contact with CDF for at least 24 hours after placement or until CDF is compacted or hardened to prevent rutting by construction equipment or traffic.

If CDF is used for trench backfill on ductile iron pipe it shall be encased in ⅝ inch minus crushed rock and services shall be encased in sand.

5-3.43 VAULT INSTALLATION

Vaults for water facilities (pressure reducing stations, valves, water service, flow meters, backflow prevention assemblies, etc.) shall be installed at the locations shown on the plan and as staked. Vaults shall be constructed as shown on the plans, Standard Plans and as directed by the City Engineer.

The excavation shall have a minimum of one (1) foot clearance between the vault outer surface and the earth bank. Foundation gravel or bedding concrete shall be used on top of undisturbed soil to support the vault. The vault shall be plumb and watertight. The access cover shall be seated properly to prevent rocking and shall be adjusted to match the finished grade.

The vault floor shall drain to daylight, or to a location specified on the plans. Gravity drain pipe shall be a minimum of 3 inches in diameter.

Where knockout locations for the pipe do not coincide with the locations of pipe penetrations into the vault, the party responsible for the project shall core drill openings for pipe.

A sump pump shall be required if directed by the City Engineer.

5-3.44 UTILITY CROSSING

If the minimum vertical distance between utility pipes is less than 6 inches and such installations are approved by the permitting agency, a rigid foam pad shall be placed between the pipes. The pad shall be outside diameter O.D. × O.D. × 2.5 inches thick minimum or as required to protect the pipes and O.D. is equal to the outside diameter of the larger pipe. The pad shall be a polyethylene foam plank (Dow Plastics Ethafoam 220), or approved equal. Additional measures may be necessary to ensure system integrity and may be required as evaluated by the permitting agency on a case by case basis.

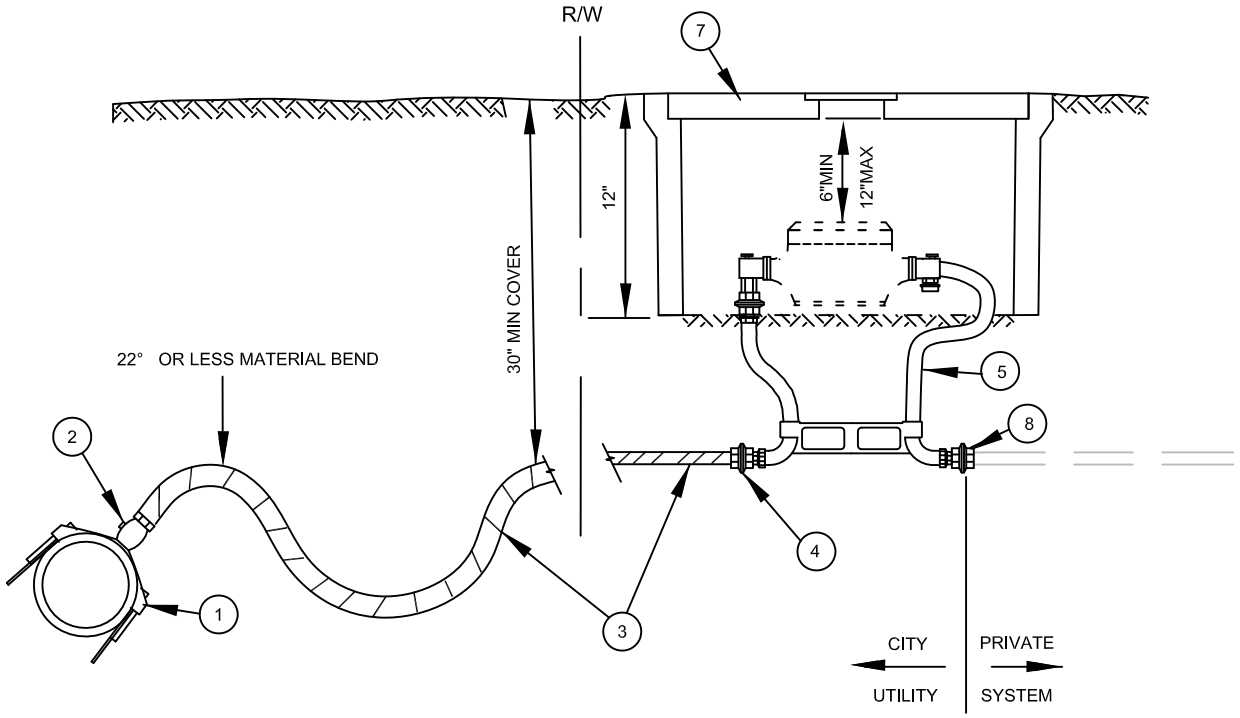
END OF SECTION

CITY OF SNOHOMISH

ENGINEERING DESIGN AND CONSTRUCTION STANDARDS

WATER DISTRIBUTION

DRAWING INDEX



NTS

NOTE:

1. ROMAC, FORD OR EQUAL DOUBLE STRAP SERVICE SADDLE WITH I.P. THREAD TO BE USED ON ALL MAINS 3" DIA AND LARGER AND ON ALL A.C. MAINS. ALL NEW TAPS ON EXISTING WATER MAINS SHALL BE DONE BY THE CITY OF SNOHOMISH WATER DIVISION AT THE DEVELOPER'S OR CONTRACTOR'S EXPENSE.

2. CORPORATION STOP: 1" MUELLER I.P. OR APPROVED EQUAL, SET AT 45° ON UPPER QUADRANT OF PIPE.

3. 1" WATER SERVICE LINE SHALL BE POLYETHYLENE TUBING (CTS).
   POLYETHYLENE SHALL:
   1. MEET THE REQUIREMENTS OF AWWA C901
   2. BE HIGH MOLECULAR MASS WITH AT LEAST 200 PSI RATING
   3. HAVE A #10 COPPER TRACE WIRE WRAPPED ALONG ITS ENTIRE LENGTH (ONE WRAP PER FT)
   4. ALL TUBING SHALL MEET THE APPLICABLE ASTM AND AWWA STANDARDS.

4. ORISEAL CURB STOP H10283 (TYP) MUELLER OR FORD.

5. 5/8" x 3/4" METER SETTER SHALL BE MUELLER B-24046A SERIES WITH CHECK VALVE.

6. METERS SHALL BE PLACED AT THE BACK OF SIDEWALK WHERE POSSIBLE AT DEVELOPER'S AND CONTRACTOR'S EXPENSE. OWNER SHALL PROVIDE CITY WITH UTILITY EASEMENT IF REQUIRED.

7. METER BOX SHALL BE MID STATES PLASTICS BFC173012 BXL FOR 1 1/2" AND 2" SERVICES; BFC111812BXL FOR 3/4" SERVICES AND 1" SERVICES. METER BOX LID SHALL BE DUCTILE IRON WITH READER (17.5" X30.375") FOR 1 1/2" AND 2" SERVICE AND DUCTILE IRON WITH READER BFC11RL FOR 3/4" AND 1" SERVICE. METER BOX SHALL HAVE A 2" HOLE FOR TOUCH READ SENSOR.

8. MUELLER BEND WITH PLUG.

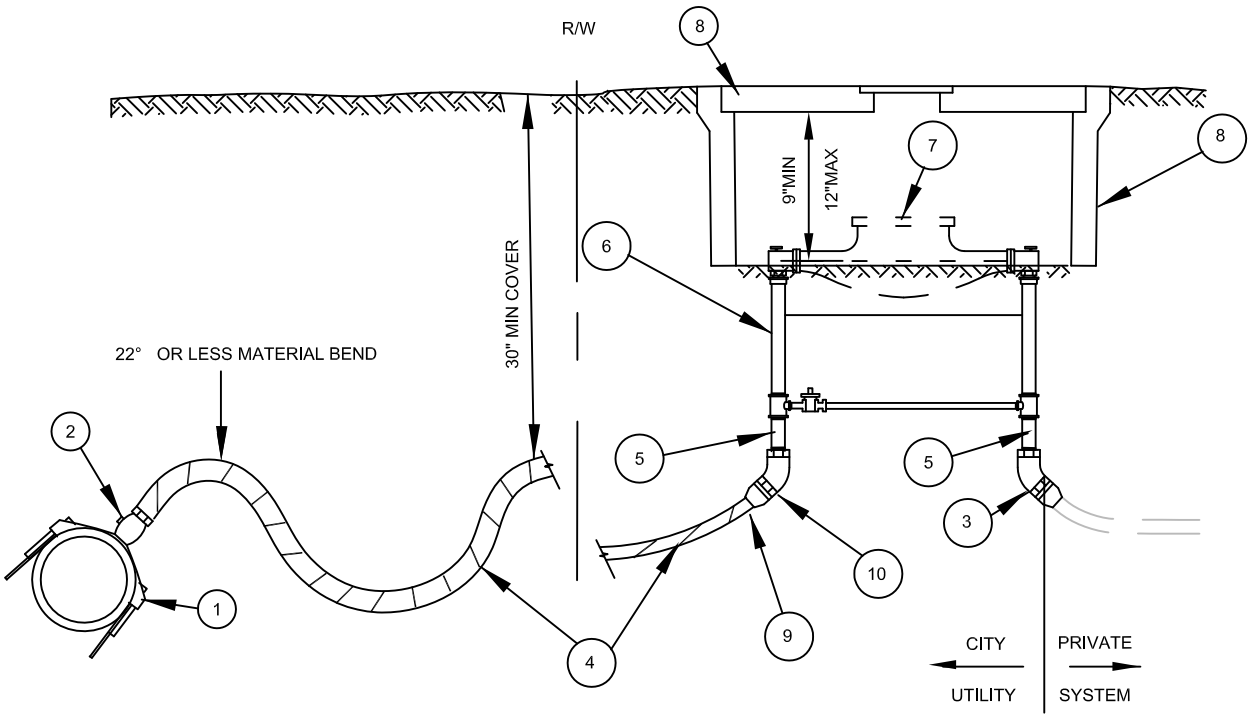
SNOHOMISH
WASHINGTON

5/8" TO 1" METERED WATER SERVICE

Approved By:
S L S
City Engineer
Date: April 2010

501
Number

City of Snohomish Public Works Department



NTS

NOTES:

1. ROMAC, FORD OR EQUAL DOUBLE STRAP SERVICE SADDLE WITH I.P. THREAD TO BE USED ON ALL SERVICE TAPS ALL NEW TAPS ON EXISTING WATER MAINS SHALL BE DONE BY THE CITY OF SNOHOMISH WATER DIVISION AT THE DEVELOPER'S OR CONTRACTOR'S EXPENSE.

2. 2" BRASS CORP STOP MUELLER ORI-CORP H9969 OR FORD.

3. MUELLER BEND WITH PLUG.

4. 2" WATER SERVICE LINE SHALL BE POLYETHYLENE TUBING :
   POLYETHYLENE TUBING SHALL BE 2" COPPER TUBE SIZE (CTS) ASTM D-2737 - SDR9 (PE3408)
   POLYETHYLENE SHALL:
   1. MEET THE REQUIREMENTS OF AWWA C901
   2. BE HIGH MOLECULAR MASS WITH AT LEAST 200 PSI RATING
   3. HAVE A #10 COPPER TRACE WIRE WRAPPED ALONG ITS ENTIRE LENGTH (ONE WRAP PER FT)
   4. ALL TUBING SHALL MEET THE APPLICABLE ASTM AND AWWA STANDARDS.

5. BRASS FITTINGS AS NEEDED.

6. METER SETTERS SHALL BE MUELLER SERIES COPPER SETTER B2427-2.012 WITH HORIZONTAL INLET AND OUTLET WITH CHECK VALVE OR APPROVED EQUAL.

7. METER SHALL BE INSTALLED BY CITY WATER DIVISION AT DEVLOPER'S OR CONTRACTOR'S EXPENSE.

8. METER BOX SHALL BE MID STATES PLASTICS BFC173012 BXL FOR 1-1/2 AND 2" SERVICES;
   METER BOX SHALL HAVE A 2" HOLE FOR TOUCH READ SENSOR.
   METER BOX LID SHALL BE DUCTILE IRON WITH READER (17.5" X30.375") FOR 1-1/2 AND 2" SERVICES.

9. 1-1/2" SERVICE SHALL BE REDUCED AT THE SETTER.

10. ORISEAL CURB STOP H10283 (TYP) MUELLER OR FORD.

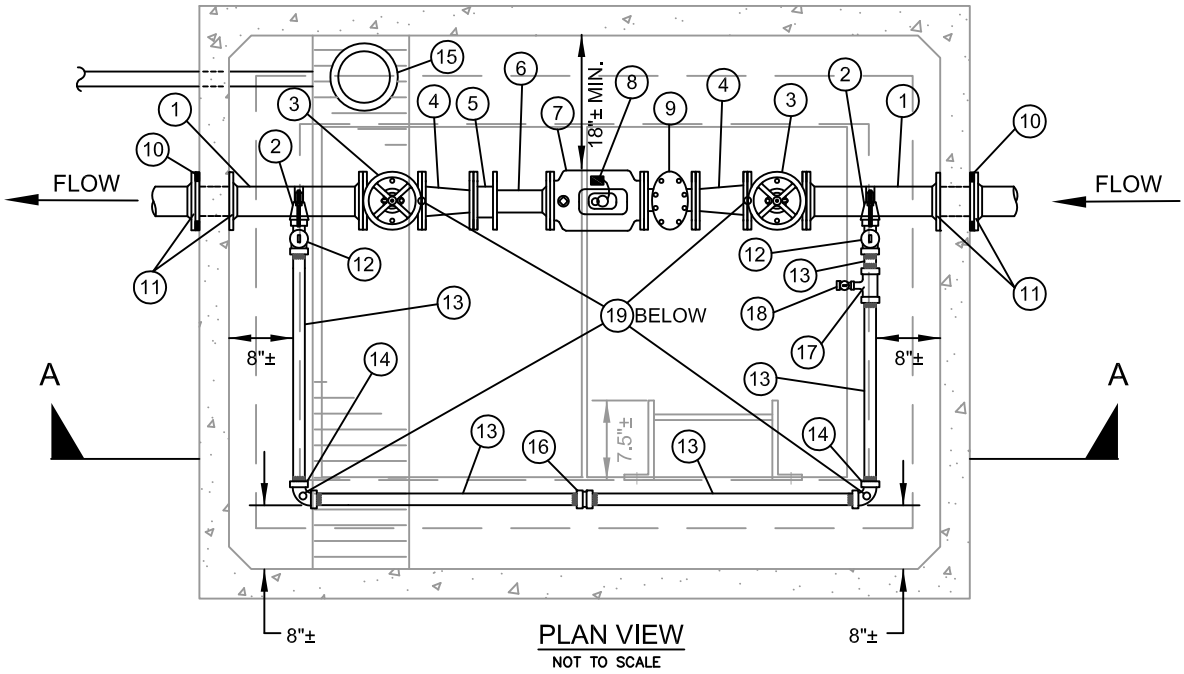
SNOHOMISH
WASHINGTON

2" METERED WATER SERVICE

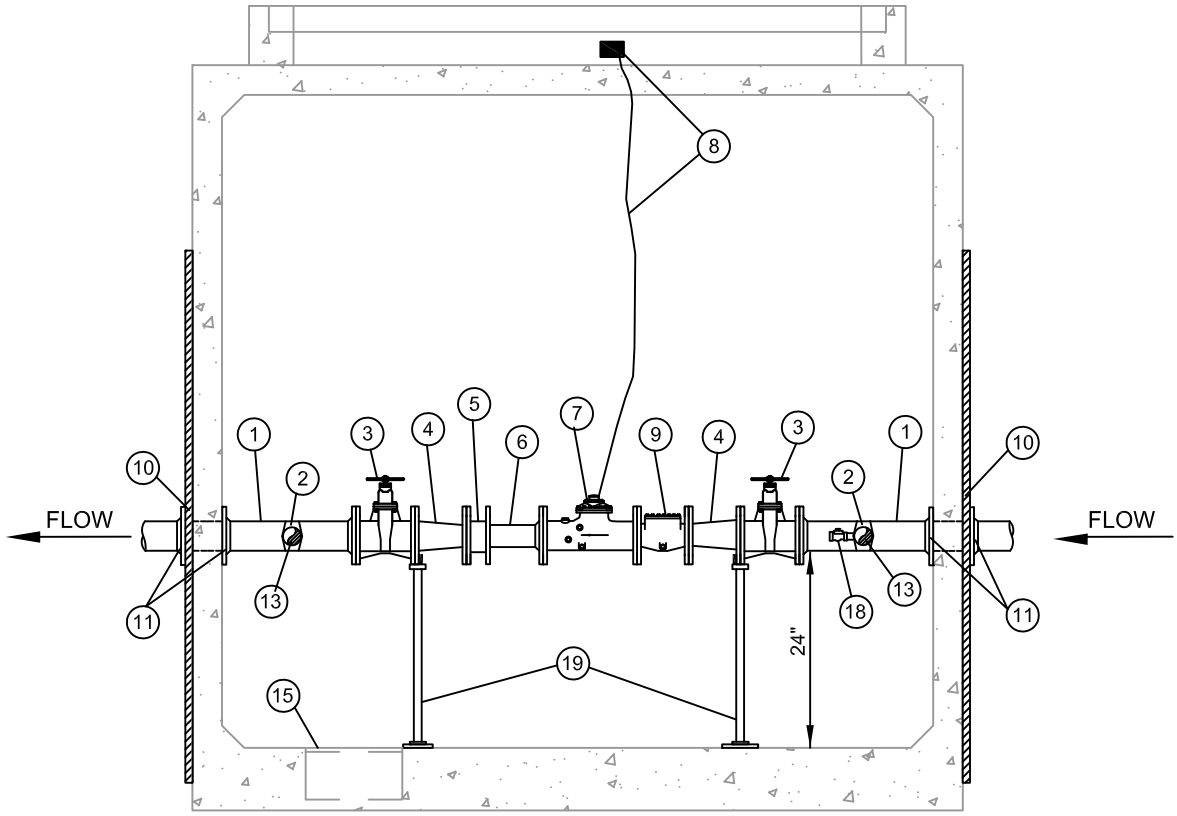
Approved By:
S L S
City Engineer
Date: April 2010

502
Number

City of Snohomish Public Works Department



PLAN VIEW
NOT TO SCALE



SECTION A-A
NOT TO SCALE

3" WATER METER INSTALLATION

PIPING DETAIL

SNOHOMISH
WASHINGTON

METER/VAULT FOR 3" METER

Approved By:
S L S
City Engineer
Date: April 2010

503
Number

City of Snohomish Public Works Department

MATERIAL LIST:

ITEM	QTY.	DESCRIPTION
1	2	4" D.I. ADAPTER, FL x PE, 5'± LONG.
2	2	SADDLE WITH STAINLESS STEEL STRAP, 2" IP TAP, FORD#FS202 SADDLE WITH IP7 TAP OR EQUAL
3	2	4" RESILIENT SEAT GATE VALVE, NRS, FL, O-RING PACKING WITH HAND WHEEL. VALVE TO BE AMERICAN, WATEROUS, MUELLER, M&H, OR CLOW MEETING AWWA C-509.
4	2	4" X 3" D.I. REDUCER, FL.
5	1	3" FLANGED COUPLING ADAPTER TO BE FORD FLANGED COUPLING ADAPTER, STYLE FFCA W/STAINLESS STEEL ANCHOR STUDS, OR EQUAL.
6	1	3" D.I. ADAPTER, FL x PE, LENGTH TO FIT.
7	1	3" FLANGED SINGLE REGISTER HIGH PERFORMANCE COMPOUND METER, TO BE PROVIDED BY THE CITY AND INSTALLED BY CONTRACTOR.
8	1	METER TRANSCEIVER UNIT (MXU) AND MOUNTING BRACKET, TO BE PROVIDED BY THE CITY AND INSTALLED BY CONTRACTOR ON HATCH RISER.
9	1	3" FLANGED STRAINER.
10	4	2" X 2" X 1/4" MIN. WALL THICKNESS SQUARE STEEL TUBING, 6' MIN. LENGTH. BOLT TO VAULT WALL IN FOUR PLACES WITH STAINLESS STEEL ANCHOR BOLTS.
11	4	UNI-FLANGE ADAPTER.
12	2	2" MIP X FIP LOCKABLE BALL VALVE.
13	5	2" BRASS NIPPLE, LENGTH TO FIT.
14	2	2" BRASS 90° BEND.
15	1	SUMP PUMP OR GRAVITY DRAIN AS REQUIRED BY SITE CONDITIONS, TO BE DETERMINED BY THE DEVELOPER AND CONTRACTOR AND REVIEWED AND APPROVED BY THE CITY. FOR GRAVITY: SUMP DRAIN, ZURN Z-551, THREADED, WITH ZURN Z-1099 BACKWATER VALVE, THREADED x NO-HUB, WITH D.I. PIPE TO 12" MIN. BEYOND VAULT WALL AND 4" PVC D3034 SDR35, MIN. 1% SLOPE TO DAYLIGHT OR C.B. FOR SUMP PUMP: 16" DIAM. x 6" DEEP SUMP WITH ZOELLER MODEL 57 SUMP PUMP. PROVIDE ELECTRICAL POWER PERALL APPLICABLE CODES. CONSTRUCT 1-1/4" DISCHARGE PIPING ENCASED IN G.I.P. TO NEAREST CATCH BASIN OR APPROVED LOCATION.
16	1	2" BRASS UNION.
17	1	2" X 1" BRASS TEE.
18	1	1" MIP LOCKABLE BALL VALVE WITH CAP.
19	4	ADJUSTABLE PIPING SUPPORT, STANDON MODEL #S89, OR EQUAL.

NOTES:

1. PROVIDE SHOP DRAWINGS AND SUBMITTALS FOR ALL MATERIALS TO THE CITY FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
2. VAULT SHALL BE UTILITY VAULT CO PRECAST VAULT OR EQUAL.
3. PIPE AND CONDUIT PENETRATIONS SHALL BE CORE-DRILLED ON-SITE AND SHALL BE SEALED WATERTIGHT. PROVIDE "LINK-SEAL" FITTINGS AT ALL PENETRATIONS.
4. ALL PIPING AND APPURTENANCES OUTSIDE THE VAULT SHALL BE RESTRAINED JOINT. IN ADDITION TO THE RESTRAINED JOINTS, THRUST BLOCKING AT ALL TEES AND BENDS PER STANDARD PLANS 505 AND 506 SHALL BE REQUIRED.
5. THE CONTRACTOR IS RESPONSIBLE FOR ELECTRICAL PERMITS AND APPROVALS FOR SUMP PUMP INSTALLATIONS.

3" WATER METER INSTALLATION
PIPING DETAIL NOTES

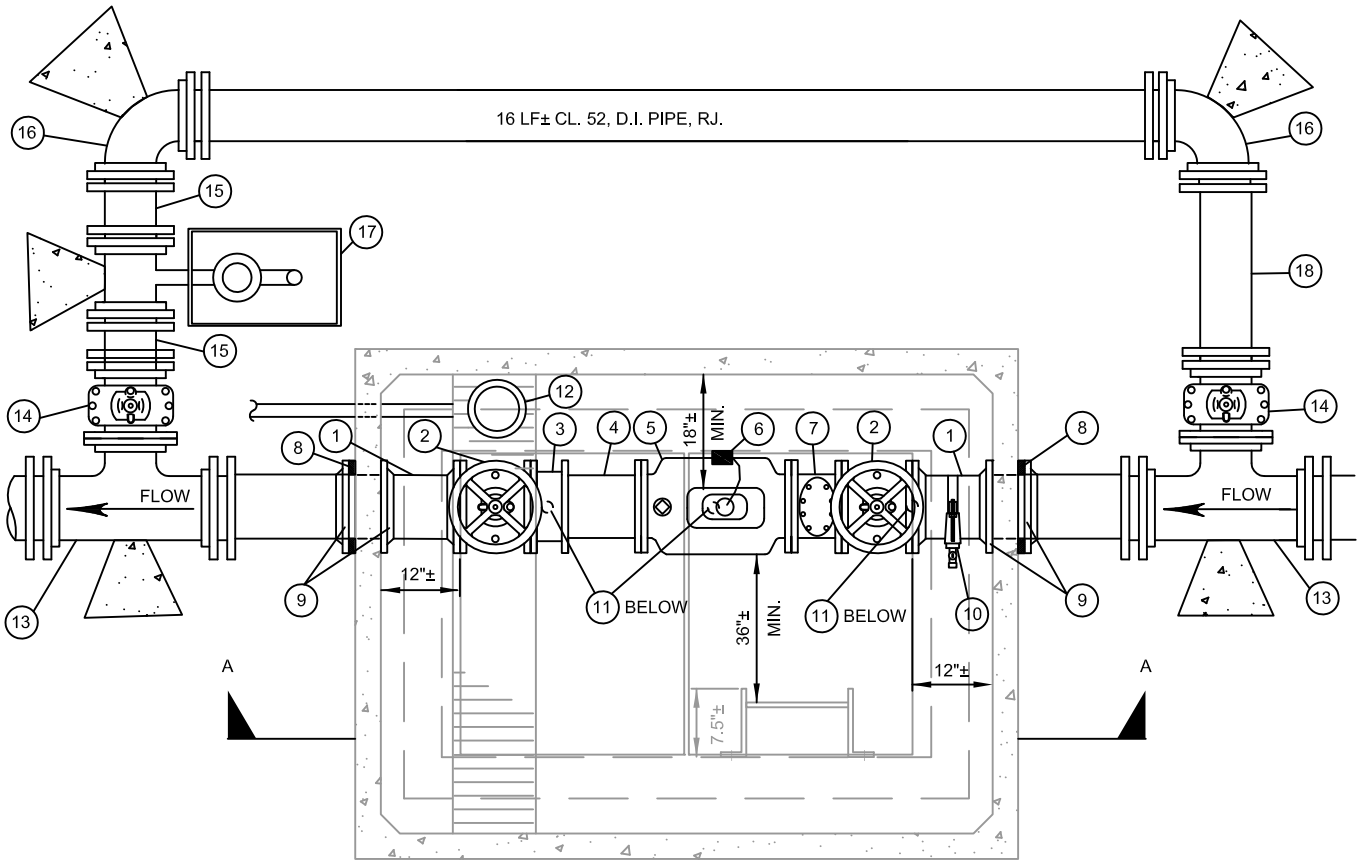
SNOHOMISH
WASHINGTON

NOTES FOR 3" METER/VAULT

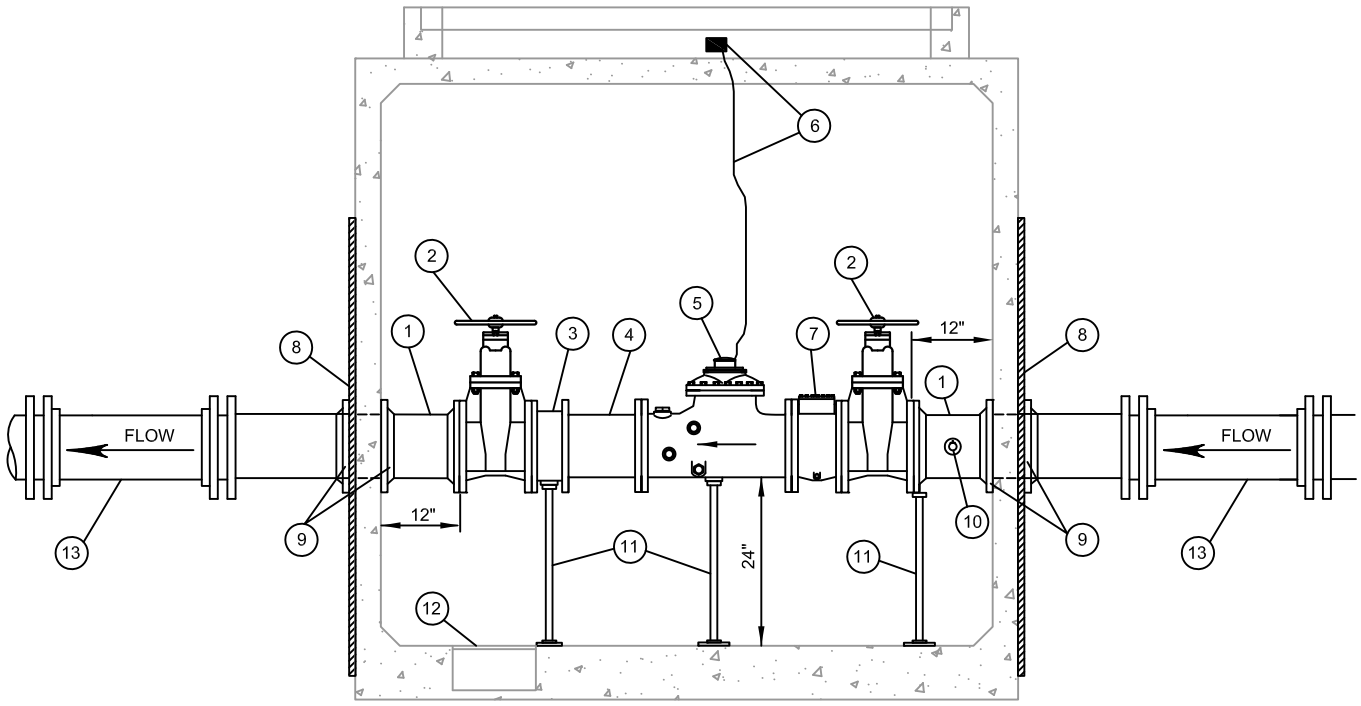
Approved By:
S L S
City Engineer
Date: April 2010

503a
Number

City of Snohomish Public Works Department



PLAN VIEW
NOT TO SCALE



SECTION A-A
NOT TO SCALE

4" & 6" WATER METER INSTALLATION
PIPING DETAIL

SNOHOMISH
WASHINGTON

METER/VAULT FOR 4" & 6" METER

Approved By:
S L S
City Engineer
Date: April 2010

504
Number

City of Snohomish Public Works Department

MATERIAL LIST: ALL PIPING & APPURTENANCES TO MATCH METER SIZE

ITEM	QTY.	DESCRIPTION
1	2	D.I. ADAPTER, FL x PE, 5'± LONG.
2	2	RESILIENT SEAT GATE VALVE, NRS, FL, O-RING PACKING WITH HAND WHEEL. VALVE TO BE AMERICAN, WATEROUS, MUELLER OR CLOW MEETING AWWA C-509.
3	1	FLANGED COUPLING ADAPTER TO BE FORD FLANGED COUPLING ADAPTER, STYLE FFCA W/STAINLESS STEEL ANCHOR STUDS, OR EQUAL.
4	1	D.I. ADAPTER, FL x PE, LENGTH TO FIT.
5	1	FLANGED SINGLE REGISTER HIGH PERFORMANCE COMPOUND METER, TO BE PROVIDED BY THE CITY AND INSTALLED BY CONTRACTOR.
6	1	METER TRANSCEIVER UNIT (MXU) AND MOUNTING BRACKET, TO BE PROVIDED BY THE CITY AND INSTALLED BY CONTRACTOR ON HATCH RISER.
7	1	FLANGED STRAINER.
8	4	2" X 2" X 1/4" MIN. WALL THICKNESS SQUARE STEEL TUBING, 6' MIN. LENGTH. BOLT TO VAULT WALL IN FOUR PLACES WITH STAINLESS STEEL ANCHOR BOLTS.
9	4	UNI-FLANGE ADAPTER.
10	1	SADDLE WITH STAINLESS STEEL STRAP, 1" IP TAP AND 1" MIP LOCKABLE BALL VALVE WITH CAP.
11	3	ADJUSTABLE PIPING SUPPORT, STANDON MODEL #S89, OR EQUAL.
12	1	SUMP PUMP OR GRAVITY DRAIN AS REQUIRED BY SITE CONDITIONS, TO BE DETERMINED BY THE DEVELOPER AND CONTRACTOR AND REVIEWED AND APPROVED BY THE CITY. FOR GRAVITY: SUMP DRAIN, ZURN Z-551, THREADED, WITH ZURN Z-1099 BACKWATER VALVE, THREADED x NO-HUB, WITH D.I. PIPE TO 12" MIN. BEYOND VAULT WALL AND 4" PVC D3034 SDR35, MIN. 1% SLOPE TO DAYLIGHT OR C.B. FOR SUMP PUMP: 16" DIAM. x 6" DEEP SUMP WITH ZOELLER MODEL 57 SUMP PUMP. PROVIDE ELECTRICAL POWER PER ALL APPLICABLE CODES. CONSTRUCT 1-1/4" DISCHARGE PIPING ENCASED IN G.I.P. TO NEAREST CATCH BASIN OR APPROVED LOCATION.
13	2	D.I. TEE, FL x RJ.
14	2	RESILIENT SEAT GATE VALVE, NRS, FL x RJ. VALVE TO BE AMERICAN, WATEROUS, MUELLER, M&H, OR CLOW MEETING AWWA C-509. VALVE BOX TO BE PER STANDARD PLAN 512
15	2	D.I. SPOOLS, 1'± LONG.
16	2	90° D.I. BENDS, RJ.
17	1	2" BLOW-OFF ASSEMBLY, STANDARD PLAN 510.
18	1	D.I. SPOOL, 3'± LONG.

NOTES:

1. PROVIDE SHOP DRAWINGS AND SUBMITTALS FOR ALL MATERIALS TO THE CITY FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
2. VAULT SHALL BE UTILITY VAULT CO PRECAST VAULT OR EQUAL.
3. PIPE AND CONDUIT PENETRATIONS SHALL BE CORE-DRILLED ON-SITE AND SHALL BE SEALED WATERTIGHT. PROVIDE "LINK-SEAL" FITTINGS AT ALL PENETRATIONS.
4. ALL PIPING AND APPURTENANCES OUTSIDE THE VAULT SHALL BE RESTRAINED JOINT. IN ADDITION TO THE RESTRAINED JOINTS, THRUST BLOCKING AT ALL TEES AND BENDS PER STANDARD PLANS 505 AND 506 SHALL BE REQUIRED.
5. THE CONTRACTOR IS RESPONSIBLE FOR ELECTRICAL PERMITS AND APPROVALS FOR SUMP PUMP INSTALLATIONS.

4" & 6" WATER METER INSTALLATION DETAIL NOTES

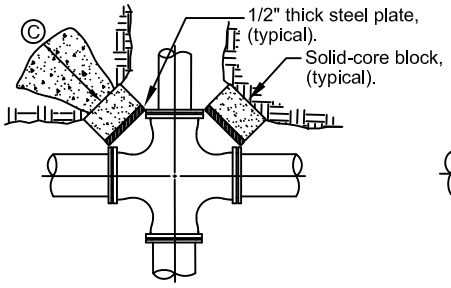
SNOHOMISH WASHINGTON

NOTES FOR 4" & 6" METER/VAULT

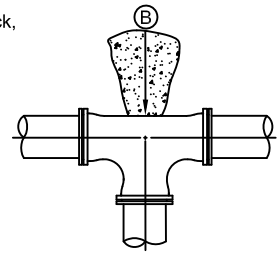
Approved By: S L S
City Engineer
Date: April 2010

504a
Number

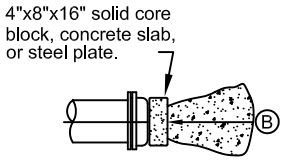
City of Snohomish Public Works Department



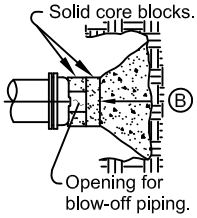
UNBALANCED CROSS



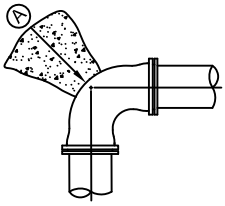
TEE



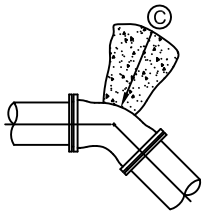
CAP



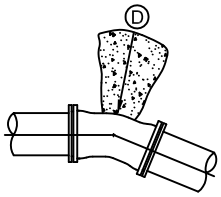
TAPPED CAP/PLUG



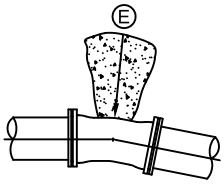
90° BEND



45° BEND



22½° BEND



11¼° BEND

NOT TO SCALE

THRUST BLOCK SIZING FOR 250 PSI PRESSURE

MIN. BEARING AREA AGAINST UNDISTRUBED SOIL-SQ. FT.

PIPE SIZE	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
4"	3/(2)	2/(1)	2/(1)	1/(1)	1/(1)
6"	6/(4)	4/(3)	3/(2)	2/(1)	1/(1)
8"	10/(7)	7/(5)	5/(4)	3/(2)	2/(1)
10"	15/(10)	11/(7)	8/(5)	4/(3)	2/(2)
12"	22/(14)	15/(10)	12/(8)	6/(4)	3/(2)
14"	29/(20)	21/(14)	16/(11)	8/(5)	4/(3)
16"	38/(26)	27/(18)	21/(14)	11/(7)	5/(4)
18"	48/(32)	34/(23)	26/(18)	13/(9)	7/(5)
20"	60/(40)	42/(28)	32/(22)	17/(11)	8/(6)
24"	86/(58)	61/(41)	47/(31)	24/(16)	12/(8)

SAFE BEARING LOADS IN LBS./SQ. FT.

THE SAFE BEARING LOADS GIVEN IN THE FOLLOWING TABLE ARE FOR HORIZONTAL THRUSTS WHEN THE DEPTH OF COVER OVER THE PIPE EXCEEDS 2 FEET.

SOIL	SAFE BEARING LOAD
*MUCK, PEAT, ETC. (SEE NOTE 7)	0
SOFT CLAY	1,000
SAND	2,000
SAND AND GRAVEL	3,000
SAND AND GRAVEL CEMENTED W/CLAY	4,000
HARD SHALE	10,000

GENERAL NOTES

1. CONCRETE THRUST BLOCK AREA BASED UPON A SAFE BEARING LOAD OF 2000/(3000) LBS. PER SQ. FT.
2. AREAS MUST BE ADJUSTED FOR OTHER SIZE PIPE, PRESSURES AND SOIL CONDITIONS.
3. CONCRETE BLOCKING SHALL BE CAST-IN-PLACE AND HAVE MINIMUM OF 1/2 SQUARE FOOT CONTACT BEARING AGAINST THE FITTING.
4. BLOCK SHALL BEAR AGAINST FITTINGS ONLY AND SHALL BE CLEAR OF JOINTS TO PERMIT TAKING UP OR DISMANTLING JOINT.
5. CONTRACTOR SHALL INSTALL BLOCKING ADEQUATE TO WITHSTAND TEST PRESSURE AS WELL AS TO CONTINUOUSLY WITHSTAND OPERATING PRESSURE UNDER ALL CONDITIONS OF SERVICE.
6. POLYETHYLENE WRAP NOT SHOWN FOR CLARITY.
7. IN MUCK OR PEAT, ALL THRUSTS SHALL BE RESTRAINED BY PILES OR TIE RODS TO SOLID FOUNDATIONS OR BY REMOVAL OF MUCK OR PEAT AND REPLACEMENT WITH BALLAST OF SUFFICIENT STABILITY TO RESIST THRUSTS.

SNOHOMISH WASHINGTON

HORIZONTAL THRUST BLOCKS

Approved By: S L S
City Engineer
Date: April 2010

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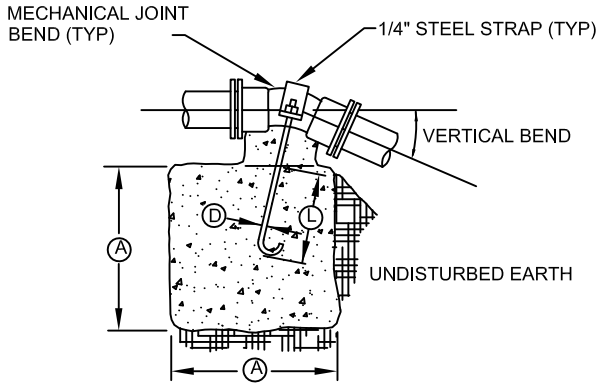
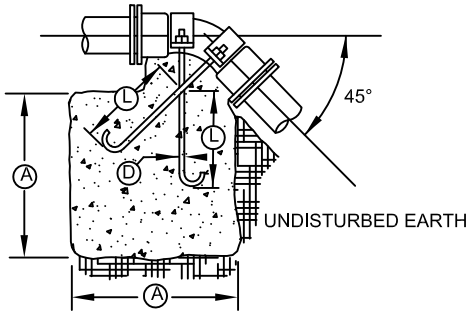
Number

City of Snohomish Public Works Department



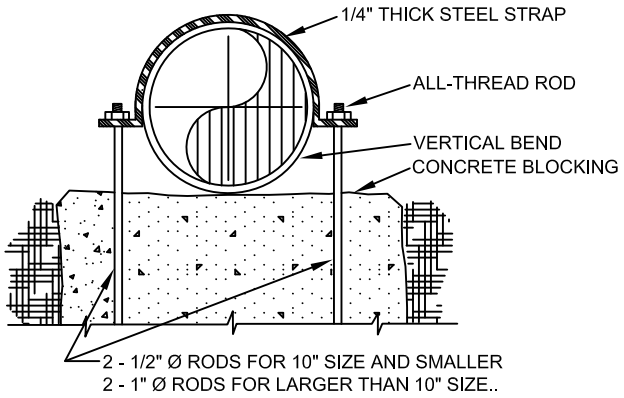
BLOCKING FOR 11-1/4°, 22-1/2° & 30° VERTICAL BENDS



BLOCKING FOR 45° VERTICAL BENDS

VERTICAL BLOCKING

PIPE SIZE	VERT. BEND	CU.FT.	(A)	(D)	(L)
4"	11-1/4°	8	2.0'	3/4"	1.5'
	22-1/2°	11	2.2'	3/4"	2.0'
	30°	17	2.6'	3/4"	2.0'
	45°	30	3.1'	3/4"	2.0'
6"	11-1/4°	11	2.2'	3/4"	2.0'
	22-1/2°	25	2.9'	3/4"	2.0'
	30°	41	3.5'	3/4"	2.0'
	45°	68	4.1'	3/4"	2.0'
8"	11-1/4°	16	2.5'	3/4"	2.0'
	22-1/2°	47	3.6'	3/4"	2.5'
	30°	70	4.1'	3/4"	2.5'
	45°	123	5.0'	3/4"	2.0'
12"	11-1/4°	32	3.2'	3/4"	2.0'
	22-1/2°	88	4.5'	7/8"	3.0'
	30°	132	5.1'	7/8"	2.5'
	45°	232	6.1'	3/4"	2.5'
16"	11-1/4°	70	4.1'	7/8"	3.0'
	22-1/2°	184	5.7'	1-1/8"	4.0'
	30°	275	6.5'	1-1/4"	4.0'
	45°	478	7.8'	1-1/8"	4.0'
20"	11-1/4°	91	4.5'	7/8"	3.0'
	22-1/2°	225	6.1'	1-1/4"	4.0'
	30°	330	6.9'	1-3/8"	4.5'
	45°	560	8.2'	1-1/4"	4.0'
24"	11-1/4°	128	5.0'	1"	3.5'
	22-1/2°	320	6.8'	1-3/8"	4.5'
	30°	480	7.9'	1-5/8"	5.5'
	45°	820	9.4'	1-3/8"	4.5'



TYPICAL CROSS-SECTION

NOTES:

1. CONCRETE BLOCKING IS BASED ON 250psi WATER PRESSURE AND 2500 psi CONCRETE STRENGTH.
2. BOLTS AND NUTS NOT EMBEDDED IN CONCRETE SHALL BE CLEANED AND COATED WITH COAL TAR EPOXY.
3. POLYETHYLENE WRAP NOT SHOWN FOR CLARITY.

NOT TO SCALE

SNOHOMISH WASHINGTON

VERTICAL THRUST BLOCKS

Approved By:
S L S
City Engineer
Date: April 2010

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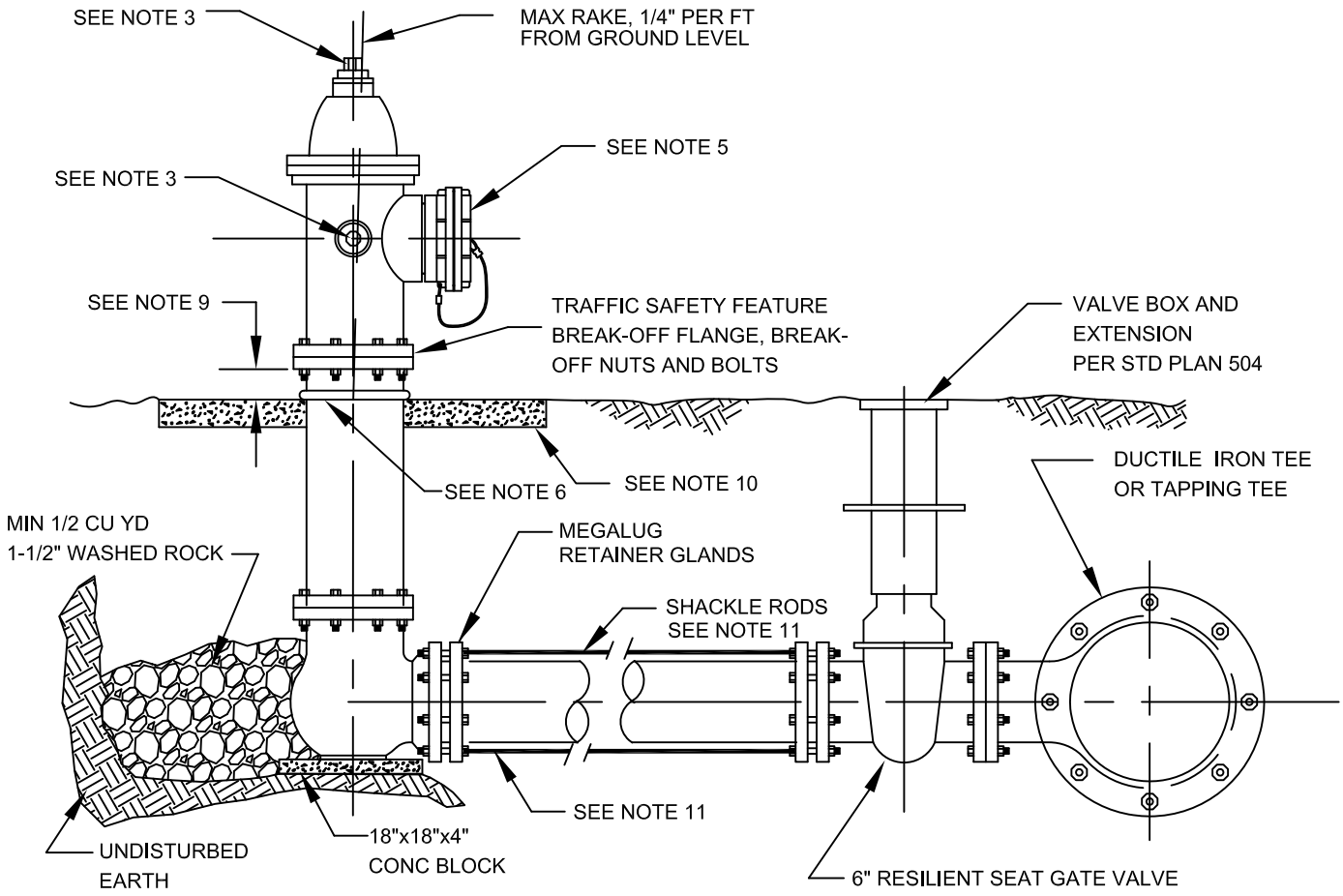
Number

City of Snohomish Public Works Department



NOTES:

1. HYDRANTS AND ALL MATERIALS SHALL CONFORM TO AWWA STANDARDS AND SHALL BE OF STANDARD MANUFACTURE - MUELLER SUPER CENTURION, M&H 929, OR AVK CLASSIC.
2. 5-1/4" VALVE MINIMUM.
3. 1-1/2" OPERATING NUT AND CAP NUT FOR 2-1/2" PORTS
4. N.S.T. THREAD ON 2-1/2" PORTS.
5. 5" STORZ FITTING WITH NATIONAL STANDARD THREAD ON THE 4-1/2" PORT.
6. IF HYDRANT RISES THROUGH CONCRETE, USE EXPANSION STRIP AROUND HYDRANT BARREL, PER STD PLAN 509.
7. PROVIDE FOR VEHICULAR TRAFFIC PROTECTION WHEN NECESSARY PER STD. PLAN 509.
8. STEAMER PORT TO BE FACING STREET OR ROADWAY FOR FIRE ENGINE ACCESS.
9. BREAK-OFF FLANGE SHALL BE MINIMUM 2", MAXIMUM 6" ABOVE CONCRETE PAD AND/OR BACK OF SIDEWALK.
10. INSTALL CONCRETE PAD AROUND HYDRANT IN UNPAVED, SOD AND ASPHALT AREAS PER STD. PLAN 508.
11. HYDRANT CONNECTION PIPE TO BE DUCTILE IRON CLASS 52, MINIMUM 3' MAXIMUM 18' LENGTH. JOINTS TO BE MJ WITH RETAINER GLANDS, OR FIELD LOCK GASKETS. SHACKLE RODS SHALL BE PART OF ASSEMBLY.
12. FIRE HYDRANTS SHALL BE PAINTED WITH TWO COATS OF CAT YELLOW HYDRANT PAINT "RUST-OLEUM" TYPE PAINT.

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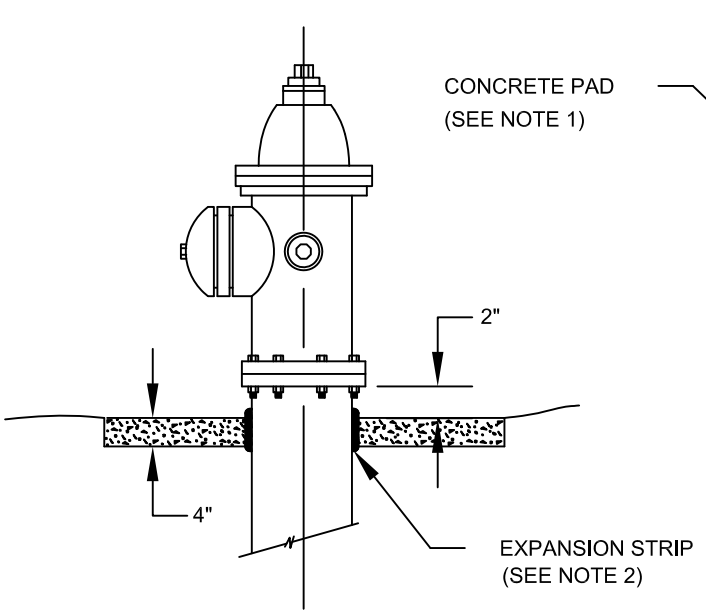
FIRE HYDRANT ASSEMBLY

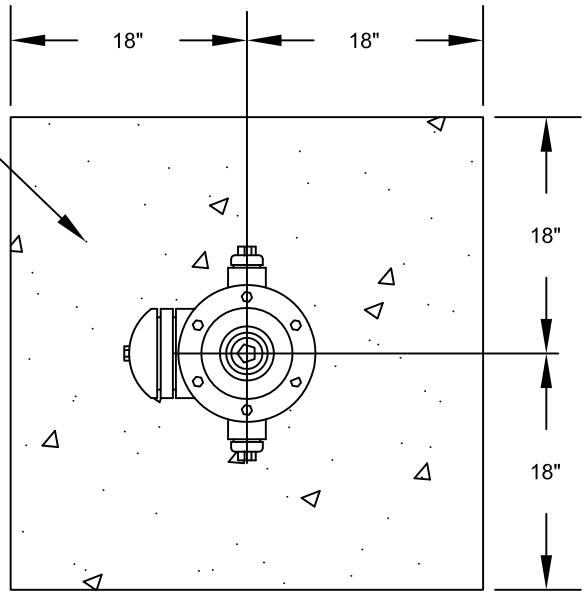
Approved By:
S L S
City Engineer
Date: April 2010

507
Number

City of Snohomish Public Works Department



ELEVATION



PLAN

NOTES:

1. CONCRETE SHALL BE CLASS 3000.
2. INSTALL 1/2"x 4" EXPANSION STRIP AROUND HYDRANT.

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CONCRETE FIRE HYDRANT PAD

Approved By:
S L S
City Engineer
Date: April 2010

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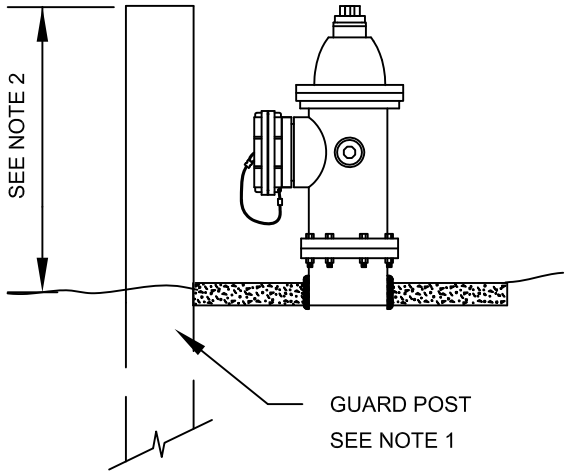
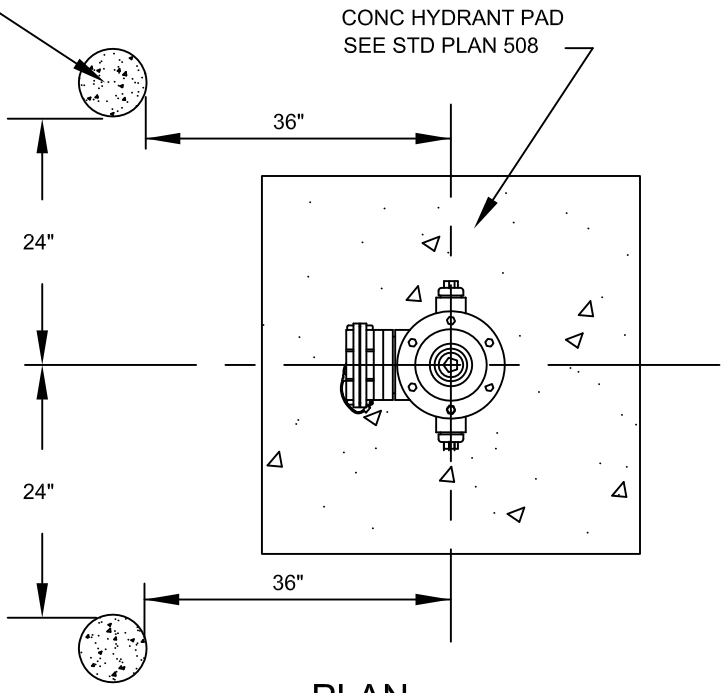
Number

City of Snohomish Public Works Department



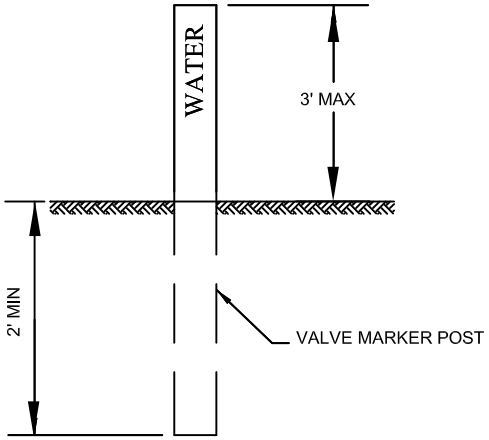
ELEVATION



PLAN

FIRE HYDRANT GUARD POST

(SEE NOTES 1 AND 2)



VALVE MARKER POST

(SEE NOTES 3, 4 AND 5)

NOTES:

1. GUARD POSTS SHALL BE 6' LONG, 6" DIAMETER CONCRETE CLASS 52 DI. PIPE OR 6' LONG, 8" DIAMETER REINFORCED CONCRETE. PAINTED WITH TWO COATS OF HIGH GLOSS EQUIPMENT YELLOW (RUST-OLEUM) TYPE PAINT.
2. TOP OF GUARD POST SHALL BE LEVEL WITH THE TOP OF THE OPERATING NUT.
3. CARSONITE PLASTIC POST MARKER, BLUE, LABELED "WATER".
4. VALVE MARKER POSTS SHALL BE INSTALLED FOR ALL VALVES LOCATED IN UNPAVED AREAS. VALVE MARKER POSTS SHALL BE SET AS DIRECTED BY THE CITY ENGINEER IN A SAFE AND REASONABLY CONSPICUOUS LOCATION.
5. VALVE MARKER POSTS MAY NOT BE REQUIRED FOR AUXILIARY HYDRANT VALVES.

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WASHINGTON

FIRE HYDRANT GUARD POST AND VALVE MARKER POST

Approved By:
S L S
City Engineer
Date: April 2010

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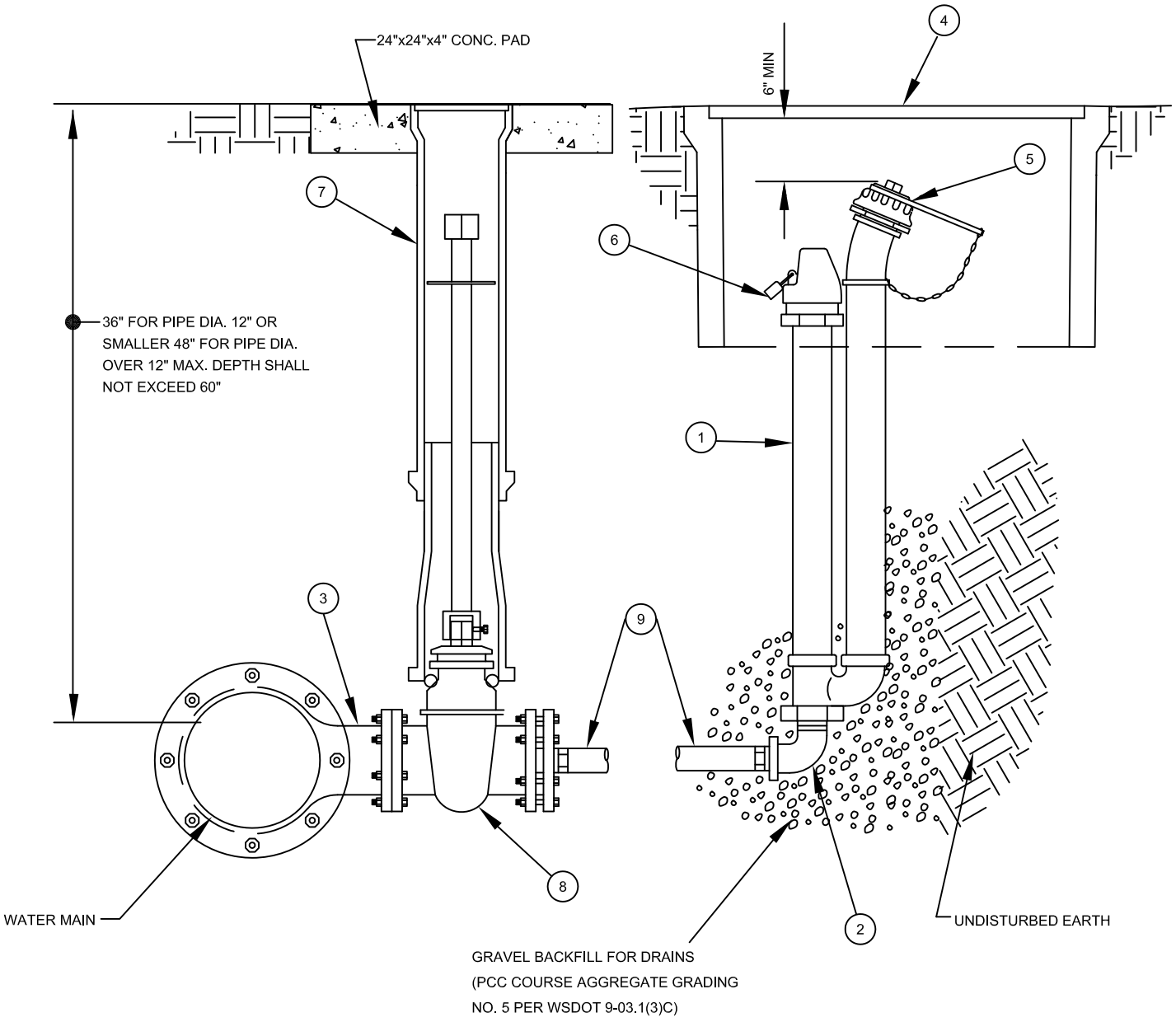
Number

City of Snohomish Public Works Department



MATERIAL LIST:

1. BLOWOFF HYDRANT KUPFERLE FOUNDRY #78 BRONZE TO BRONZE DESIGN SERVICEABLE FROM ABOVE WITH OUTLET EXPOSED. 2-1/2" NST OUTLET LOCKING CAP ON OPERATOR.
2. 2" BRASS 90° BEND
3. MAINLINE SIZE TEE WITH 6" FLANGE
4. MID-STATES PLASTICS METER BOX MSBCF 1730-18/W DI LID.
5. 2-1/2" CAP NATIONAL STANDARD THREAD.
6. LOCK TO BE SUPPLIED BY CITY OF SNOHOMISH.
7. CAST IRON VALVE BOX AND EXTENSION PER STD DETAIL W-190
8. 6" GATE VALVE WITH RESILIENT SEAT (MUELLER, M&H OR APPROVED EQUAL) WITH A 6" FLANGE X 2" COMPANION FLANGE
9. 2" HDPE HI MOL CL 200 CTS POLY PIPE W/2 2" MIP COMPRESSION ADAPTERS

SNOHOMISH WASHINGTON

BLOW OFF ASSEMBLY

Approved By: S L S
City Engineer
Date: April 2010

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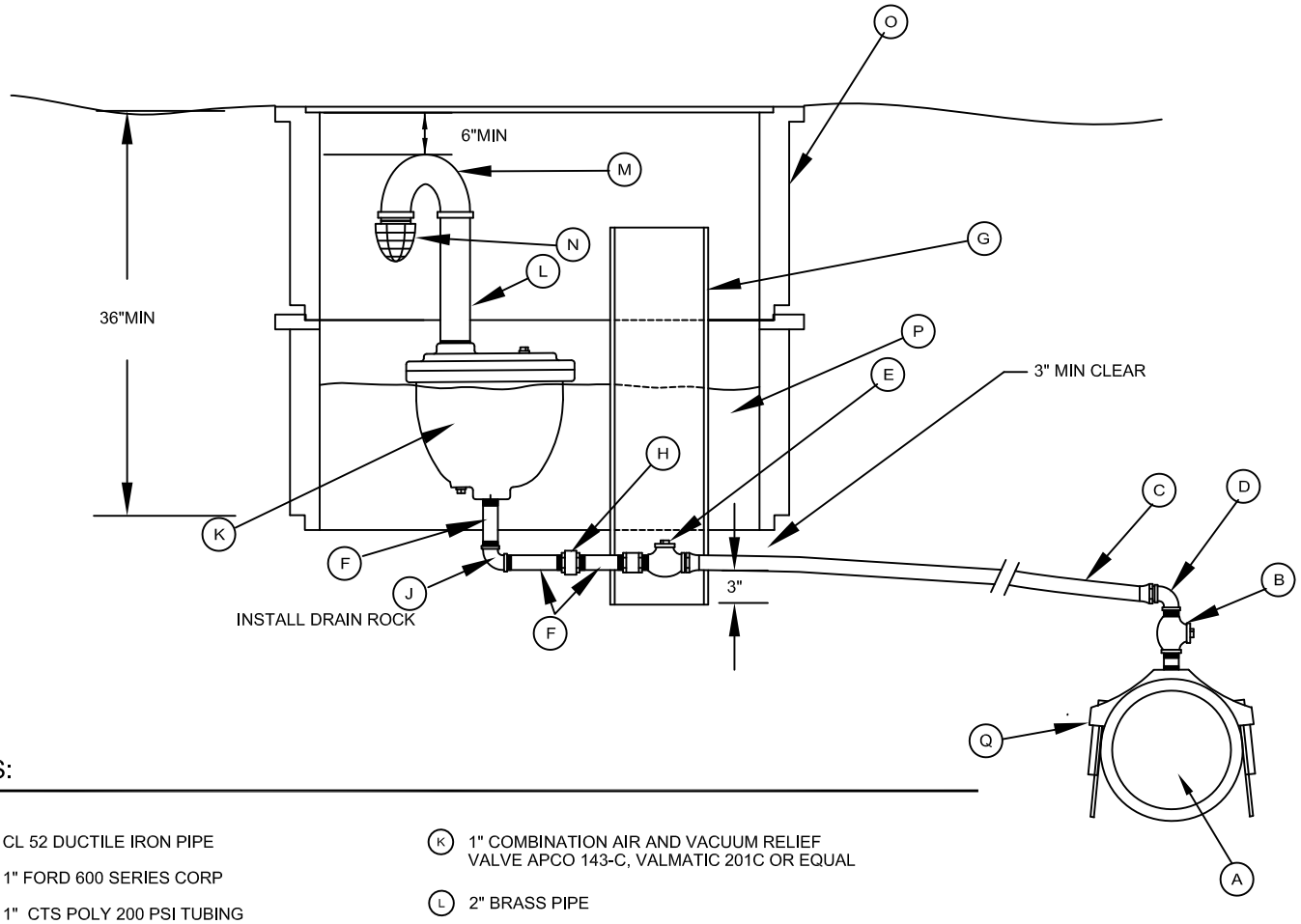
Number

City of Snohomish Public Works Department



PARTS:

- (A) CL 52 DUCTILE IRON PIPE
- (B) 1" FORD 600 SERIES CORP
- (C) 1" CTS POLY 200 PSI TUBING
- (D) 1" FORD 602-44 ANGLE COUPLING
- (E) 1" FORD B21-444 CURB STOP
- (F) 1" BRASS NIPPLE
- (G) 6" PVC PIPE
- (H) 1" BRASS UNION
- (I) AIR VAC SHALL BE PAINTED APPROVED BLUE
- (J) 1" BRASS 90° ELL
- (K) 1" COMBINATION AIR AND VACUUM RELIEF VALVE APCO 143-C, VALMATIC 201C OR EQUAL
- (L) 2" BRASS PIPE
- (M) 2" BRASS RETURN BEND
- (N) BRASS BEEHIVE STRAINER GREENBURG P-24-08, FOR 2" PIPE
- (O) METER BOX SHALL BE MID STATES PLASTICS BFC111812BXL METER BOX LID SHALL BE DUCTILE IRON WITH READER BFC11RL
- (P) BACKFILL WITH CRUSHED ROCK TO BONNET.
- (Q) DOUBLE STRAP SADDLE.

NOTES

1. AIR-VAC UNIT AND BOX TO BE INSTALLED IN NON-TRAFFIC AREA.
2. USE MUELLER DOUBLE STRAP SERVICE CLAMP OR APPROVED EQUAL ON ALL MAINS PER STANDARD PLAN 501
3. ALL PIPE FITTINGS BETWEEN MAIN AND UNION, AFTER AIR/VACUUM RELIEF VALVE, SHALL BE BRASS.
4. INSTALLATIONS FOR OTHER SIZE AIR/VACUUM RELIEF VALVES SHALL BE INDIVIDUALLY DESIGNED AND WILL REQUIRE APPROVAL BY THE CITY ENGINEER.
5. PAINT METER BOX LID AND RISER ASSEMBLY (2) COATS BLUE, OIL BASE ENAMEL- HAND BRUSH APPLIED. STENCIL RISER ASSEMBLY WITH "AV" AND SIZE OF AIR/VAC ASSEMBLY ON SIDE FACING ROADWAY IN 2" BLACK LETTERS.
6. AIR/VAC RELEASE VALVE ASSEMBLY SHALL BE INSTALLED AT HIGH POINT ON LINE. IF HIGH POINT FALLS IN LOCATION WHERE ASSEMBLY CANNOT BE INSTALLED, PROVIDE ADDITIONAL DEPTH TO CREATE NEW HIGH POINT.
7. CONCRETE VAULT PENETRATIONS SHALL BE CORE DRILLED AND GROUTED.

SNOHOMISH WASHINGTON

1" AIR VACUUM VALVE ASSEMBLY

Approved By: S L S
City Engineer
Date: April 2010

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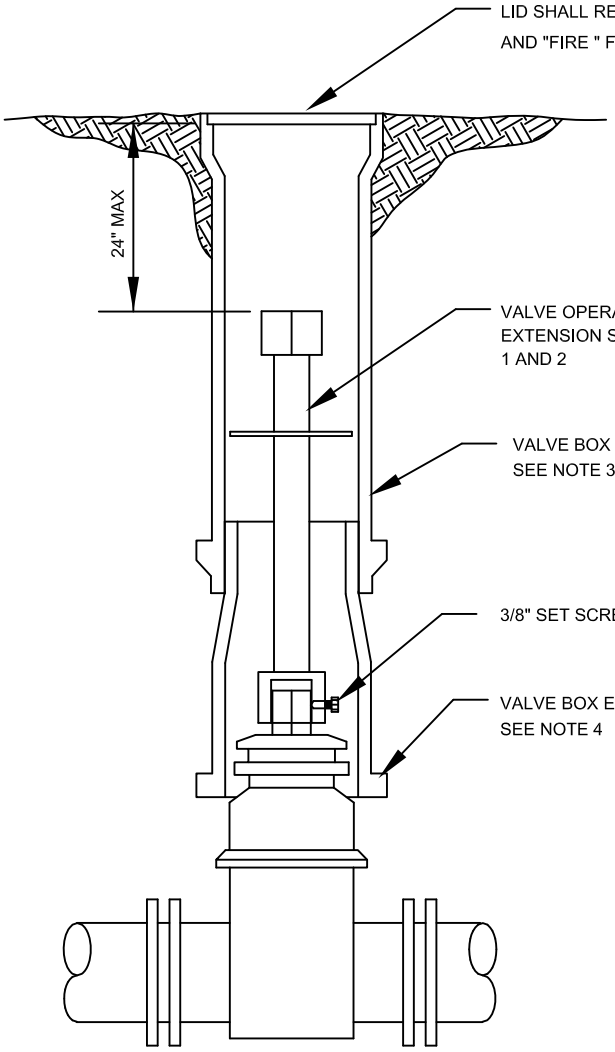
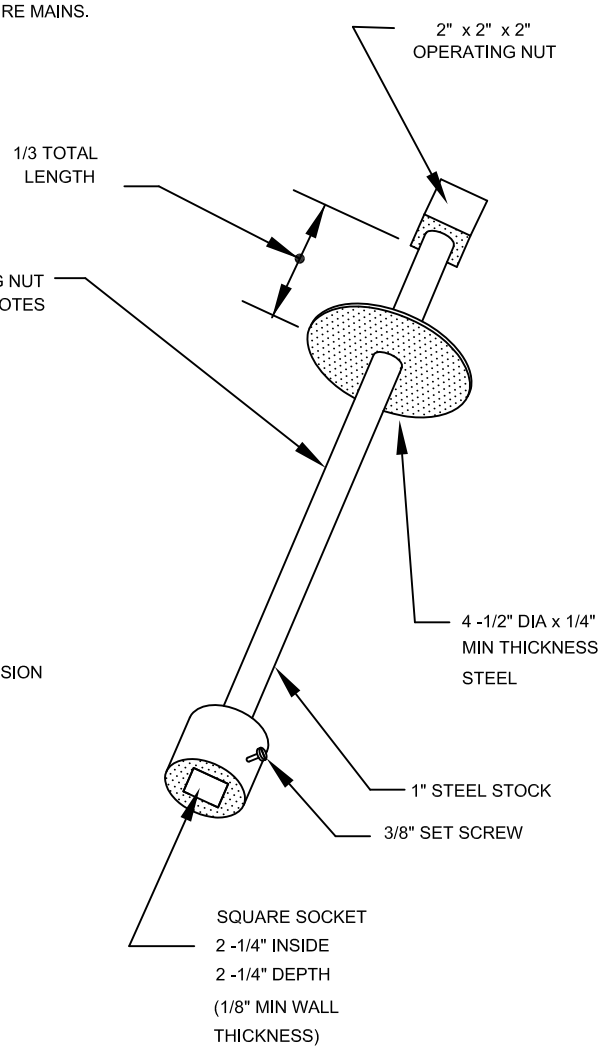
Number

City of Snohomish Public Works Department



VALVE BOX AND EXTENSION



VALVE OPERATING NUT EXTENSION

NOTES:

1. VALVE OPERATING NUT EXTENSIONS ARE REQUIRED WHEN THE VALVE NUT IS MORE THAN THREE (3) FEET BELOW FINISHED GRADE. EXTENSIONS ARE TO BE A MINIMUM OF ONE (1) FOOT LONG. ONLY ONE EXTENSION WILL BE ALLOWED PER VALVE.
2. ALL VALVE OPERATING NUT EXTENSIONS ARE TO BE MADE OF STEEL,SIZED AS NOTED AND PAINTED WITH TWO (2) COATS OF METAL PAINT.
3. VALVE BOXES IN PAVED AREAS SHALL BE CAST IRON, TWO PIECE UNITS, DESIGNED WITH (LUGS) ON COVER, AS MANUFACTURED BY EAST JORDAN IRON WORKS OR APPROVED EQUAL.
4. APPROVED VALVE BOX EXTENSIONS SHALL BE INSTALLED AT THE TOP OF THE BONNET.
5. ALIGN TABS OR PICK HOLES WITH THE DIRECTION OF THE WATER MAIN.

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WATER VALVE BOX AND EXTENSION

Approved By:
S L S
City Engineer
Date: April 2010

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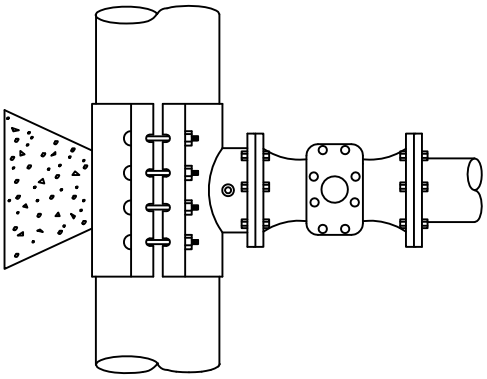
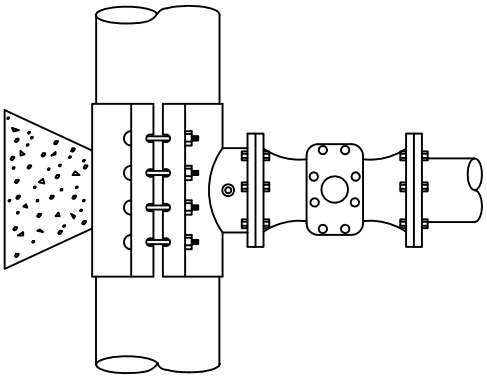
Number

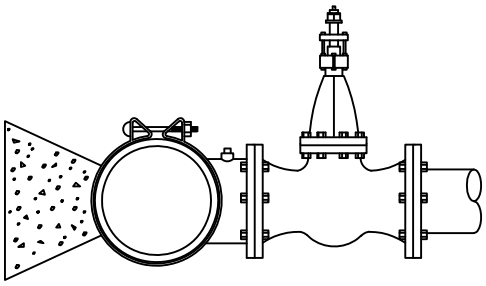
City of Snohomish Public Works Department



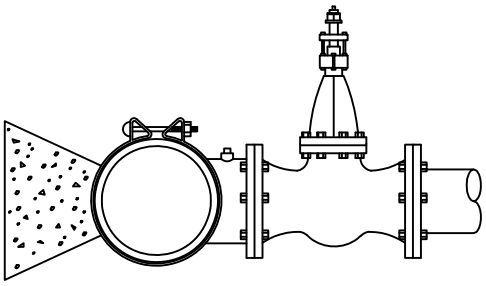
PLAN



PLAN



ELEVATION



ELEVATION

STEEL FABRICATED EPOXY COATED TAPPING SLEEVE

INSTALLED ON DI PIPE

FABRICATED STAINLESS STEEL TAPPING SLEEVE

INSTALLED ON AC PIPE

NOTES:

1. STAINLESS STEEL TAPPING TEES SHALL HAVE FULL CIRCLE SEAL.
2. STEEL TAPPING TEES SHALL BE EPOXY COATED.
3. ALL TEES AND VALVES TO BE WATER TESTED BEFORE TAPPING.
4. NO SIZE ON SIZE TAPS. TAP SHALL BE AT LEAST 2" SMALLER THAN THE EXISTING MAIN.

SNOHOMISH WASHINGTON

TAPPING TEES

Approved By:
S L S
City Engineer
Date: April 2010

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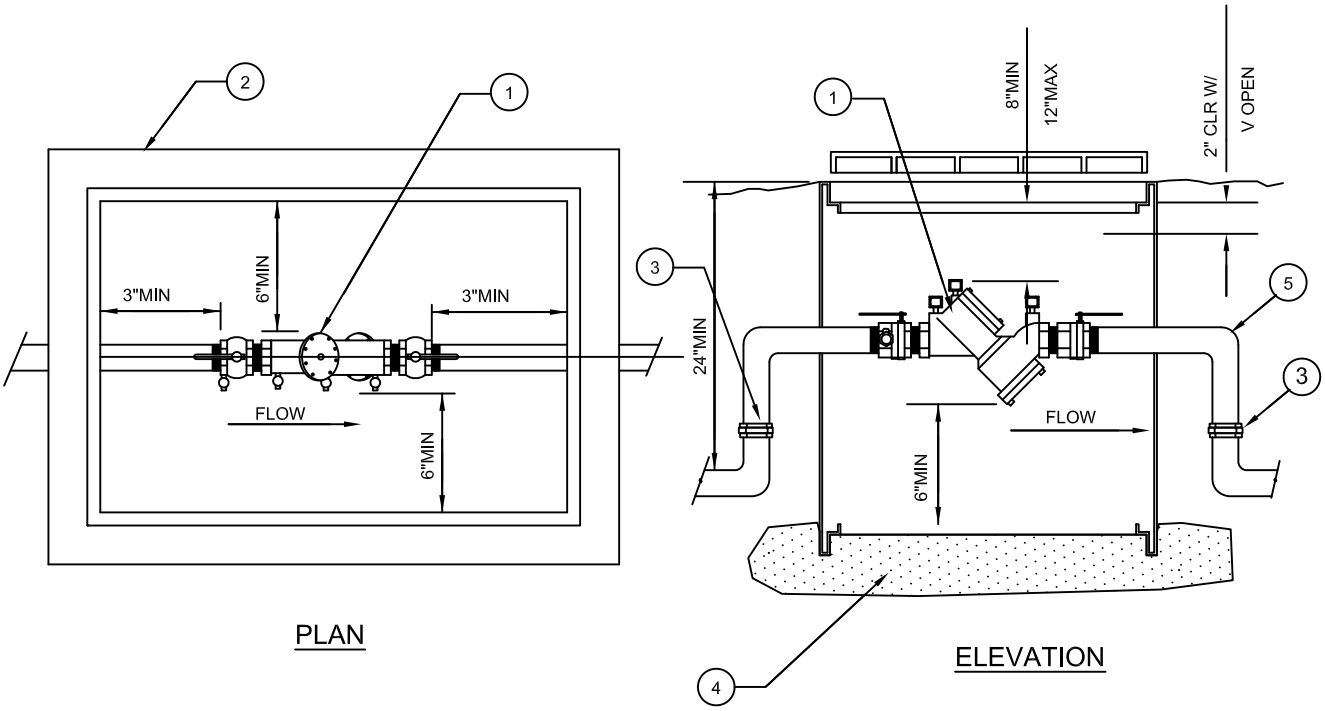
Number

City of Snohomish Public Works Department



MATERIAL LIST:

1. WASHINGTON STATE APPROVED DOUBLE CHECK VALVE ASSEMBLY.
2. IN NON-TRAFFIC AREAS USE:

   FOR 3/4" TO 1" ASSEMBLIES, USE A MID STATE MSBCF 1324-12.

   FOR 1-1/4" TO 2" ASSEMBLIES, USE A MID STATE MSBCF 1730-18.

   IN TRAFFIC AREAS:

   A TRAFFIC LOADED BOX MUST BE USED AND LOCATION APPROVED BY THE CITY OF SNOHOMSIH PRIOR TO INSTALLATION
3. PROVIDE TWO UNIONS.
4. IF A DAYLIGHT DRAIN CANNOT BE PROVIDED THERE MUST BE A 12" MIN LAYER OF FREE DRAINING GRAVEL AT THE BOTTOM OF BOX.
5. ANGLES MAY BE IN OR OUT OF BOX SO LONG AS SUFFICIENT ROOM IS ALLOWED AT EACH END FOR VALVE OPERATION AND DCVA REPAIR OR MAINTENANCE.

NOTES:

1. INSTALL ACCORDING TO MANUFACTURER'S SPECIFICATIONS.
2. INSTALL ONLY IN HORIZONTAL CONFIGURATION, UNLESS APPROVED OTHERWISE BY CITY ENGINEER.
3. INSTALL TEST COCKS FACE UP OR TO ONE SIDE.
4. INSTALL BRASS PLUGS IN ALL TEST COCKS.
5. FOR 3/4" TO 1" ASSEMBLIES, USE A MIDSTATES 1324-12.
6. FOR 1-1/4" TO 2" ASSEMBLIES, USE A MID STATE MSBCF 1730-18.
7. ASSEMBLY REQUIRES CERTIFICATION UPON INSTALLATION AND RECERTIFICATION ANNUALLY.
8. ALL MINIMUM CLEARANCES MUST BE MET.
9. ALL BRANCH CONNECTIONS SHALL BE LOCATED DOWN STREAM OF THE ASSEMBLY. ANY BRANCH CONNECTION ON THE SUPPLY SIDE OF THE ASSEMBLY MUST BE PROTECTED BY A SEPARATE APPROVED BACKFLOW PREVENTION ASSEMBLY.

SNOHOMISH
WASHINGTON

DOUBLE CHECK VALVE ASSEMBLY (DCVA) FOR 2" AND SMALLER

Approved By:
S L S
City Engineer
Date: April 2010

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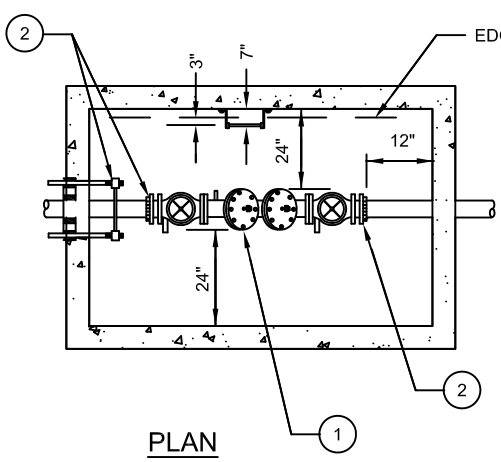
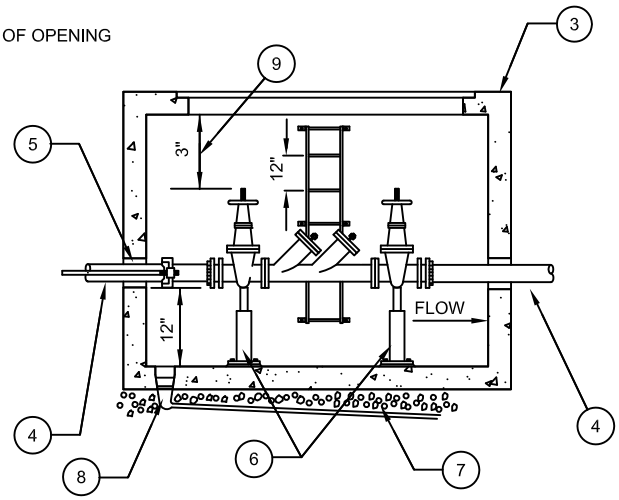
Number

City of Snohomish Public Works Department



PLAN



ELEVATION

MATERIAL LIST:

1. WASHINGTON STATE APPROVED DOUBLE CHECK VALVE ASSEMBLY INCLUDING: 2 EACH 0.S.& Y RESILIENT SEATED GATE VALVES, AND FOUR RESILIENT SEATED TEST COCKS.
2. UNI-FLANGE WITH SET SCREWS OR MJ x FL ADAPTER WITH MEGALUG OR GALVANIZED SHACKLE TO MAIN WITH TWO 3/4" RODS, OR MJ RETAINER GLANDS.
3. PRECAST CONCRETE VAULT WITH STEEL ACCESS HATCH (AS MANUFACTURED BY UTILITY VAULT CO OR AN APPROVED EQUAL). COVER TO READ "WATER". PROVIDE OSHA APPROVED HOT DIPPED GALVANIZED STEEL LADDER. INSTALL LADDER IN SUCH A WAY AS TO PROVIDE VAULT ACCESS THAT DOES NOT INTERFERE WITH INSTALLED EQUIPMENT OR MAINTENANCE THEREOF. PROVIDE A SPRING LOADED TRAFFIC LOAD RATED DOUBLE DOOR.
4. DUCTILE IRON PIPE (SIZED AS REQUIRED) CLASS 52.
5. WATER TIGHT GROUT SHALL BE USED IN ALL VAULT PENETRATIONS.
6. 2 EACH GALVANIZED OR STAINLESS STEEL ADJUSTABLE PIPE SUPPORTS FOR 2-1/2" AND LARGER PIPE.
7. GRAVEL FOUNDATION AS REQUIRED.
8. DRAIN, SLOPE TO DAYLIGHT WHEN POSSIBLE. PROVIDE A SUMP PER STANDARD PLAN 514 IF DAYLIGHT DRAIN CANNOT BE PROVIDED.
9. 3" MIN CLEARANCE FROM UNDERSIDE OF VAULT LID TO STEM AND OS&Y WHEN FULLY OPEN.

NOTES:

1. TEE AND GATE VALVE REQUIRED ON MAIN.
2. ASSEMBLY REQUIRES CERTIFICATION UPON INSTALLATION AND RECERTIFICATION ANNUALLY.
3. TEST COCKS ARE REQUIRED TO BE PLUGGED.
4. MAXIMUM HEIGHT OF ASSEMBLY IS FIVE FEET UNLESS AN OSHA APPROVED PLATFORM IS PROVIDED.
5. MINIMUM INSIDE VAULT HEIGHT IS 78", OR AS APPROVED BY THE ENGINEER, FOR 2-1/2" SERVICE AND LARGER.
6. METER SHALL BE INSTALLED SUCH THAT IT CAN BE READ WITHOUT ENTERING VAULT WITH ACCESS HATCH OPEN.
7. ALL DIMENSIONS ARE MINIMUM CLEARANCE REQUIREMENTS.

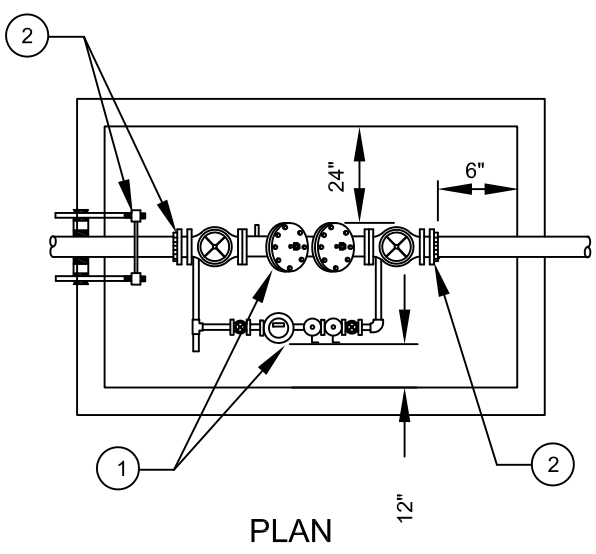
SNOHOMISH
WASHINGTON

DOUBLE CHECK VALVE ASSEMBLY (DCVA) FOR 2-1/2" AND LARGER

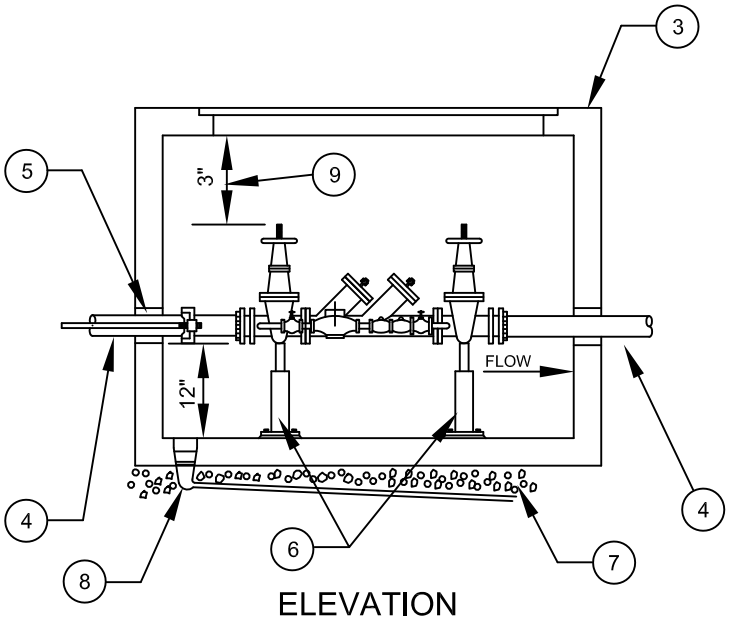
Approved By:
S L S
City Engineer
Date: April 2010

515
Number

City of Snohomish Public Works Department



PLAN



ELEVATION

LEGEND

1. WASHIINGTON STATE APPROVED DOUBLE CHECK DETECTOR VALVE ASSEMBLY METER TO READ IN CUBIC FEET.
2. UNI-FLANGE WITH SET SCREWS OR MJ x FL ADAPTOR WITH MEGALUG OR GALVANIZED SHACKLE TO MAIN WITH 2-3/4" RODS, OR MJ RETAINER GLANDS.
3. PRECAST CONCRETE VAULT WITH STEEL ACCESS HATCH (AS MANUFACTURED BY UTILITY VAULT CO OR AN APPROVED EQUAL). PROVIDE OSHA APPROVED HOT DIPPED GALVANIZED STEEL LADDER INSTALL IN SUCH A WAY THAT VAULT ACCESS DOES NOT INTERFERE WITH INSTALLED EQUIPMENT MAINTENANCE. PROVIDE SPRING LOADED, TRAFFIC LOAD RATED DOUBLE DOOR.
4. DUCTILE IRON PIPE (SIZED AS REQUIRED) CLASS 52.
5. WATER TIGHT GROUT SHALL BE USED IN ALL VAULT PENETRATIONS.
6. 2 - GALVANIZED ADJUSTABLE PIPE SUPPORTS FOR 2 1/2" DIAM AND LARGER PIPE.
7. GRAVEL FOUNDATION AS REQUIRED.
8. DRAIN, SLOPE TO DAYLIGHT WHEN POSSIBLE. INSTALL SUMP PER STANDRD PLAN 518.
9. 3" MIN CLEARANCE FROM UNDERSIDE OF VAULT LID TO STEM OF OS&Y WHEN FULLY OPEN.

NOTES

1. TEE AND GATE VALVE REQUIRED ON MAIN.
2. SINGLE DETECTOR CHECKS ARE NOT APPROVED BACKFLOW PREVENTION DEVICES.
3. ASSEMBLY REQUIRES TESTING UPON INSTALLATION, RETROFITTING, MOVING OR REPAIR AND TESTED ANNUALLY.
4. TEST COCKS ARE REQUIRED TO BE PLUGGED.
5. MAXIMUM HEIGHT OF ASSEMBLY IS FIVE FEET UNLESS AN OSHA APPROVED PLATFORM IS PROVIDED.
6. MINIMUM INSIDE VAULT HEIGHT IS 78" OR AS APPROVED BY THE CITY ENGINEER FOR 3" SERVICE AND LARGER.
7. METER SHALL BE INSTALLED SUCH THAT IT CAN BE READ WITHOUT ENTERING VAULT WITH ACCESS HATCH OPEN.
8. ALL DIMENSIONS ARE MINIMUM CLEARANCE REQUIREMENTS.

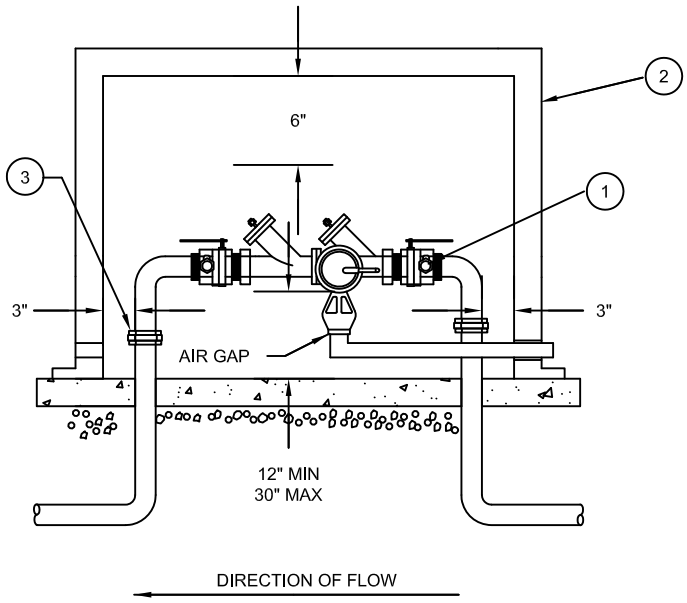
SNOHOMISH WASHINGTON

DOUBLE CHECK DETECTOR VALVE ASSEMBLY (DCDA) 2 1/2" AND LARGER

Approved By:
S L S
City Engineer
Date: April 2010

516
Number

City of Snohomish Public Works Department



ELEVATION

MATERIAL LIST:

1. WASHINGTON STATE APPROVED REDUCED PRESSURE BACKFLOW ASSEMBLY
2. INSULATED PROTECTIVE ENCLOSURE (HOT BOX) REQUIRED FOR OUTSIDE INSTALLATIONS. THE PROTECTIVE ENCLOSURE MUST BE PROVIDED WITH DRAINS AT BOTH ENDS OF THE BOTTOM SUFFICIENTLY SIZED TO PROVIDE FREE GRAVITY DRAINAGE OF MAXIMUM DISCHARGE OF RELIEF VALVE PORT (2" MIN).
3. 90° ELBOW WITH A CLOSE NIPPLE AND UNION ON VERTICAL.

NOTES:

1. ASSEMBLY REQUIRES CERTIFICATION UPON INSTALLATION AND RECERTIFICATION ANNUALLY, BY OWNER.
2. THE ENCLOSURE MUST BE INSTALLED ON A 4" THICK CONCRETE PAD.
3. AN ELECTRICAL OUTLET MUST BE PROVIDED.
4. GUARD POSTS SHALL BE INSTALLED IF LOCATED IN A TRAFFIC AREA.
5. ALL BRANCH CONNECTIONS SHALL BE LOCATED ON THE DOWNSTREAM SIDE OF THE ASSEMBLY.

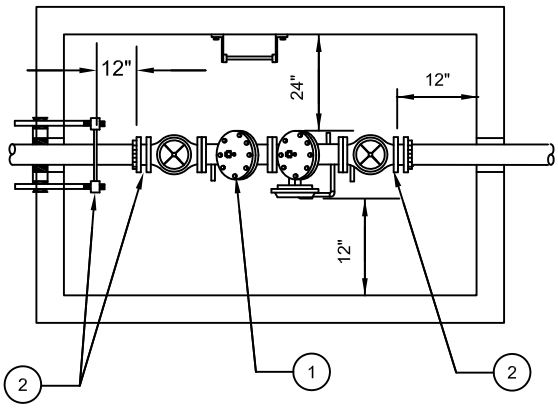
SNOHOMISH
WASHINGTON

REDUCED PRESSURE BACKFLOW ASSEMBLY (RPBA) 2" AND SMALLER

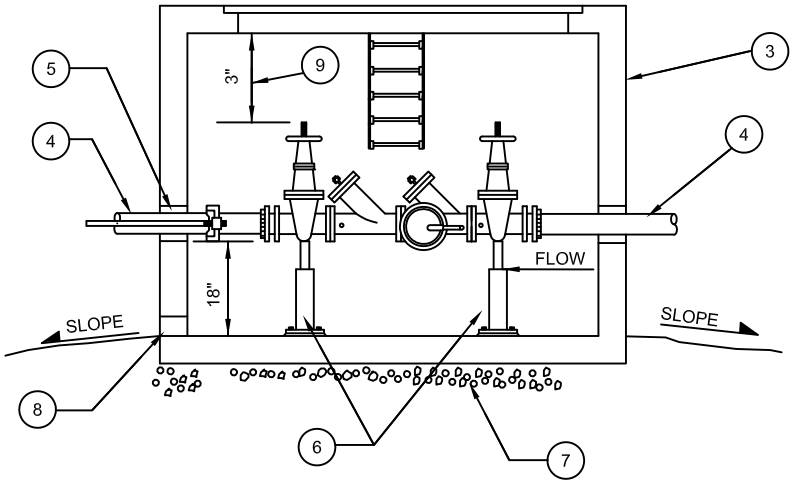
Approved By:
S L S
City Engineer
Date: April 2010

517
Number

City of Snohomish Public Works Department



PLAN



ELEVATION

MATERIAL LIST:

1. WASHINGTON STATE APPROVED REDUCED PRESSURE BACKFLOW ASSEMBLY
2. UNI-FLANGE WITH SET SCREWS OR MJ x FL ADAPTOR WITH MEGALUG OR GALVANIZED SHACKLE TO MAIN WITH TWO 3/4" RODS, OR MJ RETAINER GLANDS.
3. INSULATED PROTECTIVE ENCLOSURE (HOT BOX) REQUIRED FOR OUTSIDE INSTALLATIONS. THE PROTECTIVE ENCLOSURE MUST BE PROVIDED WITH DRAINS AT BOTH ENDS OF THE BOTTOM AND SUFFICIENTLY SIZED TO PROVIDE FREE GRAVITY DRAINAGE OF MAXIMUM DISCHARGE OF RELIEF VALVE PORT (2" MIN.).
4. DUCTILE IRON PIPE (SIZED AS REQUIRED) CLASS 52.
5. WATER TIGHT GROUT SHALL BE USED IN ALL VAULT PENETRATIONS.
6. 2 EACH GALVANIZED ADJUSTABLE PIPE SUPPORTS.
7. 5/8" CRUSHED ROCK FOUNDATION AS REQUIRED.
8. DRAIN SHALL BE INSTALLED WITH APPROVED AIR GAP, BE ABLE TO BE BORE SIGHTED TO DAYLIGHT WHICH MUST BE ABOVE 100 YEAR FLOOD LEVEL. DRAIN WILL BE SIZED SO AS TO PROVIDE FREE GRAVITY DRAINAGE OF MAXIMUM DISCHARGE OF RELIEF VALVE PORT.
9. 3" MIN CLEARANCE FROM UNDERSIDE OF VAULT LID TO STEM OF OS&Y WHEN FULLY OPEN.

NOTES:

1. TEE AND GATE VALVE REQUIRED AT WATER MAIN.
2. TEST COCKS ARE REQUIRED TO BE PLUGGED.
3. MAXIMUM HEIGHT OF ASSEMBLY IS FIVE FEET UNLESS AN OSHA APPROVED PLATFORM IS PROVIDED.
4. MINIMUM INSIDE VAULT HEIGHT IS 78", OR AS APPROVED BY CITY ENGINEER, FOR 2-1/2" SERVICE AND LARGER.
5. INSIDE INSTALLATIONS SEE STD. DETAIL NO. W-120.
6. ALL DIMENSIONS ARE MINIMUM CLEARANCE REQUIREMENTS.
7. ASSEMBLY REQUIRES CERTIFICATION UPON INSTALLATION AND RECERTIFICATION ANNUALLY.

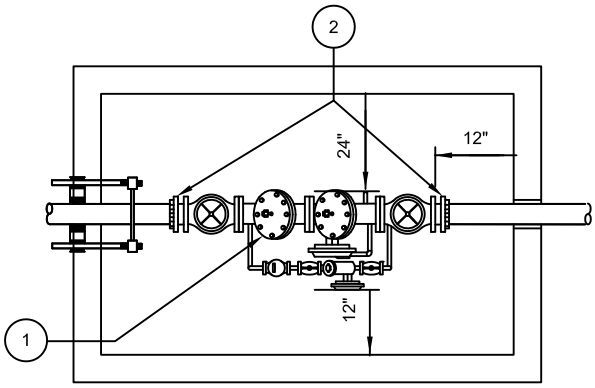
SNOHOMISH
WASHINGTON

REDUCED PRESSURE BACKFLOW ASSEMBLY (RPBA) 2-1/2" AND LARGER

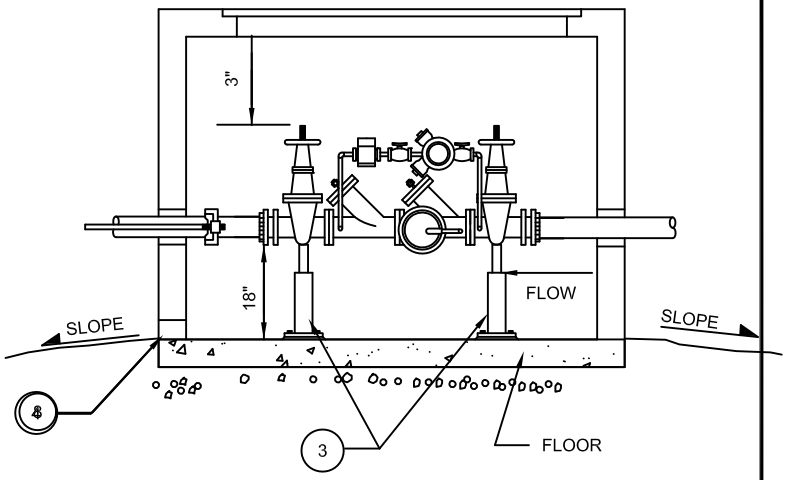
Approved By:
S L S
City Engineer
Date: April 2010

518
Number

City of Snohomish Public Works Department



PLAN



ELEVATION

MATERIAL LIST:

1. WASHINGTON STATE APPROVED REDUCED PRESSURE DETECTOR ASSEMBLY I (METER TO READ IN CUBIC FEET),
2. UNI-FLANGE WITH SET SCREWS OR MJ x FL ADAPTER WITH MEGALUG OR GALVANIZED SHACKLE TO MAIN WITH 2 EACH 3/4" RODS, OR MJ RETAINER GLANDS.
3. TWO - GALVANIZED ADJUSTABLE PIPE SUPPORTS FOR 2-1/2" DIAMETER AND LARGER PIPE.
4. DRAIN SHALL BE INSTALLED WITH APPROVED AIR GAP, BE ABLE TO BE BORE SIGHTED TO DAYLIGHT WHICH MUST BE ABOVE 100 YEAR FLOOD LEVEL. DRAIN WILL BE SIZED SO AS TO PROVIDE FREE GRAVITY DRAINAGE OF MAXIMUM DISCHARGE OF RELIEF VALVE PORT.

NOTES:

1. TEE AND GATE VALVE REQUIRED AT WATER MAIN.
2. TEST CLOCKS ARE REQUIRED TO BE PLUGGED IF ASSEMBLY IS INSTALLED UNDERGROUND.
3. ASSEMBLY REQUIRES CERTIFICATION UPON INSTALLATION AND RECERTIFICATION ANNUALLY, BY OWNER.
4. 2 1/2" AND LARGER RPDAS REQUIRE EITHER AN APPROVED BUILDING ENCLOSURE.
5. INSULATED PROTECTIVE ENCLOSURE (HOT BOX) REQUIRED FOR OUTSIDE INSTALLATIONS. THE PROTECTIVE ENCLOSURE MUST BE PROVIDED WITH DRAINS AT BOTH ENDS OF THE BOTTOM AND SUFFICIENTLY SIZED TO PROVIDE FREE GRAVITY DRAINAGE OF MAXIMUM DISCHARGE OF RELIEF VALVE PORT (2" MIN.).

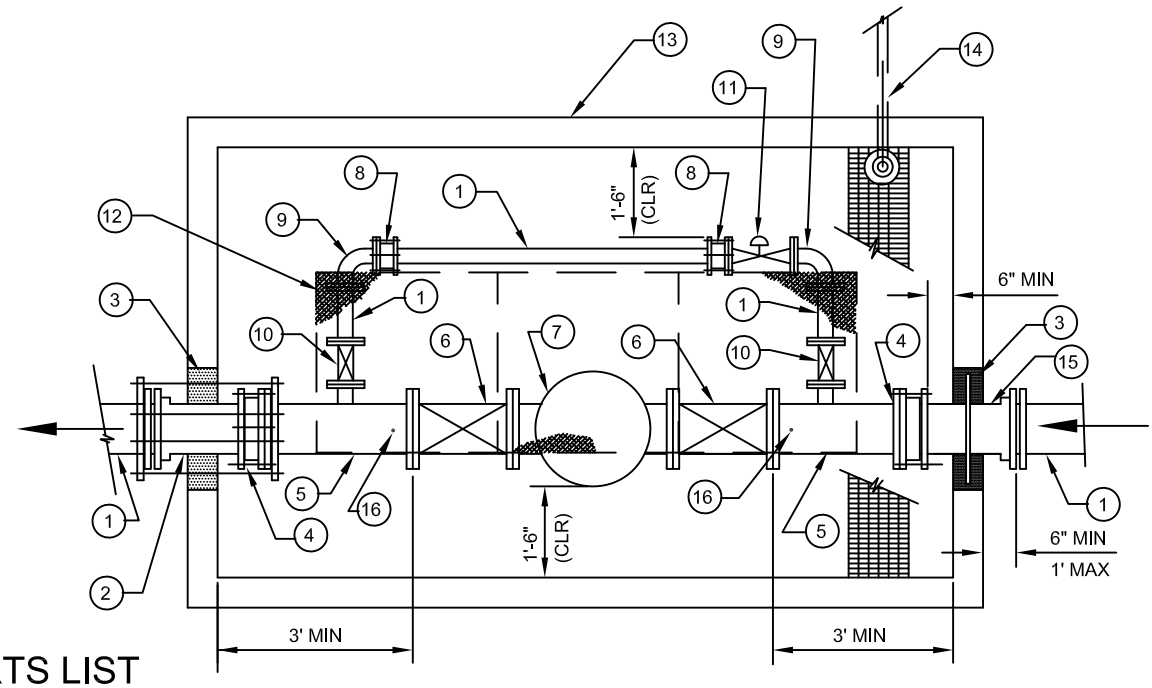
SNOHOMISH WASHINGTON

REDUCED PRESSURE DETECTOR ASSEMBLY (RPDA) 2 1/2"AND LARGER

Approved By:
S L S
City Engineer
Date: April 2010

519
Number

City of Snohomish Public Works Department



PARTS LIST

1. DUCTILE IRON PIPE
2. SPOOL (MJxPE) WITH SHACKLE BOLTS TO BE USED IN PRECAST VAULTS
3. NON-SHRINK GROUT
4. FLANGE COUPLING ADAPTOR (FLxMJ)
5. TEE (ALL FL)
6. GV CL 200 (FLxFL)
7. PRV (FLxFL)
8. FLANGE COUPLING ADAPTOR
9. 90° ELL (ALL MJ W/MEGA LUGS)
10. GV (FLxFL)
11. PRV (FLxFL)
12. UTILITY VAULT CO LID WITH TRAFFIC LOADED LOCKING STEEL COVERS OR EQUAL.
13. UTILITY VAULT CO PRECAST VAULT.
14. 2" GRAVITY SUMP DRAIN EXTEND TO DAY-LIGHT OR TO STORM DRAINAGE SYSTEM.
15. WALL SLEEVE (FLxPE) TO BE USED WITH CAST IN PLACE VAULTS.
16. 1/4" GAUGE TAPS WITH 1/4" BALL VALVES FOR ISOLATION.

NOTES

1. MINIMUM VAULT INSIDE HEIGHT SHALL BE 78", OR AS APPROVED BY THE ENGINEER.
2. MINIMUM CLEARANCE BETWEEN PRV VALVES AND FLOOR SHALL BE 12".
3. PROVIDE LIQUID FILLED 2 1/2" GAUGES AMETEK SERIES 550L OR EQUAL.
4. ALL EQUIPMENT MUST BE RATED FOR SOURCE PRESSURE.
5. PIPING AND VALVES SHALL BE SUPPORTED BY POURED-IN-PLACE CONCRETE OR STEEL STANDS. NUMBER OF AND PLACEMENT OF STANDS TO BE DETERMINED BY CITY ENGINEER ACCORDING TO VALVE SIZE.
6. BRAND, MINIMUM CLEARANCES, TYPE OF PRV AND ACCESSORIES TO BE DETERMINED BY CITY OF SNOHOMISH PUBLIC WORKS DIVISION.

SNOHOMISH
WASHINGTON

TYPICAL PRV INSTALLATION

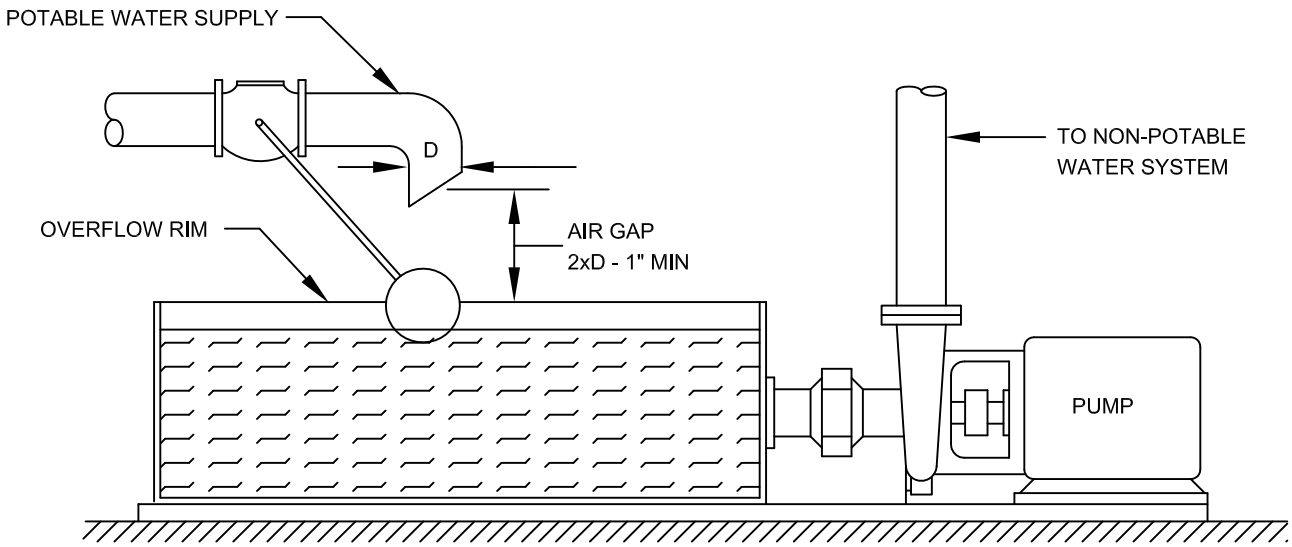
Approved By:
S L S
City Engineer
Date: April 2010

520
Number

City of Snohomish Public Works Department

APPROVED AIR GAP SEPARATION

AN APPROVED AIR GAP IS A PHYSICAL SEPARATION BETWEEN THE FREE FLOWING DISCHARGE END OF A POTABLE WATER SUPPLY PIPELINE AND THE OVERFLOW RIM OF AN OPEN OR NON-PRESSURE RECEIVING VESSEL. THESE VERTICAL, PHYSICAL SEPARATIONS MUST BE AT LEAST TWICE THE DIAMETER OF THE INLET PIPE BUT NEVER LESS THAN ONE INCH. IF SPLASHING IS A PROBLEM, TUBULAR SCREENS MAY BE ATTACHED OR THE SUPPLY LINE OUTLET MAY BE CUT AT A 45 DEGREE ANGLE. IF SUPPLY LINE IS CUT AT A 45 DEGREE ANGLE THE AIR GAP DISTANCE IS MEASURED FROM THE CENTER OF THE ANGLE. HOSES ARE NOT ALLOWED. BYPASSES ARE NOT ALLOWED. THE INSPECTION OF AIR GAPS SHALL BE INCLUDED IN THE YEARLY TESTING PROGRAM FOR BACKFLOW DEVICES.



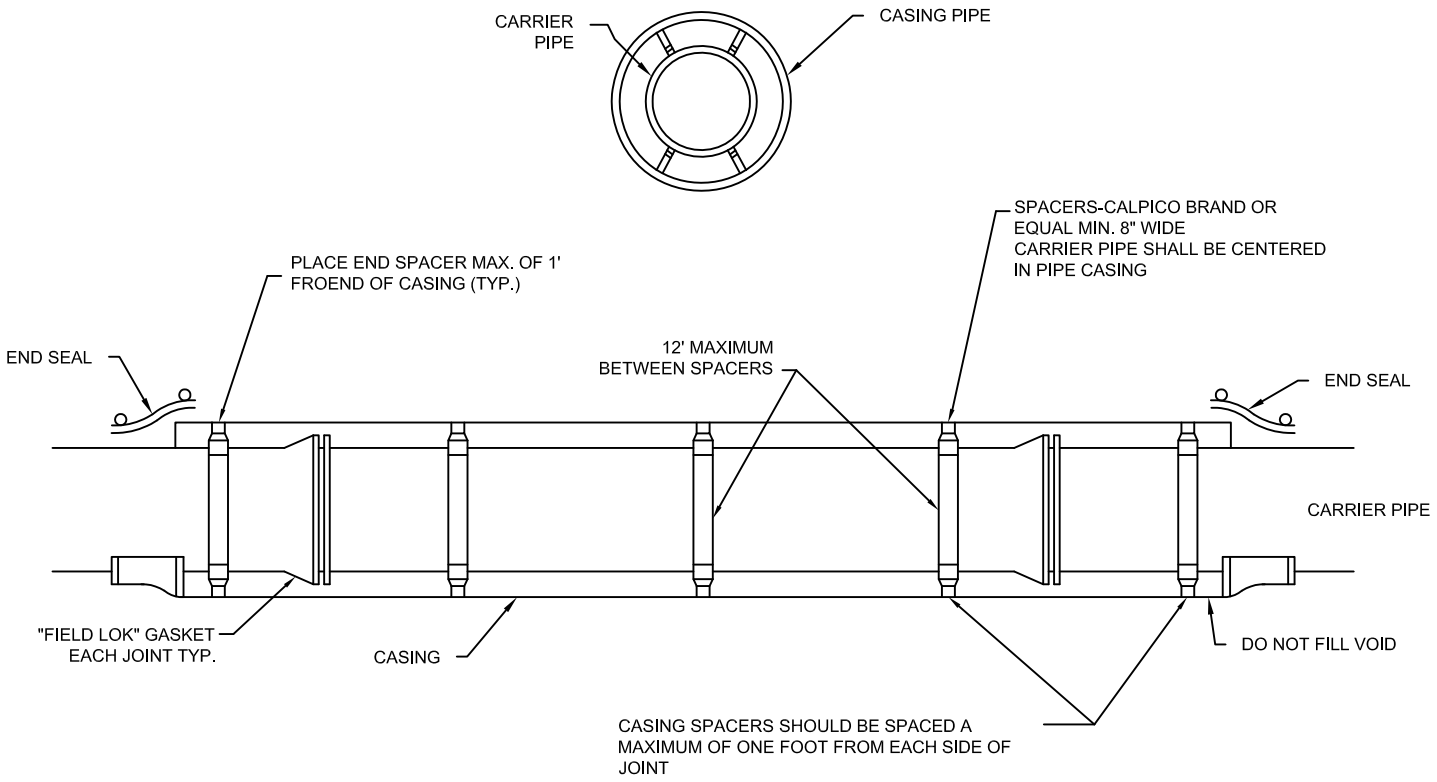
SNOHOMISH
WASHINGTON

AIR GAP FOR MAKEUP TANK

Approved By:
S L S
City Engineer
Date: April 2010

521
Number

City of Snohomish Public Works Department



CARRIER PIPE DIAMETER	4"	6"	8"	10"	12"
CASING DIAMETER (MJ/MEGALUG JOINT CARRIER PIPE)	14"	16"	18"	20"	22" *
STEEL CASING THICKNESS	0.25"	0.25"	0.25"	0.25"	0.25
SPACER BAND WIDTH	8"	8"	8"	8"	8"

* USE 24" DUCTILE IRON PIPE

NOTES:

1. ANY VARIATION TO THIS DETAIL SHALL BE REVIEWED AND APPROVED BY CITY ENGINEER.
2. CASING SHALL BE SEALED AT BOTH ENDS.
3. PIPE CASINGS SHALL EXTEND 6 FEET BEYOND THE EDGE OF PAVEMENT. IF THE RIGHT-OF-WAY IS NOT OWNED BY CITY OFSNOHOMISH, PIPE CASING SHALL EXTEND 6 FEET BEYOND RIGHT-OF-WAY.

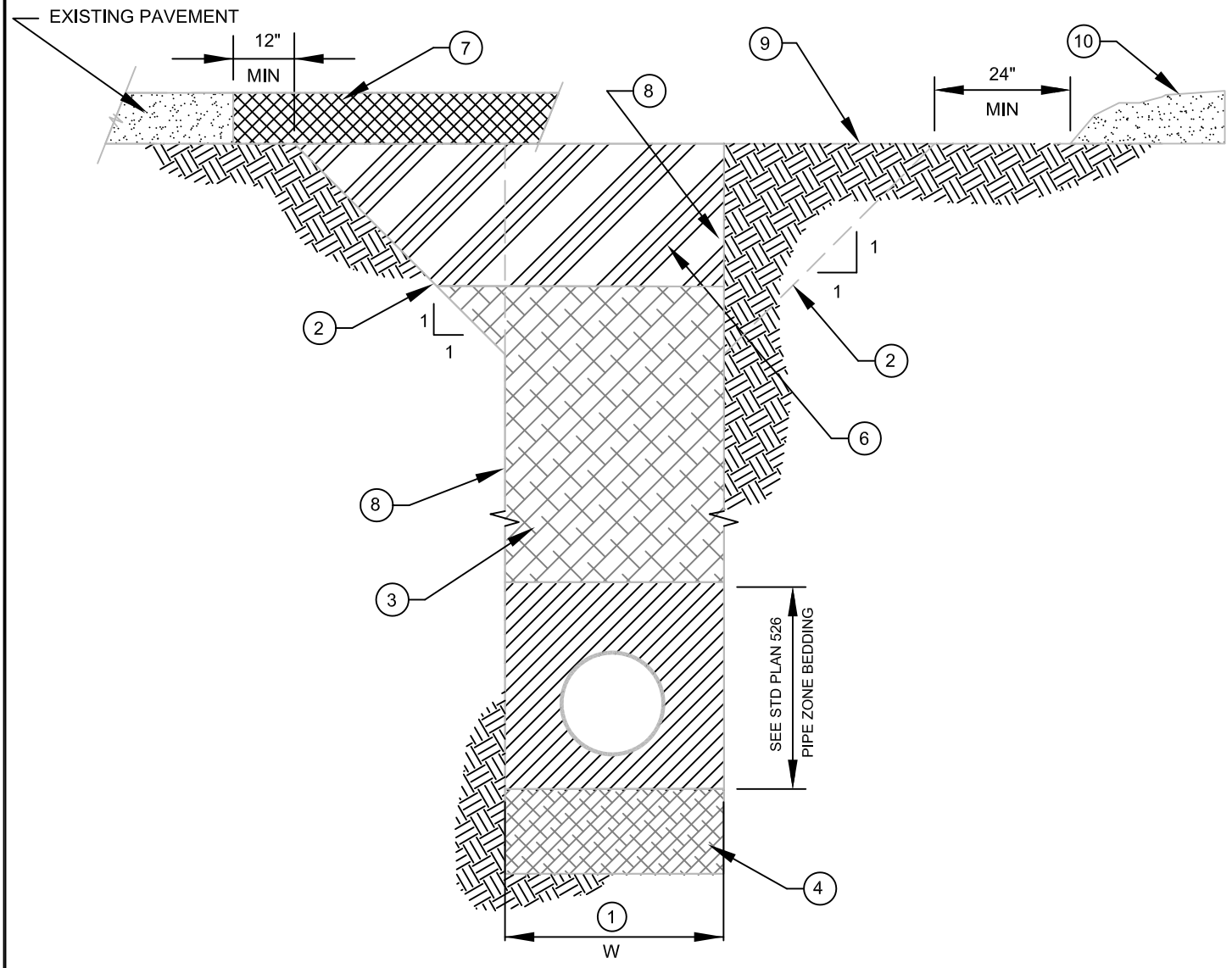
SNOHOMISH WASHINGTON

STEEL CASING FOR WATER MAIN

Approved By: S L S
City Engineer
Date: April 2010

522
Number

City of Snohomish Public Works Department



NOTES

1. W = MAXIMUM WIDTH OF TRENCH FOR PIPES 15" OR LESS IN DIA, W-40 FOR PIPES 18" OR GREATER, W = 1-1/2 X I.D. + 18".
2. ALTERNATE LAID-BACK TRENCH TO MEET O.S.H.A. REQUIREMENTS (NO SLOPES STEEPER THAN 1:1 EXCEPT FOR ROCKE).
3. NATIVE MATERIAL IF ALLOWED IN ADVANCE BY THE CITY ENGINEER, OR IMPORTED GRAVEL BORROW AS DIRECTED SHALL COMPACT TO 90% MAXIMUM DENSITY EXCEPT FROM SUBGRADE DOWN 4' WHICH SHALL BE CSTC.
4. CLASS A FOUNDATION GRAVEL, IF REQUIRED BY THE CITY ENGINEER TO REPLACE UNSUITABLE MATERIAL.
5. FOR ADDITIONAL COMPACTION INFORMATIONS SEE STANDARD PLAN 527
6. THE TOP 4' OF BACKFIL SHALL BE CSTC. THE CONTRACTOR HAS THE OPTION TO FILL THE ENTIRE EXCAVATION TO SUBGRADE WITH CSTC.
7. SEE CITY OF SNOHOMISH STANDARD PLAN 316 FOR PAVEMENT PATCH DETAILS.
8. VERTICAL TRENCH WALLS WITH SHORING SHALL CONFORM TO O.S.H.A. REGULATIONS.
9. SUBGRADE OR GROUND SURFACE IN NON-PAVED AREAS.
10. EXCAVATED NATIVE MATERIAL OR APPROVED STOCKPILED BACKFILL MATERILAL

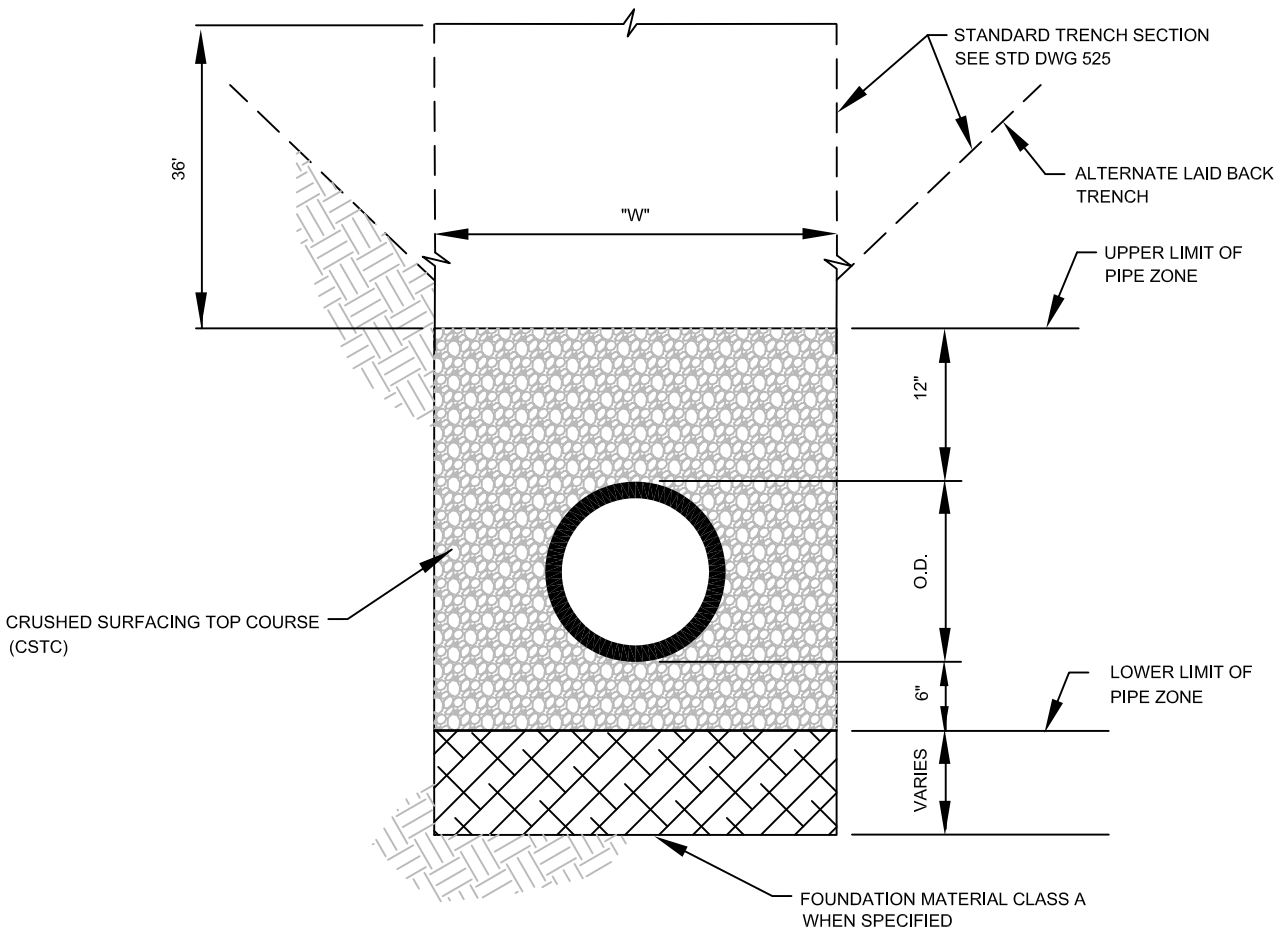
SNOHOMISH
WASHINGTON

TYPICAL WATER TRENCH SECTION

Approved By:
S L S
City Engineer
Date: April 2010

523
Number

City of Snohomish Public Works Department



LIMITS OF TRENCH:

W = MAXIMUM WIDTH OF TRENCH. FOR PIPES 15" OR LESS IN DIAMETER W = 40". FOR PIPES 18" OR GREATER W = 1 1/2 x I.D. + 18".

BEDDING AND FOUNDATION MATERIALS:

1. BEDDING MATERIAL SHALL BE CRUSHED SURFACING TOP COURSE CONFORMING TO SECTION 9-03.08(3) OF THE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION WSDOT/APWA
2. FOUNDATION MATERIAL, IF REQUIRED, SHALL BE FOUNDATION MATERIAL CLASS A CONFORMING TO SECTION 9-03.12 OF THE STANDARD SPECIFICATION FOR ROAD , BRIDGE AND MUNICIAPL CONSTRUCTION WSDOT/APWA.

PROCEDURE FOR COMPACTION:

1. PROVIDE UNIFORM SUPPORT UNDER BARREL.
2. COMPACT BEDDING MATERIAL TO 90% MAXIMUM DENSITY EXCEPT DIRECTLY OVER PIPE. HAND TAMP ONLY.
3. HAND TAMP UNDER HAUNCHES.
4. FOR ADDITIONAL COMPACTION INFORMATION SEE STANDARD PLAN NO. 527.

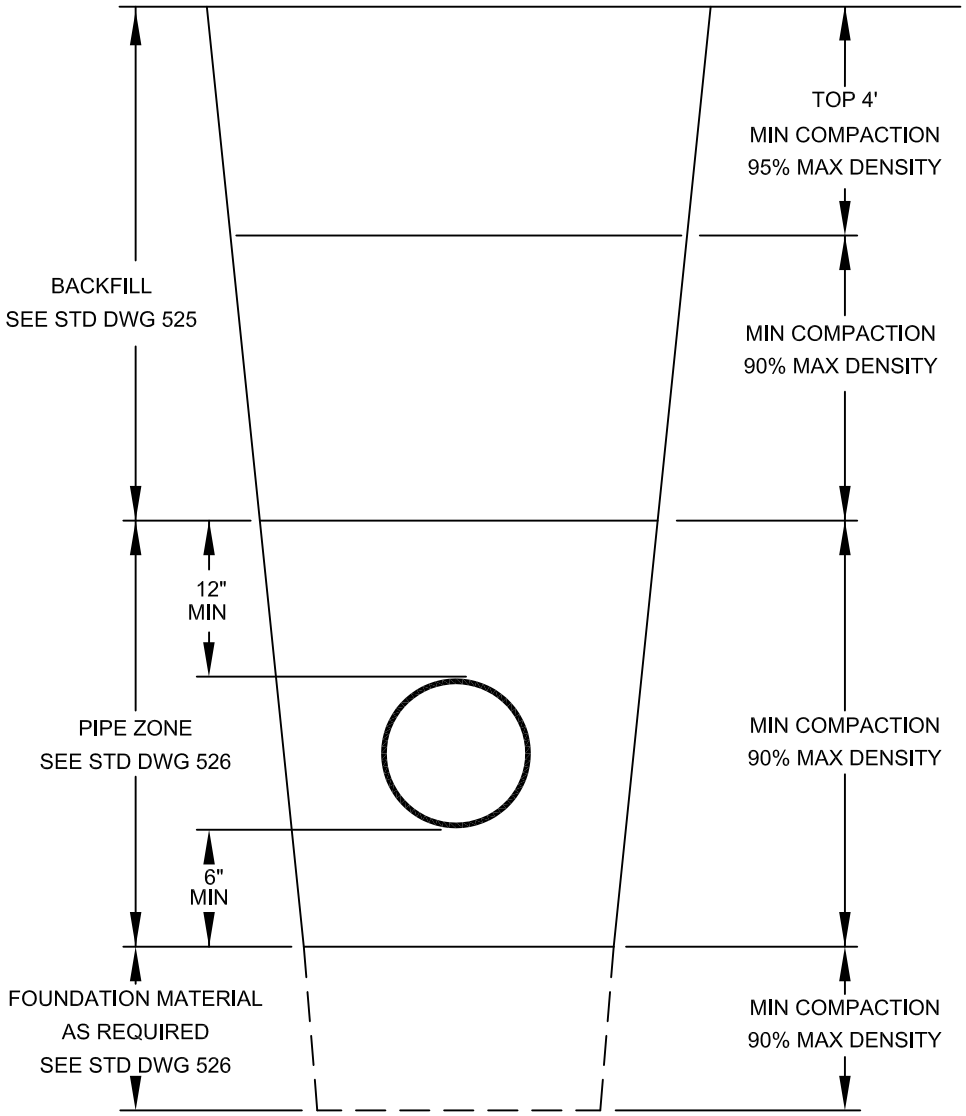
SNOHOMISH
WASHINGTON

BEDDING FOR WATER PIPE IN TRENCHES

Approved By:
S L S
City Engineer
Date: April 2010

524
Number

City of Snohomish Public Works Department



SECTION

NTS

NOTES:

1. ALL BACKFLL MATERIAL SHALL BE PLACED IN LIFTS NOT TO EXCEED 12 INCHES BEFORE COMPACTION UNLESS AUTHORIZED BY THE CITY ENGINEER DUE TO THE CHARACTER OF THE MATERIAL AND COMPACTING EQUIPMENT.
2. MECHANICAL COMPACTION OF BACKFILL MATERIAL SHALL NOT BEGIN UNTIL THE DEPTH OF COMPACTED MATERIAL IS 2 FEET ABOVE THE TOP OF PIPE.
3. EACH LIFT SHALL BE MECHANICALLY COMPACTED TO THE REQUIRED DENSITY PRIOR TO PLACING SUCCEEDING LIFTS OF BACKFILL MATERIAL
4. COMPACTON TESTS SHALL BE AS REQUIRED BY THE CITY ENGINEER, BUT IN NO CASE LESS THAN 2 TESTS EVERY 200 FEET OF TRENCH LENGTH (ONE AT SUBGRADE AND ONE AT 50% OF TRENCH DEPTH).
5. IN PLACE DENSITY WILL BE DETERMINED BY ONE OR MORE OF THE FOLLOWING METHODS
   ASTM D1556 - TEST FOR DENSITY OF SOIL IN PLACE BY THE SAND CONE METHOD.
   ASTM D2167 - (RUBBER. BALLON METHOD)
   ASTM D2922 - (NUCLEAR METHOD)
6. LABORATORY DENSITY WILL BE DETERMINED BY ASTM D698, MOISTURE DENSITY RELATIONS OF SOILS AND SOIL AGGREGATE MIXTURES.

SNOHOMISH
WASHINGTON

TYPICAL WATER TRENCH COMPACTION

Approved By:
S L S
City Engineer
Date: April 2010

525
Number

City of Snohomish Public Works Department