Eastsound Water Users Association

Water Main Extension

Design and Construction Standards

Eastsound Water Users Association
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EASTSOUND WATER USERS ASSOCIATION

DESIGN AND CONSTRUCTION STANDARDS

These Design & Construction Standards and the accompanying Standard Drawings are intended to assist project owners and engineers in understanding the requirements and preferences of Eastsound Water Users Association in the design and construction of water main extensions. The design of other types of improvement projects shall adhere to Washington State Department of Health standards and guidelines and the requirements of WAC 246-290. These standards are intended as guidelines and NOT SPECIFICATIONS; therefore, the legal responsibility for project document preparation shall continue to reside with the Design Professional. Engineers shall contact EWUA prior to design completion to discuss the project and to determine any specific requirements that pertain to the work.

A. Design Standards and Requirements

1. Submittal Requirements

A project report, construction drawings and technical specifications for water main extension projects shall be submitted to Eastsound Water Users Association (EWUA) by an engineer, licensed in Washington State. The report and drawings will be reviewed by EWUA to insure conformance with Washington State Department of Health and local requirements. Construction may not begin until the submitted documents are approved by EWUA. Project reports are not required for all distribution system projects. Refer to WAC 246-290-125 for submittal exceptions.

The project report, construction drawings and technical specifications shall include:

a. A narrative discussion documenting the availability of adequate source and storage to serve the proposed service area including a summary of the hydraulic analysis for the proposed system expansion and the effect on the existing system.

b. The identification and description of proposed land use within the project area.

c. A hydraulic analysis which demonstrates the ability of the project to supply 30 psi during peak flows (peak hourly demand PHD) and 20 psi during fire flows. The analysis should include a narrative discussion that describes the hydraulic analysis method, explains critical assumptions, and summarizes the effect of the proposed expansion on the existing system. EWUA maintains a hydraulic computer model of the water system. Contact EWUA for additional information or to run the model. A fee will be assessed for model runs.

d. A service area map designating specific properties to be served.

e. A distribution system map showing location of water lines, sizes, type of pipe, pressure zones, easements, location of critical control valves.

f. The specifications for materials, construction, depth of pipe, pressure and leakage testing, and disinfection in accordance with these and other standards referenced herein.

g. Detailed drawings for service connections, air and vacuum relief valves, bury, pressure reducing valves, thrust blocking or restraint systems, backflow assemblies, fire hydrants, and other system appurtenances. Reference to EWUA Standard Drawings is acceptable where applicable.

Review fees will be assessed and must be received as a condition of approval.

2. *General Requirements*

a. Detailed plans and specifications shall prepared by a professional engineer (P.E.) licensed in the State of Washington (hereinafter, the project engineer) and warranted by same to be in accordance with these Design and Construction standards, all applicable rules, regulations, laws and ordinances and that the plans and specifications are in accordance with good engineering practices, standards, and criteria. The project engineer shall act on behalf of the project owner in furnishing the necessary statements and completion records as stipulated by EWUA. The plans and specifications shall be submitted to EWUA for review and approval and may also be required to be submitted to the WSDOH for review and approval. Appropriate fees will be charged to the project owner for the review and approval process.

b. No construction, installation, removal, connection to, or alteration of the EWUA system shall occur until approval from EWUA has been granted both as to the plans and specifications and any other matter related to the project. Approval by EWUA does not constitute a warrant that plans, specifications, or other requirements are in complete conformance to these Design and Construction standards. Any deficiencies discovered in the course of construction or project approval are the sole responsibility of the project owner to correct.

c. Once approved, no deviation from the plans and specifications shall occur without the prior approval of the project engineer and either the EWUA General Manager or EWUA's engineer. Approved "as-built" changes are to be documented with copies to EWUA staff. EWUA through their engineer shall provide construction observation to ensure conformance with the approved plans and specifications. A fee will be charged for this service. However EWUA reserves the right to require that the project engineer provide this

function. In that case the project engineer shall observe the work periodically during construction to insure conformance with the approved plans and specifications. Further it is the project engineer's responsibility to keep appropriate, complete, proper and accurate records during the course of the project to insure that all necessary reports, records, results, and documentation can be provided to EWUA.

d. When the project engineer provides construction observation EWUA will also periodically inspect the work. The inspector will advise the project owner or owner's representative when, in the inspector's opinion, the work does not conform to the plans and specifications, but will in no way take control of the project owner's work. The EWUA inspector is not responsible for collecting information required by the project engineer for the preparation of the engineer's report.

e. The project owner shall furnish all permits, insurance, bonds, materials, labor, tools, easements, and equipment required for the safe, efficient, and orderly excavating, installation, backfilling, testing, recordkeeping, and site restoration of the work called for in the plans and specifications.

f. The owners of a proposed project are considered to be solely responsible for adherence to these standards. The owner may delegate the work to an engineer or a contractor or an agent who will be considered by EWUA to be acting on behalf of the owner.

g. These standards are considered to be a part of any contract, oral or written, between EWUA and the project owner. Implementation of the project by the owner constitutes explicit acceptance of the terms, conditions, and provisions herein.

h. If any conflict exists between these Design and Construction standards and any other referenced standard, the more restrictive requirement shall govern. If there is an irresolvable conflict, the project owner or project engineer may apply for a waiver from these standards. Waivers to these standards are only valid if provided in writing from EWUA. Any water main specifications that EWUA provides to the owner as part of the plan review are considered a part of these Design and Construction standards.

i. Project owner shall contact utilities in the project area at least 48 hours in advance of work to obtain markouts and conditions of work.

j. All salvageable water system materials provided by EWUA shall be turned over to EWUA at a location so specified by EWUA.

k. The project owner may be required to furnish a surety bond or bonds covering the faithful performance of the work. A performance bond may be required to insure the adequate performance of the work and to guarantee payment of any and all liability of any type, kind, nature, and description due as a result of the owner's work throughout the warranty period.

l. If, in EWUA's sole judgment, the owner should neglect to prosecute the work properly or fail to meet provisions of these standards or any other condition required by EWUA, EWUA may, without prejudice to any other remedy that it may have, make good such deficiencies and may assess the cost thereof as a charge against the owner to be paid prior to approval of the project. Normally five (5) days written notice will be provided to the owner unless the health, safety, or welfare of others is compromised and, in the sole judgment of EWUA, such remedy requires immediate response. Any incidental damage or delay resulting from EWUA's right to do the work shall not become a charge against EWUA.

m. The project engineer shall provide written certification as to all matters required by EWUA including, without limitation, certifications that the modifications to the water system have been installed in accordance with the approved plans and specifications, that as installed they meet these Design and Construction standards, all applicable rules, regulations, laws and requirements and that the system has been tested and found to be in good operating order free from defects. All required documentation including WSDOH Construction Completion Report, WSDOH Pressure, Leakage and Bacteriological Test Report, construction progress reports, as-built records and any other report required by EWUA and/or the WSDOH shall be provided by the project engineer and certified as accurate and true.

n. Water service to the project will not be provided by EWUA until all required documentation has been received and accepted, outstanding charges by EWUA have been paid, proof of lien releases supplied, membership requirements, if applicable, have been satisfied, and the works accepted by EWUA.

o. The project owner shall dedicate the approved and completed works to EWUA if required as condition of service. EWUA will be the sole operator of the works thereafter. Ownership of the works automatically transfers to EWUA after one year from the date of acceptance by EWUA. The owner is liable for one year from the date of acceptance for the warranty of all charges for repairs of defects that may be discovered. The owner will be given an opportunity to promptly make such repairs in accordance with EWUA standards, prior to EWUA making the repairs unless such a provision would unduly threaten the integrity of the system. A performance bond, at the sole discretion of EWUA, may be required to insure conformance with this rule.

Failure by the owner to uphold this warranty provision will result in the suspension of service and ownership transfer by EWUA.

p. A project will be considered as being complete and ready for service when:
    i. The engineer submits and certifies that the work was constructed in accordance with all applicable standards and the submitted plans and specifications using a WSDOH approved form.
    ii. The engineer submits and certifies to be true the results of construction inspection tests including flushing, pressure tests, disinfection, and water quality sampling.
    iii. The engineer submits and certifies to be true an accurate "as-built" drawing that identifies the actual infrastructure that was installed including all modifications to the approved plans and specifications.
    iv. The engineer completes and submits to EWUA WSDOH Construction Completion Report, WSDOH Pressure, Leakage and Bacteriological Test Report.
    v. All punch-list items generated by EWUA.
    vi. Payment of all fees and charges rendered to the project owner.
    vii. Completion of all conditions identified by EWUA including the posting of required performance bonds.
    viii. An offer of dedication of all appropriate infrastructure has been tendered by the owner and accepted by EWUA if such an offer is specified by EWUA.

3. Design Standards

a. All work, material, methods, plans and specifications shall conform to the current Rules and Regulations of the State Board of Health regarding Public Water Supplies, Chapter 246-290 Washington Administrative Code (Group A Public Health Water System Regulations). Also the current edition of the WSDOH Water System Design Manual will be used as the basis for design and performance approval.

b. It is the responsibility of project owners to perform work, supply materials, and undertake methods to insure compliance with applicable standards. However, if an EWUA plan or specification differs from these standards, the provisions of the EWUA plan or specification shall govern.

c. EWUA system design information and requirements:
    i. Maximum day demand (MDD) = 275 gallons per day per ERU.
    ii. Residential fire flow = 500 gpm for 20 minutes
    iii. Commercial fire flow = 1000 gpm for 1 hour
    iv. Minimum pressure = 30 psi during peak hour demand (PHD) at the property line.
    v. Minimum pressure under fire flow conditions = 20 psi during MDD

vi. Minimum pipe size = 6-inch diameter unless hydraulic calculations show conformance with minimum standards using smaller pipe.
vii. Maximum water velocity = 8 feet per second
viii. Minimum service line diameter = ¾ inch for single residence, 1-inch for dual residence line. Lines may be larger for longer runs or for services to commercial and multi-family uses.

d. Valves should be located on the outlets of all tees where mains intersect and otherwise such that an interruption will not affect more than 500 feet of mains in commercial districts or 1,000 feet of mains in residential districts. Obtain EWUA approval for all valve locations prior to construction.

e. EWUA does not guarantee its ability to provide sufficient pressure or flow in any portion of its service area. Project owners are responsible for any and all costs associated with increasing flow and/or pressure levels to meet San Juan County, EWUA or DOH minimum standards.

f. Fire hydrant spacing . Fire hydrants shall be installed at all intersections in all areas except single-family residential, so that the distance between them shall not exceed 300 feet and if the distance between intersections is over 400 feet, then one hydrant shall be placed halfway between. Fire hydrants shall be so installed in single-family residential areas so that the distance between them shall not exceed 800 road feet. This standard may be adjusted to insure that a hydrant is placed at the end of dead-end main, near intersecting mains or otherwise to improve system maintenance of facilitate fire fighting efforts. Hydrant locations are subject to review by the San Juan County Fire Marshal.

g. Water main connections to existing water mains shall be made by the hot-tap method unless specifically approved by EWUA. Taps shall be made by a specialty company acceptable to EWUA

h. Water mains should maintain ten (10) feet horizontal and 18 inch vertical separation from sewer mains and five (5) feet horizontal and 6 inch vertical separation from other non-potable water mains such as storm drains. If site conditions do not allow this then design variances should follow the Washington State Department of Ecology's manual titled Criteria for Sewage Works Design.

i. Water system mains should be looped to improve circulation, fire flow and achieve redundancy whenever feasible. EWUA reserves the right to require that mains serving more than 20 units be looped if reasonably feasible.

j. Mechanical joint restraint shall be used instead of concrete thrust blocks wherever feasible and practical.

k. Service tap connections to existing mains shall be made by the hot-tap method. Taps larger than 2" diameter shall be made by a specialty company acceptable to EWUA.

l. Service meter, air/vac, and double check valve boxes shall be located in areas that are not prone to flooding. Discuss location of all proposed underground boxes with EWUA prior to completing the design.

m. To support sprinkler system design contact EWUA for pressure and flow measurements at nearest hydrant. A charge for this service will be assessed. Contact EWUA for current rate.

n. Provide State approved backflow prevention device and service meters for all sprinkler system services.

B. Construction Standards

1. Materials

a. Water main pipe shall conform to AWWA C900 specifications for polyvinyl chloride (PVC) with a minimum wall thickness of DR18 (class 150). Schedule 80 PVC pipe may be used on water mains smaller than 4-inch diameter. HDPE pipe with a minimum wall thickness of SDR 11 (class 160) is also allowed.

b. Ductile iron spools and pipe shall be Standard Thickness Class 51 except Class 52 as noted for fire hydrant laterals.

c. Ductile Iron Mechanical Joint (MJ) fittings shall be manufactured in accordance with ANSI/AWWA C153/A21.53 and ANSI/AWWA C111/A21.11 and shall be rated for water pressure of 250 psi.

d. Ductile Iron compact Flanged (FL) fittings shall be manufactured in accordance with ANSI/AWWA C110/A21.10 and shall be rated for water pressure of 250 psi. Flanged surface shall be faced and drilled in accordance with ANSI class 125 B16.1.

e. No galvanized or schedule 40 pipe or fittings are to be used in the system. Additionally EWUA will not allow service extensions from galvanized or schedule 40 pipes.

f. Combination air/vacuum - air release valves (ARV) shall be Val-matic Model 201C.2. with an isolation valve installed between the main and the ARV. The ARV shall be placed at the high point of the line.

g. Fire hydrants shall be Watrous Pacer hydrants (Model WB-67-250) meeting the latest revision of AWWA standard C-502. Inlet shall be six (6") size and MJ. Outlets shall be two (2) 2 ½" and one (1) 4 ½" NST.

h. Joint restraint devices shall be Ford Uni-Flange BlockBusters or ROMAC Grip Ring pipe restrainer.

i. Hydrant gate (i.e. guard) valves shall be resilient wedge design, have ductile iron bodies, and have a minimum pressure rating of 200 psi. A cast iron valve box shall be included with each gate valve and shall be adjusted to final ground level upon completion of the project.

j. Water meters for single family homes shall be disc type 5/8" X 3/4" Badgermeter RCDL 25 with gallon registration.

k. Meter setters shall be Ford Meter Box Co. "Coppersetters" with compression inlet and outlets for polyethylene (PE) pipe. The shutoff will have a locking collar. The setter will include a check valve.

l. Corporation stops will be bronze with male iron pipe size (IPS) threads on inlet and outlet.

m. Service saddles will be bronze or stainless steel, double-strapped or band-aid type, sized for C900 PVC pipe, IPS tapped.

n. Service pipe shall be high-density polyethylene, ¾" minimum, 200 psi working pressure conforming to ANSI/AWWA C901, AWWA Standard for Polyethylene (PE) Pressure Pipe and Tubing. Connections to corporation stop and the meter setter, and couplings will be by brass compression fittings, IPS thread. Type K copper tubing will be required wherever a risk of permeation by organic solvents or petroleum products exists.

o. Meter boxes shall be of a high density plastic with a reader lid or a prefabricated concrete box made by Fog Tite for the specific purpose of housing meters with a cast iron lid. Meter boxes shall be able to sustain expected traffic load.

p. All fittings will be of bronze, municipal grade quality.

2. *Workmanship*

a. Trenching. All trenches shall be excavated to the lines and grades specified on the drawings and established in the field by the project engineer. If the bottom of any excavation is taken out beyond the limit indicated or prescribed, the

resulting void shall be backfilled with thoroughly compacted run-of-bank gravel. All trenches shall be braced and shored as necessary to meet OSHA standards. The width of the trench shall be made as narrow as practicable consistent with efficient handling and laying of the material. The sides of the trenches, between the horizontal center of the pipe and an elevation of one (1) foot above the top of the pipe shall be vertical. The depth of the trench shall be sufficient to provide a cover over the top of the pipe of at least two feet six inches (2'-6") plus the necessary depth for the laying of the pipe and pipe bedding. The top cover shall be determined after all finish grading of lawns and roadways have been completed. EWUA requires three feet (3'-0") cover in roadways.

The trench, or section of trench being excavated, shall be kept free from water during the time pipe joints are being made. Bell holes shall be provided at each joint to permit the joint to be made properly.

If, in the opinion of the project engineer, material unsuitable for foundation is found at or below the grade to which excavation would normally be carried in accordance with the plans and specifications, such material shall be removed to the required width and depth and replaced with thoroughly compacted bank-run gravel.

b. Rock Excavation. Should rock be encountered, the trenches shall be excavated such that the clearance between the pipe and remaining rock will be not less than six (6) inches in every direction after the pipe has been laid. Rock shall be excavated to the lines and grades indicated on the drawing or as directed by the project engineer. Following excavation and before placement of the pipe, the trench shall be backfilled to the correct subgrade with a minimum thickness of six (6) inches of thoroughly compacted suitable material.

   If blasting is required to loosen any rock encountered, all permits shall be obtained from the appropriate agencies in accordance with the regulations of the Department of Labor and Industries concerning excavation and discharge of explosives. Appropriate insurance coverage shall be in effect.

c. Installation of Pipe and Appurtenances. Care shall be taken in handling pipe to prevent damage to the pipe. All pipe shall be carefully examined for defects and no pipe shall be laid which is known to be defective. If any defective pipes shall be discovered after having been laid, they shall be removed and replaced with sound pipes.

   The bottom of the trench shall be finished to a uniform grade. Pipe shall be laid true to line without objectionable breaks in grade and shall have a firm bearing for the entire length of the pipe.

All interior surfaces of pipes shall be thoroughly cleaned before they are laid and shall be kept clean until accepted by the project engineer. Bell and spigot ends and other pipe surfaces involved in making joints shall also be thoroughly cleaned prior to making joints.

Suitable water-tight end caps or plugs shall be used for capping the ends of pipe when pipe laying is not actually in progress. Materials such as burlap, canvas, or plywood will not be acceptable for this purpose. Water standing in the trench when work is resumed shall be pumped out prior to removal of a cap or plug.

d. Installation of PVC Pipe. Installation of PVC pipe shall follow the methods described in the Handbook of Plastic Pipe as published by the Uni-Bell Plastic Pipe Association.

e. Installation of Mechanical Joints. The joint gasket and surfaces against which the gasket will come in contact shall be thoroughly cleaned prior to assembly of the joint. The gasket, bell, and spigot shall be lubricated with a thin film of non-toxic gasket lubricant approved for potable water systems. The gland and gasket, in that order, shall be slipped over the spigot, and the spigot shall be inserted into the bell until it is correctly seated. The gasket shall then be seated evenly in the bell at all points, centering the spigot, and the gland shall be pressed firmly against the gasket. After all bolts have been inserted and the nuts have been made up finger tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint to the proper tension by means of a torque wrench. The correct range of torque as indicated by a torque wrench shall fall into the range of 60-90 ft/lbs.

   If effective sealing of the joint is not obtained at the maximum torque indicated above, the joint shall be disassembled and thoroughly cleaned, then reassembled. Bolts shall not be overstressed to tighten a leaking joint.

f. Installation of Valves and Valve Boxes. Unless otherwise directed by EWUA, all gate valves shall be set with their stems truly vertical. The valves shall be joined to the pipeline with mechanical joints unless directly attached to tees or other fittings. The tops of the valve boxes shall be set neatly to the final grade of the street or the ground. The valve boxes shall be set so there is a uniform space around the operating nut, and the sides of the valve box shall be parallel to the axis of the stem of the valve.

g. Installation of Hydrants and Branches. The hydrant shall be set vertical at proper elevation and braced in position. A 18” X 18”X 4” solid concrete building block or equivalent as approved by EWUA shall be placed under the base of the hydrant for support. If the block is placed on disturbed soil or

backfill gravel, the support material shall be thoroughly tamped to prevent settlement of the hydrant.

The excavation for the hydrant shall end sufficiently below the base of the hydrant to allow for setting of the support block and gravel drain bed. The hydrant shall be firmly set on the support block. The hydrant, guard valve, and branch shall be installed and secured with an approved restraint system. The hydrant gate valve shall be set no closer than two feet from the hydrant's pumper nozzle.

Hydrants shall be set truly vertical and plumb, and hydrants shall be flushed out after being set to insure that branch valves are fully open and the hydrants close and drain properly. Hydrant laterals shall be constructed perpendicular to the water main alignment. Where the water main is in a roadway or street the hydrant lateral shall be constructed perpendicular to the pavement centerline. valves shall be placed Hydrants shall be placed so that there is three (3) feet of unobstructed area around the hydrant with unimpeded access from the street approach.

A gravel pocket shall be placed around the base of the hydrant sufficient to insure proper drainage of the hydrant. The drainage pocket shall be isolated from the surrounding soil with geotextile fabric properly secured in a way to minimize plugging of the drain pocket.

Hydrants must be braced just below grade with a concrete pad or pressure treated lumber to insure the correct operation of traffic breakaway flanges, bolts, and stem couplings.

The project owner shall be responsible for painting each hydrant following installation and cleanup with one coat of finish paint in the color approved by EWUA. The paint shall be applied after all loose scale, rust, dirt, grease, and other foreign matter has been removed completely from the hydrant.

h. Installation of Services. Services shall be installed from the main to the right-of-way (ROW) line with meter boxes being placed on the ROW line. The service pipe shall rest firmly on undisturbed soil or compacted backfill but in no case shall it be in contact with rock. Services that cross streets where pavement is in place shall be installed in accordance with the requirements of the pavement owner. All excavations, both in and out of pavement, shall be properly compacted to eliminate future settlement. There shall be a minimum of two (2) feet six (6) inches of cover over all portions of the service pipe as measured from final grade. Service lines shall run straight at a 90° angle from the main to the meter box. Caution should be exercised to prevent ground or surface water from following the service line trench and flooding the meter

box. Clay dams, weeper pipes, or grading should be employed to manage drainage water.

A meter service with roadway crossing shall be installed in a rigid conduit compatible with the service line material. The conduit shall be sufficiently large to allow removal and replacement of the service line without disturbance of the roadway. No couplings will be installed on service pipes within roadways.

Type K copper tubing will be required wherever a risk of permeation by organic solvents or petroleum products exists.

Taps shall be made within 22 ½° of horizontal on the pipe.

Obtain EWUA approval of all meter box locations prior to construction. Meter boxes will not be set within five (5) feet of a ditch line. No meter boxes shall be installed in parking lots, driveways, or roadways unless they are installed in a traffic-proof vault. Meter boxes will be set flush all around with final grade and shall be staked by the contractor to avoid subsequent damage by equipment. No meter box shall be set in a location that drainage would submerge the meter connections or sediment will infiltrate the box. Meters will be set so the reading dial is 9 inches below the top of the meter box. Meter boxes will be made frostproof.

Before any portion of the service line is buried, an EWUA inspector shall observe a minimum of 30-minute pressure test using available water pressure. When service lines are constructed as part of a water main extension then the service lines shall be flushed, disinfected and pressure tested along with the main.

Service line taps, service lines, and meter boxes are to be measured and included on the as-built record submitted by the project engineer.

i. Backfilling. Services shall be installed from the main to the right-of-way (ROW) line with meter boxes being placed on the ROW line. The service pipe shall rest firmly on undisturbed soil or compacted backfill but in no case shall it be in contact with rock. Services that cross streets where pavement is in place shall be installed in accordance with the requirements of the pavement owner. All excavations, both in and out of pavement, shall be properly compacted to eliminate future settlement. There shall be a minimum of two (2) feet six (6) inches of cover over all portions of the service pipe as measured from final grade. Service lines shall run straight a 90° angle from the main to the meter box. Caution should be exercised to prevent ground or surface water from following the service line trench and erupting at the meter box. Clay dams, weeper pipes, or grading should be employed to manage

drainage water. In general, and unless other material is indicated on the plans and specifications or these standards, material used for backfilling trenches shall be suitable material free from cinders, ashes, refuse, organic matter, frozen material, or stones or rock over eight (8) inches in greatest dimension.

The backfill material in the zone around the pipe shall be sand. There shall be six (6) inches of sand bedding around the pipe in every direction. This material shall be placed in layers not to exceed six (6) inches in depth and shall be thoroughly tamped with approved hand or power tampers specifically designed for this type of work Hand tamping by means of lumber, picks, shovels or their handles will not be accepted.
Special care shall be taken in placing this portion of the backfill to avoid damage to the pipe.

All underground water mains and service lines shall be marked with detectable, metallized, 2" wide tape bearing the words "Water Line Below" or equivalent. The tape shall be placed 18" above the water line.

For trenches not in roadways, the remainder of the trench from six (6) inches above the pipe may be filled with approved materials obtained from the trench excavation. This may be done in one operation by filling in the entire trench and compacting the backfill by rolling with construction equipment, leaving the fill mounded over the trench. The project owner shall correct excess or deficient fill after a suitable period of time.

Where excavations are made through existing permanent highway or street pavements, their shoulder areas, curbs, driveways, or sidewalks, backfilling shall conform to the current requirements of the particular agency having jurisdiction. Project owners are specifically referred to San Juan County Public Works Department Application and Utilities Installation Permit. In general, bank run gravel shall be used and placed in six (6) inch layers and thoroughly compacted with approved power tampers.

The project owner shall restore the work site and all other disturbed areas within a twenty-day period after the initial disturbance. However, livestock fencing, driveways, or other features required to be kept in service shall be restored immediately or an alternative method of functional equivalence shall be provided.

In general, the intent of backfilling is to restore the site to its original or better condition including surface appearance as much as practicable.

j. Pipe Restraint. All tees, dead-ends, bends, changes in direction, and hydrants shall be restrained using integral locking joints or joint restraint devices. The length of the restrained pipe and the number and method of such devices at the

pipe joints that are to be used in a particular situation depend on pipe size, configuration, and main pressures. The manufacturer shall be consulted for recommendations on the proper specifications.

Concrete thrust blocking of the proper mix, strength, and dimensions may be required by EWUA.

k. Testing. Testing of water mains shall, in general, proceed in accordance with the following sequence:
   1. Main filling through testing ports via backflow prevention device.
   2. Scouring flush
   3. Disinfection period
   4. Flushing
   5. Pressure testing
   6. Bacteriological testing

   No activity associated with main testing shall compromise the integrity or safety of the existing system in any manner. The testing procedure follows the current editions of AWWA Standards C605 and C651. Pressure testing follows APWS standards.

   It is recommended that the main be filled slowly in order to minimize hydraulic shock, system disruption, and air entrapment. Mains shall not be filled without prior notice to and supervision by EWUA. Connecting gate valves shall not be opened without EWUA personnel present and a waste port opened on the new section to insure that flow proceeds from the existing system into the new section. An alternative to this method of filling is to use a temporary fill line fitted with a double check valve assembly.

   A scouring flush is intended to remove debris and air pockets from the newly installed work. There should be enough flow to insure a velocity of eight (8) feet per second. It is the project owner's responsibility to insure that there is both an adequate supply of flushing water and adequate waste ports available to flow a sufficient volume of water to achieve the required flow. This flush can only be conducted with EWUA personnel operating the gate valve and controlling the timing and rate of the flush in order to minimize disruption to the existing system. It is possible that this flush will have to be done in stages or in the early morning hours depending upon system demands. The project owner is responsible for disposing of the flushed water in a manner that will prevent property damage to lawns, roadways, vehicles., or other property.

   The new main shall undergo pressure and leakage testing. The pressure in the new system, including hydrants, shall be raised, by pumping, to a pressure equivalent to 1.5 times the service pressure or 150 psi whichever is higher. The test pressure shall be determined at the lowest point of the section under

test and corrected in accordance with gage location. Ensure that the allowable pressure for the class of pipe used is not exceeded. Hydrant auxiliary gate valves shall be open and the test pressure applied against the internal hydrant valve. If the specified pressure cannot be achieved, the section under test shall be considered as failing the pressure test. If the aforementioned pressure can be achieved and then maintained for two (2) hours, the section under test shall be considered as passing the pressure and leakage test without further testing. If, however, after achieving the aforementioned pressure, additional pumping is required to maintain the specified pressure, then the amount of water required to maintain this pressure shall be measured during the two (2) hour period. This measured quantity of water shall be classified leakage and shall be compared with the allowable leakage as calculated by the formula as given in AWWA specification C651, current edition. Should the actual leakage exceed the allowable, then the section under test shall be considered as failing the test. If, however, the actual leakage is equal to or less than allowable, then the section under test shall be considered as passing the test.

The project owner shall disinfect the project with a chlorine solution of a strength to insure a residual of 25 ppm of chlorine after twenty-four (24) hours. The disinfection method shall be in accordance with the current AWWA standard C651, continuous feed method. Hydrants shall be operated during the disinfection process to insure that hydrants and hydrant branches are disinfected. Following disinfection, all treated water shall be thoroughly flushed from the project until only a normal system residual remains. Chlorinated water shall be disposed of in a manner acceptable to the Department of Ecology. A bacteria sample for each 1,000 feet of main shall be taken by EWUA personnel. The chain of custody of the sample(s) shall remain entirely within EWUA until the sample(s) is delivered to the lab for analysis. The main shall remain pressurized but not in service until satisfactory results are achieved. Unsatisfactory results will require additional flushing and/or rechlorination before additional samples are taken. This process will be repeated until satisfactory results are achieved.

l. Safety. All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Existing hydrants, utility vaults, valve boxes, or other appurtenances shall be left unobstructed and accessible at all times. Gutters shall be kept clear or other provisions made for street drainage, and natural water courses shall no be obstructed. To protect persons from injury and to avoid property damage, adequate barricades, construction signs, torches, lanterns and guards as required shall be placed and maintained during the progress of the construction work and until it is safe for traffic to use the highway. All excavations shall be enclosed by fences or barricades and shall be protected by proper lights when the visibility is poor. The contractor shall comply with WISHA construction safety rules (WAC chapter 296-155 Safety Standards for

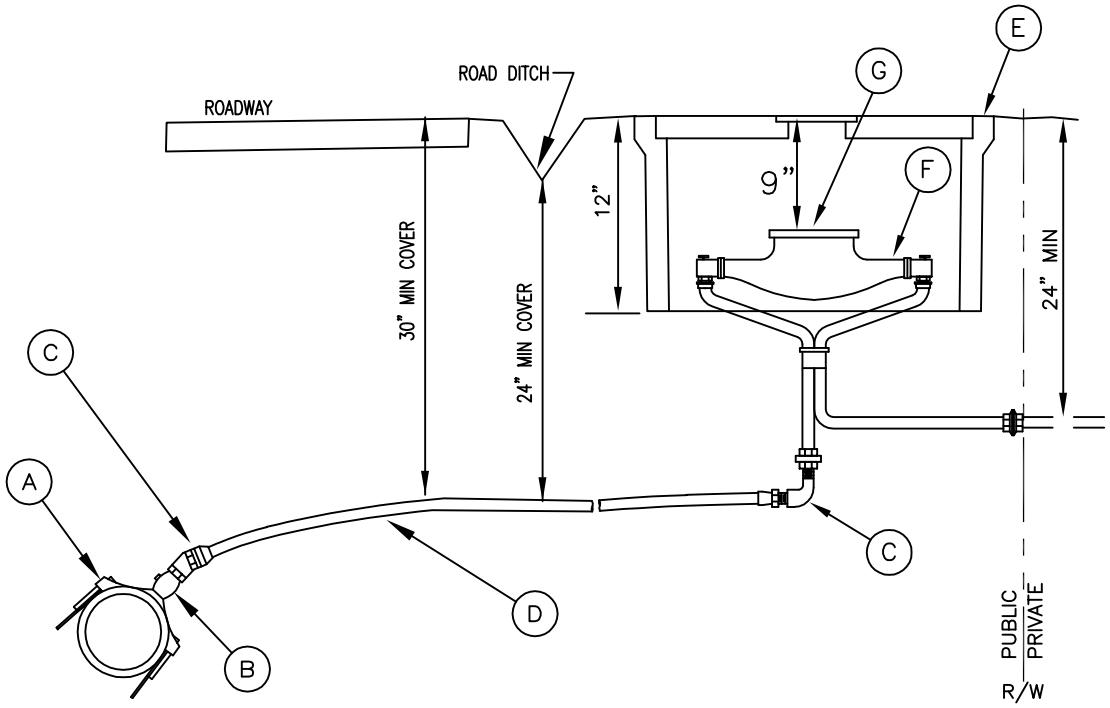
Construction Work and WAC chapter 296-800 Safety and Health Core Rules). Also the rules and regulations of the local authorities respecting safety provisions shall be observed. It is the intent of this section to insure that the responsibility and liability for project safety, is entirely under the control of the project owner.

m. As-Built Drawings. No newly constructed water main, water main extension, fire line, or service line shall be approved for service or supplied with water until EWUA has received an acceptable as-built drawing from the project engineer. The purpose of an as-built record is for future reference when location or repairs are required. Clear, complete, and accurate measurements and information are therefore required. EWUA prefers measurements to be made from permanent, close-by, visible, man-made objects such as building lines, hydrants, utility poles or enclosures, concrete monuments, head-walls, catch basins, manholes, etc. Roadway centerlines are preferred while road edges are discouraged. Measurements are to be taken in two dimensions. Measurements are to be shown with dimension lines and are not to be referenced to the survey stationing of the subdivision or the pipeline project. Horizontal alignment of the water main will be provided every 50 feet. All appurtenances will be shown and referenced. Other utility crossings or other infrastructure that would be uncovered during a subsequent excavation will be shown. ROW or easement boundaries shall be shown with dimensions. As built records will not be accepted until EUWA is satisfied that that the as built record is satisfactory for EWUA's needs.

n. Dead Ends. Any main extension, 6-inches and larger, resulting in a dead end shall have a standard fire hydrant with a guard valve at the dead end. A properly restrained main valve shall also be required so that a future connection can be made without shutting down any part of the current extension. Any main extension shall go to the farthest boundary line of the last property receiving water or a right through easement or fee simple in order for others to extend in the future. Main extensions smaller than 6-inches resulting in a dead end shall have a standard blowoff assembly placed at the dead end.

EWUA, in its sole judgment, may require the project owner to complete a loop to insure distribution water quality even if such a loop requires the installation of pipe beyond what the project owner needs to provide service to the project area.

END OF DESIGN AND CONSTRUCTION STANDARDS



PARTS:

(A) STAINLESS STEEL OR BRONZE DOUBLE STRAPPED OR BAND–AID TYPE SERVICE SADDLE, SIZED FOR C900 PVC PIPE, IPS TAPPED.

(B) CORPORATION STOP: BRONZE WITH MALE IPS THREADS ON INLET AND OUTLET.

(C) USE BRASS ELBOWS AND COMPRESSION FITTINGS FOR POLYETHYLENE PIPE, IPS THREAD.

(D) 3/4 WATER SERVICE LINE SHALL BE 200 PSI POLYETHYLENE TUBING CONFORMING TO AWWA STANDARD C901.

(E) METER BOX SHALL BE HIGH DENSITY PLASTIC WITH A READER LID OR FOG TITE PRE–CAST CONCRETE METER BOX WITH CAST IRON LID. IN NON–TRAFFIC AREAS USE EITHER PLASTIC OR CONCRETE BOX. IN TRAFFIC AREAS USE A CONCRETE BOX ABLE TO SUSTAIN EXPECTED TRAFFIC LOADS. LOCATION MUST BE APPROVED BY EWUA PRIOR TO INSTALLATION.

(F) METER SETTERS SHALL BE FORD BRAND COPPERSETTERS WITH COMPRESSION INLET AND OUTLETS FOR POLYETHYLENE PIPE. THE SHUTOFF WILL HAVE A LOCKING COLLAR. THE SETTER WILL INCLUDE A CHECK VALVE.

(G) WATER METERS FOR SINGLE FAMILY RESIDENCES SHALL BE 5/8" X 3/4" BADGERMETER RCDL 25 MEASURING IN GALLON UNITS.

EASTSOUND WATER USERS ASSOCIATION	DATE: 11/2009	¾" WATER SERVICE N.T.S.	STANDARD DETAIL	DETAIL No. 010

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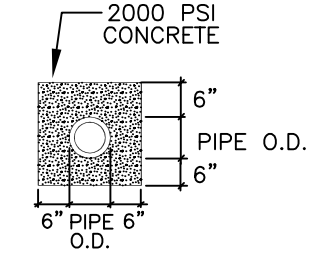
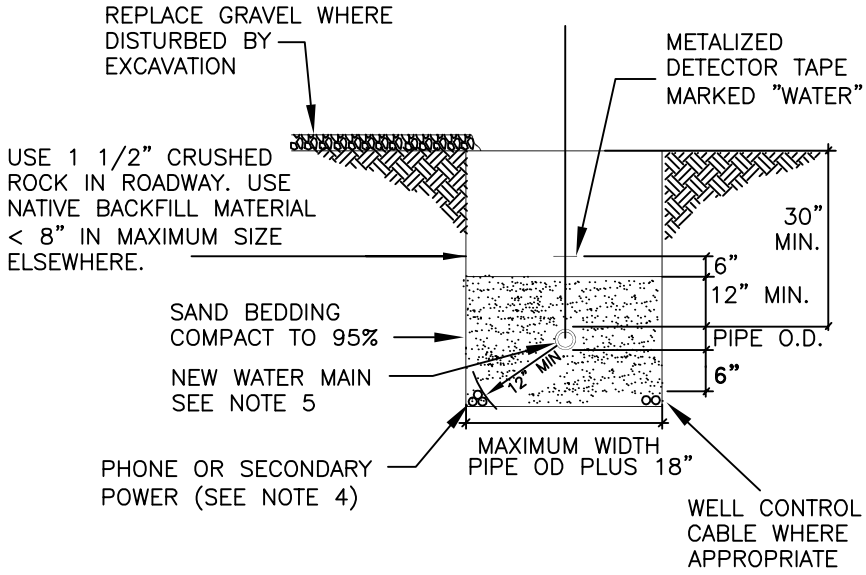


CONCRETE ENCASEMENT
(SEE NOTE 6)



NOTES:

1. CONFORM TO AWWA STANDARD C605–94 FOR THE INSTALLATION OF WATER PIPE.

2. REPLACE ROADWAY GRAVEL WHERE APPROPRIATE. EXTEND CRUSHED GRAVEL BACKFILL TO A POINT 4 INCHES BELOW THE SURFACE IN ROADWAY AREAS.

3. SEPARATION REQUIREMENTS:
VERTICAL – WHERE NEW WATER MAIN CROSSES OVER OR UNDER AN EXISTING STORM OR SANITARY SEWER PIPE, CENTER ONE FULL LENGTH OF WATER MAIN PIPE ON THE SEWER PIPE. IF WATER PIPE CLEARANCE WITH CROSSING PIPE IS LESS THAN 18" FOR SANITARY SEWER AND 6" FOR STORM SEWER ENCASE SEWER PIPE IN CONCRETE PER DETAIL FOR A DISTANCE OF 10 FEET EITHER SIDE OF CROSSING POINT.
HORIZONTAL – WATER MAIN SHALL HAVE A MINIMUM 10 FEET SEPARATION FROM SANITARY SEWER MAIN AND 5 FEET SEPARATION FROM STORM SEWER MAIN. THE DISTANCE MEASURED SHALL BE EDGE TO EDGE. REQUEST INSTRUCTIONS FROM ENGINEER IF THIS REQUIREMENT CANNOT BE MET.

4. WHERE SECONDARY POWER OR PHONE WILL BE PLACED IN THE SAME TRENCH CONFORM TO THE UTILITY'S SEPARATION REQUIREMENTS. ENSURE THAT WATER MAIN IS ABOVE OTHER UTILITIES.

5. WHERE MULTIPLE WATER LINES ARE PLACED IN THE TRENCH, MAINTAIN AT LEAST 4" OF SEPARATION BETWEEN THEM.

6. INSTEAD OF CONCRETE ENCASEMENT WATER MAIN CAN BE SLEEVED WITH 20 FOOT LENGTHS OF C–900 PVC PIPE. ENDS SHALL BE SEALED WITH NON–SHRINK GROUT OR RUBBER COUPLINGS

EASTSOUND WATER USERS ASSOCIATION	DATE: 11/2009	STANDARD TRENCH SECTION N.T.S.	STANDARD DETAIL	DETAIL No. 020

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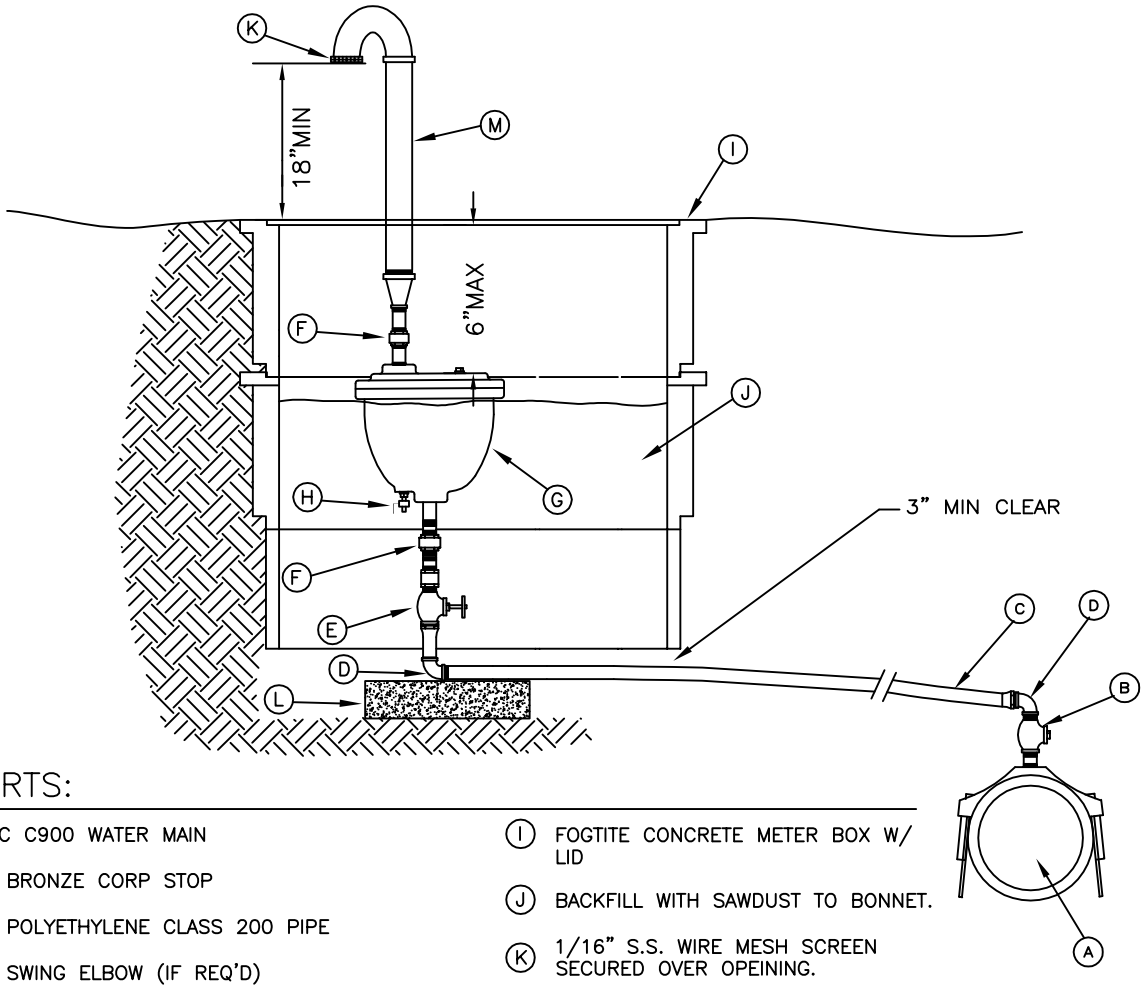


PARTS:

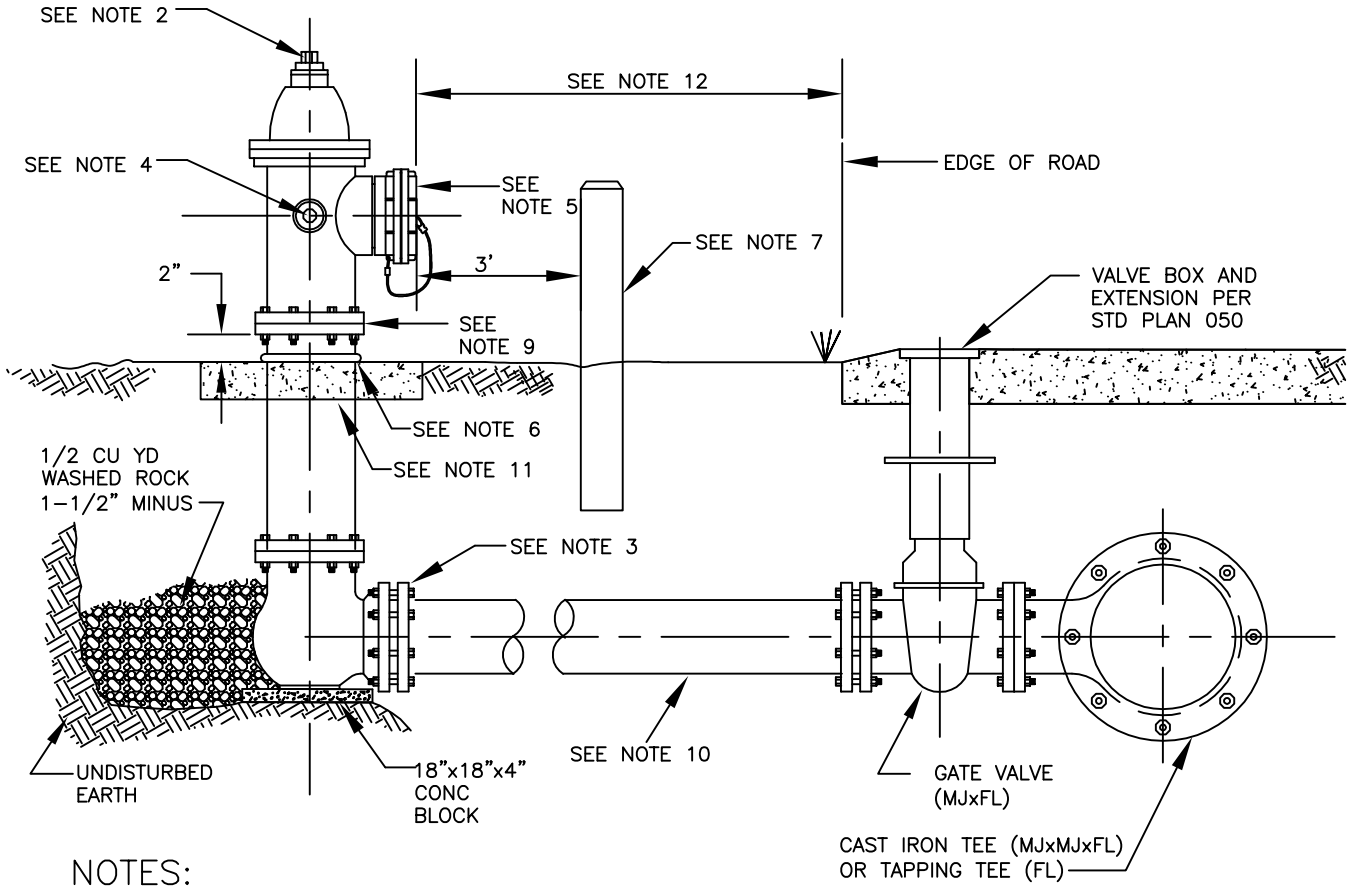
- (A) PVC C900 WATER MAIN
- (B) 1" BRONZE CORP STOP
- (C) 1" POLYETHYLENE CLASS 200 PIPE
- (D) 1" SWING ELBOW (IF REQ'D)
- (E) 1" BRASS OR BRONZE GATE VALVE
- (F) 1" BRONZE UNION
- (G) 1" COMBINATION AIR AND VACUUM RELIEF VALVE. USE VAL-MATIC 201C.2 OR EQ.
- (H) BALL VALVE
- (I) FOGTITE CONCRETE METER BOX W/ LID
- (J) BACKFILL WITH SAWDUST TO BONNET.
- (K) 1/16" S.S. WIRE MESH SCREEN SECURED OVER OPEINING.
- (L) PRE-CAST CONCRETE BLOCK SET ON UNDISTURBED NATIVE SOIL.
- (M) 2" GALVANIZED IRON PIPE.

NOTES:

1. AIR-VAC UNIT AND BOX TO BE INSTALLED IN NON-TRAFFIC AREA.
2. USE STAINLESS STEEL OR BRONZE DOUBLE STRAP OR BAND-AID TYPE SERVICE CLAMP SIZED FOR C900 PVC PIPE, IPS THREADED
3. ALL PIPE FITTINGS BETWEEN MAIN AND UNION, AFTER AIR/VACUUM RELIEF VALVE, SHALL BE BRASS OR BRONZE.
4. INSTALLATIONS FOR OTHER SIZE AIR/VACUUM RELIEF VALVES SHALL BE INDIVIDUALLY DESIGNED AND WILL REQUIRE APPROVAL BY THE UTILITIES DIVISION.
5. PAINT METER BOX LID AND RISER ASSEMBLY (2) COATS SAFETY YELLOW, 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.

EASTSOUND WATER USERS ASSOCIATION	DATE: 11/2009	1" AIR/VAC VALVE ASSEMBLY N.T.S.	STANDARD DETAIL	DETAIL No. 030

N:\Desk A\HartPac\EWUA Std Dwgs\EWUA Stds.dwg, 030 1-Inch ARV



NOTES:

1. ALL MATERIALS SHALL CONFORM TO AWWA STANDARDS AND SHALL BE OF STANDARD MANUFACTURE.

2. FIRE HYDRANT ASSEMBLY – USE WATROUS PACER MODEL WB-67-250 PER LATEST AWWA C502. OUTLETS SHALL BE (2) 2-1/2" AND ONE 4-1/2" NST. USE 1-1/4" OPERATING NUT AND CAP NUT FOR 2-1/2" PORTS.

3. HYDRANT CONNECTION JOINTS TO BE MJ WITH RETAINER GLANDS, OR FIELD LOCK GASKETS.

4. FIRE HYDRANTS SHALL BE PAINTED WITH TWO COATS OF HIGH PERFORMANCE ACRYLIC OR "RUST-OLEUM" #5265.

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. SEE STANDARD PLAN 005. IN ADDITION, INSTALLATION OF THE HYDRANT ON PRIVATE PROPERTY SHALL EQUAL OR EXCEED THE STANDARDS FOR INSTALLATION OF PUBLIC FIRE HYDRANTS IN SAN JUAN COUNTY.

7. PROVIDE FOR VEHICULAR TRAFFIC PROTECTION WITH GUARD POSTS WHEN HYDRANT IS ALONG ROADWAY AND THERE IS NO CURB. USE 2 EACH 6 FT. LON 9-INCH DIAMETER PRECAST CONCRETE GUARD POSTS. SET POSTS 3' DEEP. PAINT PER EWUA STANDARDS.

8. STEAMER PORT TO BE FACING STREET OR ROADWAY FOR FIRE ENGINE ACCESS.

9. TRAFFIC SAFETY FEATURE BREAK-OFF FLANGE, BREAK- OFF NUTS AND BOLTS

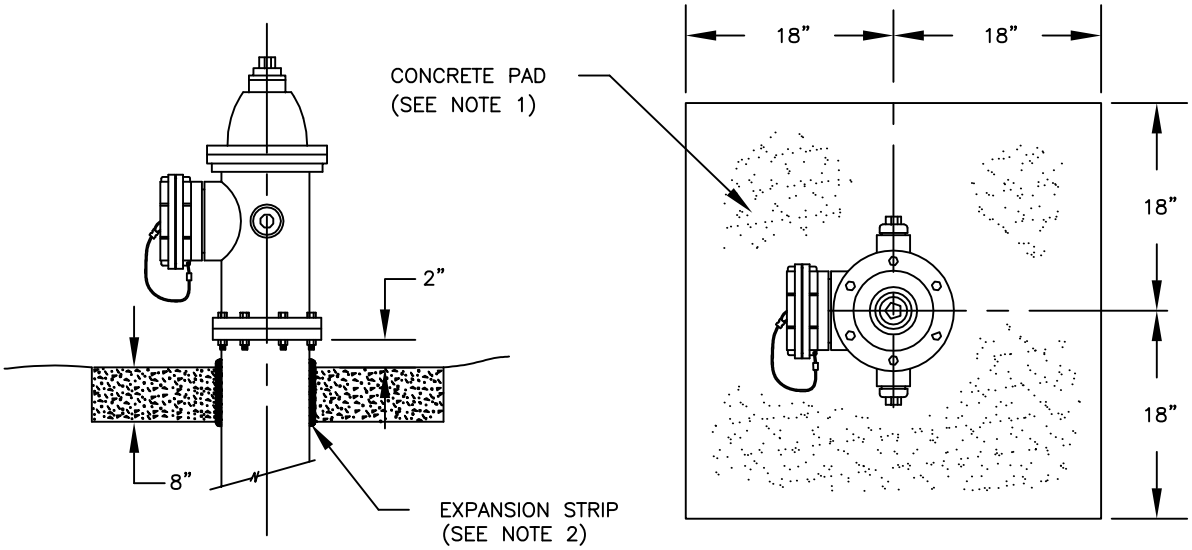
10. CLASS 52 DUCTILE IRON PIPE. INTERMEDIATE JOINTS TO BE MJ WITH MECHANICAL RESTRAINT.

11. INSTALL CONCRETE PAD AROUND HYDRANT IN UNPAVED, SOD OR ASPHALT AREAS. SEE STANDARD PLAN 005.

12. IN GENERAL HYDRANTS AND GUARD POSTS SHALL BE LOCATED A SUFFICIENT DISTANCE FROM THE EDGE OF ROAD SO AS NOT TO POSE A TRAFFIC HAZARD. OBTAIN EWUA APPROVAL PRIOR TO PLACEMENT OF ALL HYDRANTS.

EASTSOUND WATER USERS ASSOCIATION	DATE: 11/2009	FIRE HYDRANT INSTALLATION N.T.S.	STANDARD DETAIL	DETAIL No. 040

N:\Desk A\HartPac\EWUA Std Dwgs\EWUA Stds.dwg, 040 Fire Hydrant Assy



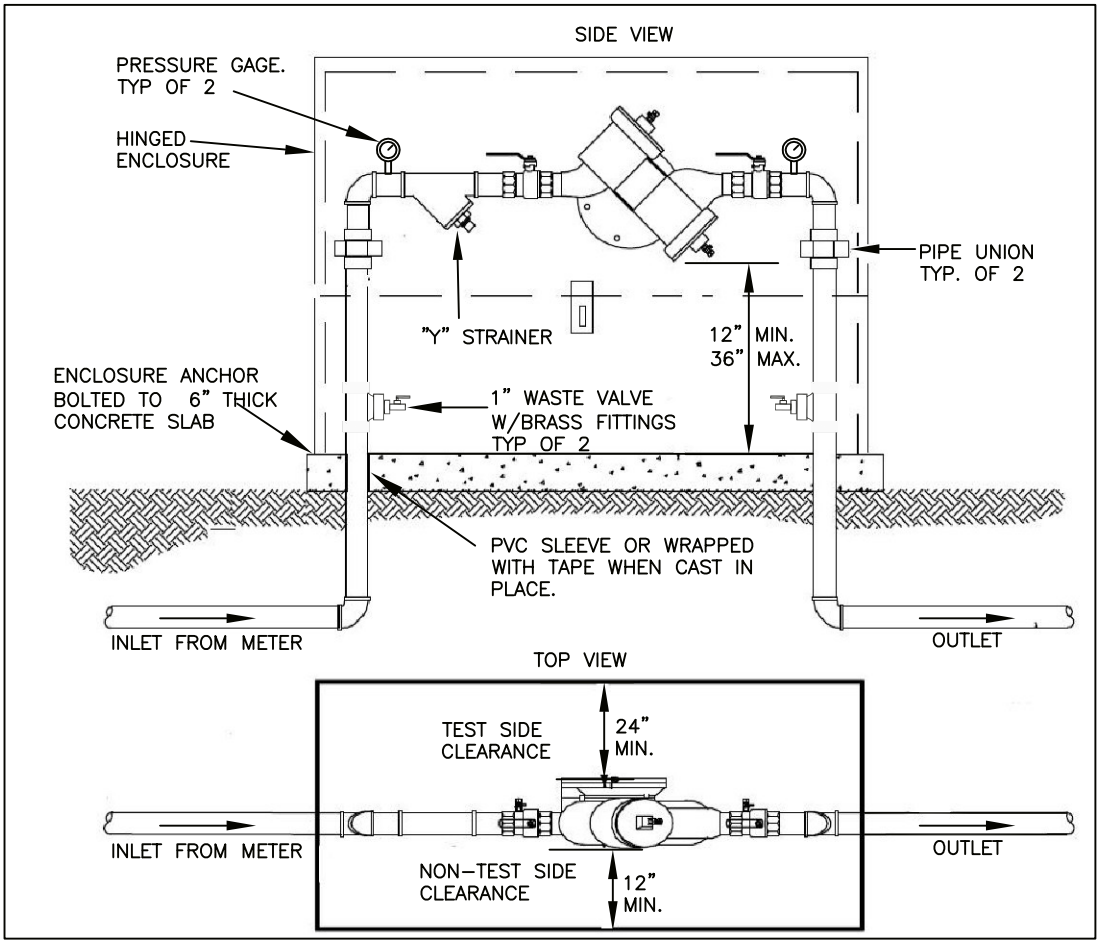
ELEVATION

PLAN

NOTES:

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

EASTSOUND WATER USERS ASSOCIATION	DATE: 11/2009	CONCRETE FIRE HYDRANT PAD N.T.S.	STANDARD DETAIL	DETAIL No. 050



NOTES:

1. PROVIDE STANDARD SERVICE CONNECTION TO MAIN, WITH METER AND GATE VALVE PRIOR TO ASSEMBLY.

2. BACKFLOW ASSEMBLY SHALL BE STATE APPROVED REDUCED PRESSURE PRINCIPLE BACKFLOW ASSEMBLY.

3. ASSEMBLY SHALL BE INSTALLED ABOVE GRADE, IN HORIZONTAL POSITION AND IN WEATHERPROOF ENCLOSURE. ENCLOSURE TO BE HOTBOX OR EQUIVALENT. THE ENCLOSURE SHALL BE HEATED TO PREVENT FREEZING.

4. TEST COCKS ARE TO FACE AWAY FROM WALLS.

5. THERE MUST BE NO BRANCH PIPING CONNECTED TO THE INLET PIPING BETWEEN THE METER AND THE ASSEMBLY.

6. PROVIDE ADEQUATE DRAINAGE FROM THE ASSEMBLY.

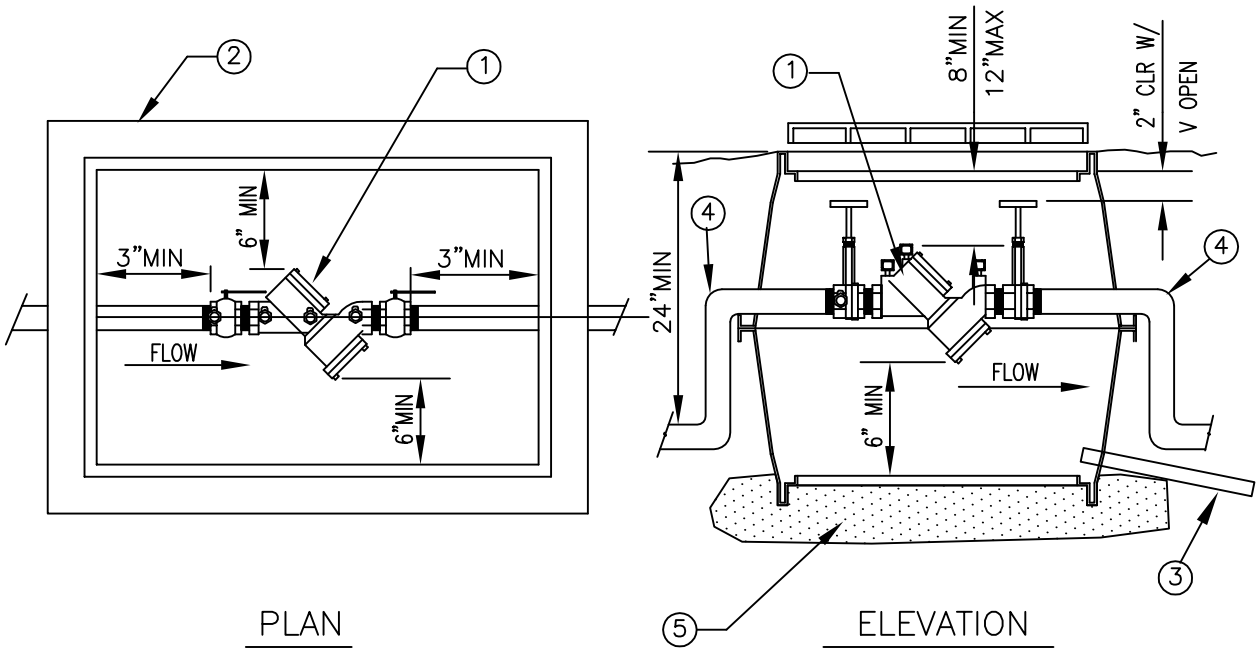
7. ALL DIMENSIONS ARE MINIMUM CLEARANCE REQUIREMENTS.

8. ASSEMBLY REQUIRES CERTIFICATION UPON INSTALLATION AND RECERTIFICATION ANNUALLY.

9. ALL PIPING SHALL BE METALLIC. USE COPPER PIPE WITH BRASS FITTINGS OR DUCTILE IRON AS APPROPRIATE. DO NOT USE GALVANIZED IRON PIPE OR PVC.

10 USE FOR ALL SERVICE SIZES.

EASTSOUND WATER USERS ASSOCIATION	DATE: 11/2009	REDUCED PRESSURE BACKFLOW ASSEMBLY N.T.S.	STANDARD DETAIL	DETAIL No. 060



PLAN ELEVATION

PARTS:

1. STATE APPROVED DOUBLE CHECK VALVE ASSEMBLY.
2. METER BOX SHALL BE HIGH DENSITY PLASTIC OR FOG TITE PRE–CAST CONCRETE METER BOX WITH CAST IRON LID. IN NON–TRAFFIC AREAS USE EITHER PLASTIC OR CONCRETE BOX. IN TRAFFIC AREAS USE A CONCRETE BOX ABLE TO SUSTAIN EXPECTED TRAFFIC LOADS. LOCATION MUST BE APPROVED BY EWUA PRIOR TO INSTALLATION.
3. USE 2" PVC PIPE TO DRAIN BOX. EXTEND TO DAYLIGHT AND SCREEN END. IF A DAYLIGHT DRAIN CANNOT BE PROVIDED THERE MUST BE A 4" MIN LAYER OF FREE DRAINING GRAVEL AT THE BOTTOM OF BOX.
4. ANGLES MAY BE IN OR OUT OF BOX SO LONG AS SUFFICIENT ROOM IS ALLOWED AT EACH END FOR VALVE OPERATOR AND DCVA REPAIR OR MAINTENANCE.
5. PROVIDE FREE DRAINING SOIL.

NOTES:

1. PROVIDE STANDARD SERVICE CONNECTION TO MAIN, WITH METER AND GATE VALVE PRIOR TO ASSEMBLY.
2. THERE MUST BE NO BRANCH PIPING CONNECTED TO THE INLET PIPING BETWEEN THE METER AND THE ASSEMBLY.
3. BACKFLOW ASSEMBLY SHALL BE STATE APPROVED REDUCED PRESSURE PRINCIPLE BACKFLOW ASSEMBLY.
4. ALL TEST COCKS MUST HAVE BRASS PLUGS. AND MUST FACE UP OR SIDEWAYS WHICH EVER IS MORE ACCESSIBLE.
5. USE FOR 2–½" AND SMALLER SERVICE

EASTSOUND WATER USERS ASSOCIATION	DATE: 11/2009	DOUBLE CHECK VALVE ASSEMBLY N.T.S.	STANDARD DETAIL	DETAIL No. 070

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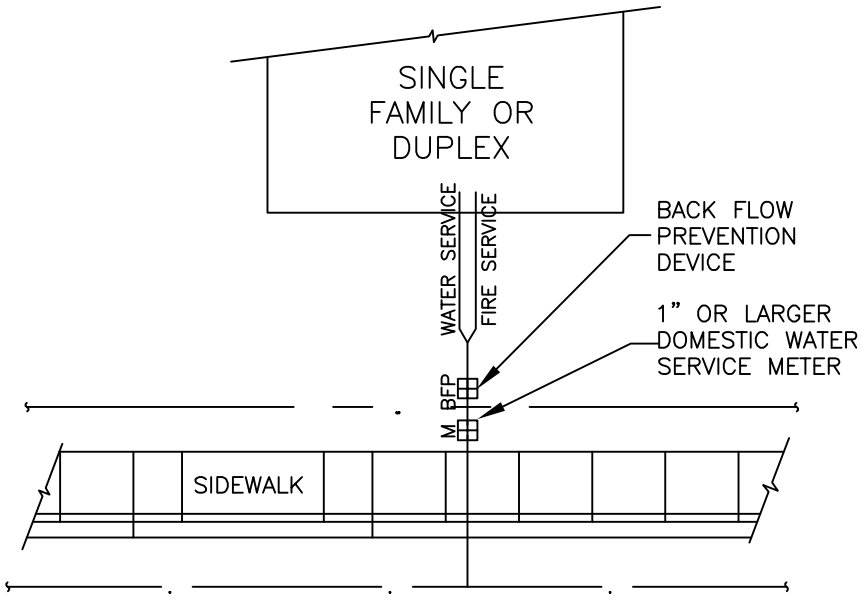
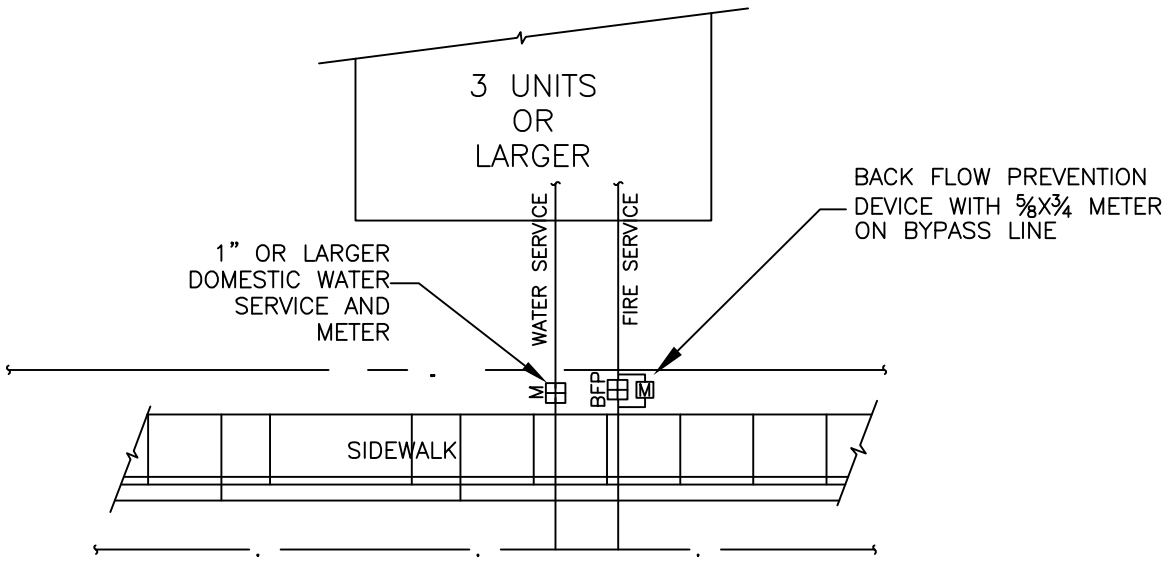


NOTES:

SINGLE FAMILY OR DUPLEX STRUCTURES THAT ARE REQUIRED TO HAVE A FIRE SPRINKLER SYSTEM MAY USE A SINGLE DOMESTIC WATER METER. THE SIZE OF THE SERVICE METER SHALL BE CALCULATED BY THE CIVIL ENGINEER OR FIRE SPRINKLER DESIGNER AND IS SOLELY RESPONSIBLE FOR THESE CALCULATIONS. THE EWUA DOES NOT REVIEW THESE CALCULATIONS AND IS NOT THE AUTHORITY HAVING JURISDICTION. THE FIRE SERVICE SIDE OF THE SYSTEM MUST HAVE A STATE APPROVED BACKFLOW PREVENTION DEVICE.

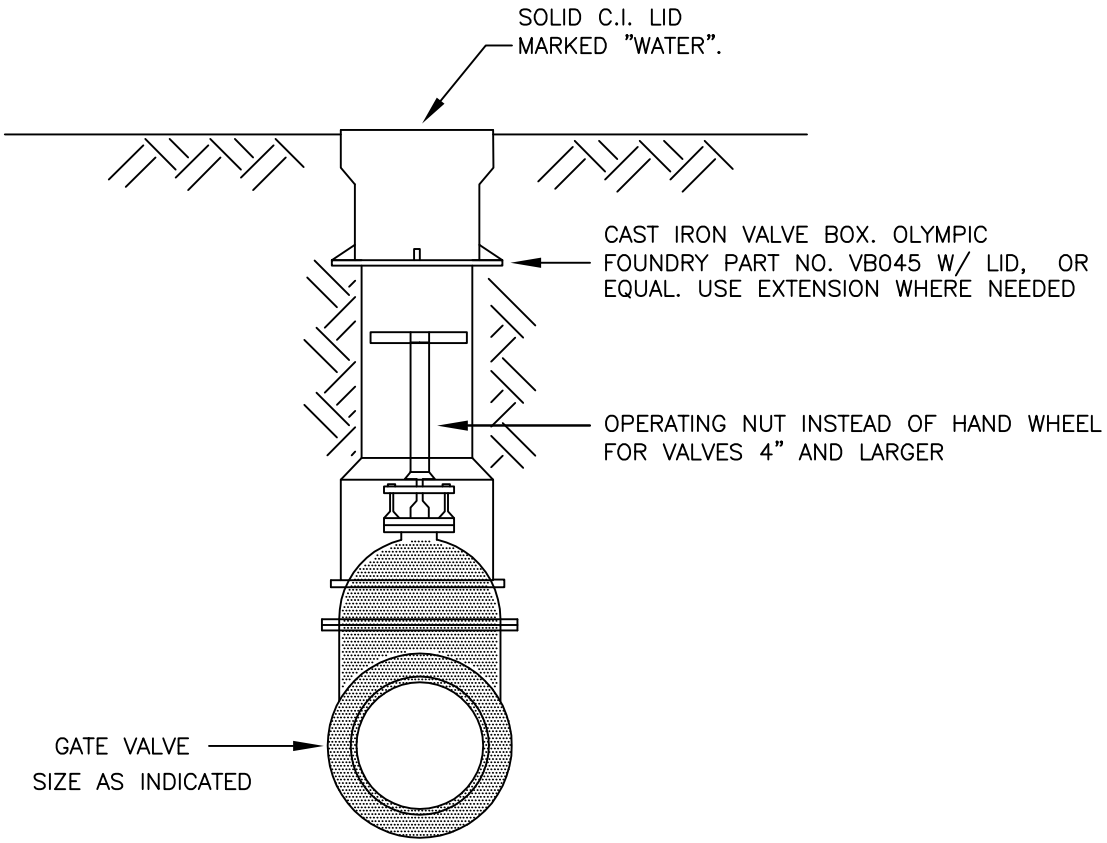


NOTES:

SIZE OF FIRE SPRINKLER SERVICE AND METER WILL BE CALCULATED BY A CIVIL ENGINEER OR FIRE SPRINKLER DESIGNER AND IS SOLELY RESPONSIBLE FOR THIS CALCULATION. EWUA DOES NOT REVIEW THESE CALCULATIONS AND IS NOT THE AUTHORITY HAVING JURISDICTION. ALL BUILDINGS 3 UNITS OR LARGER THAT ARE REQUIRED TO HAVE A FIRE SPRINKLER MUST HAVE A SEPARATE FIRE SERVICE. FIRE SERVICES LARGER THAN 2" MUST CONFORM TO SAN JUAN COUNTY STANDARDS. THE FIRE SERVICE SIDE OF THE SYSTEM MUST HAVE A STATE APPROVED BACKFLOW PREVENTION DEVICE.

EASTSOUND WATER USERS ASSOCIATION	DATE: 11/2009	RESIDENTIAL FIRE SPRINKLER SYSTEM METERING REQUIREMENTS N.T.S.	STANDARD DETAIL	DETAIL No. 080

N:\Desk A\HartPac\EWUA Std Dwgs\EWUA Stds.dwg, 080 Sprinkler Meter



EASTSOUND WATER USERS ASSOCIATION	DATE: 11/2009	VALVE BOX AND EXTENSION N.T.S.	STANDARD DETAIL	DETAIL No. 090

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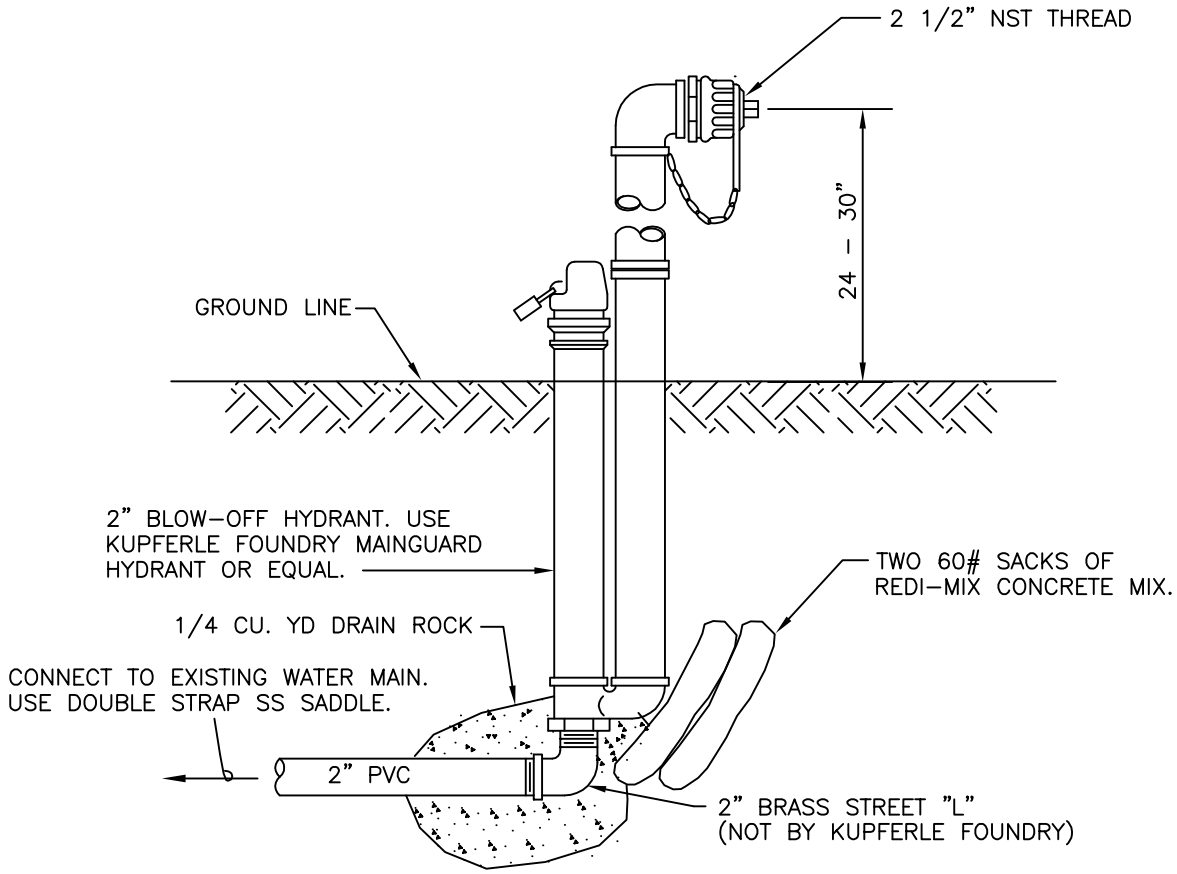

EASTSOUND WATER USERS ASSOCIATION	DATE: 11/2009	2" BLOWOFF ASSEMBLY N.T.S.	STANDARD DETAIL	DETAIL No. 100

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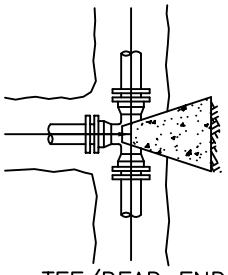
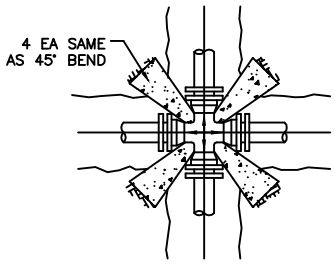
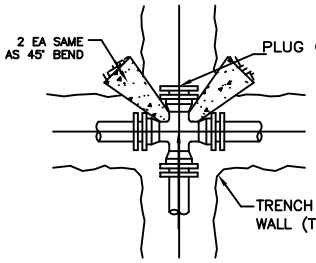


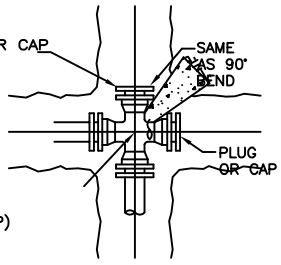
TEE/DEAD END



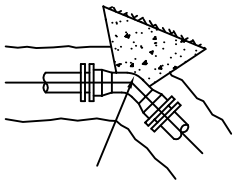
CROSS



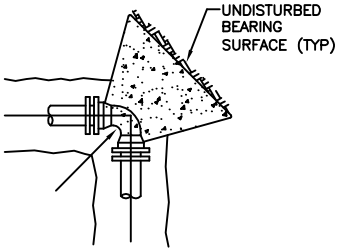
CROSS W/ ONE PLUG



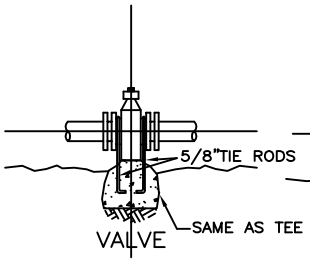
CROSS W/ TWO PLUGS



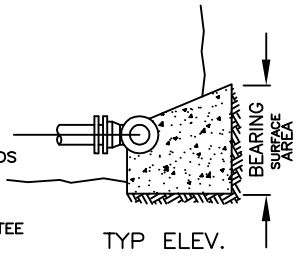
11 1/4°,22 1/2°, & 45° BENDS



90° BENDS



VALVE



TYP ELEV.

TYPES OF BLOCKING

TABLE A

THRUST (IN LBS) PER PSI OF WATER PRESSURE AT VARIOUS FITTINGS

PIPE SIZE	BENDS				TEES
	11 1/4°	22 1/2°	45°	90°	DEAD ENDS
4	3	7	13	24	17
6	7	15	29	53	38
8	13	26	51	95	67
10	21	41	80	148	105
12	30	60	115	213	150
14	40	80	157	290	205
16	52	104	205	378	267
18	66	132	259	479	338
20	82	163	320	591	418
24	118	235	461	851	602

NOTES:

1. TABLE A SHOULD BE USED WITH THE MAXIMUM PRESSURE ANTICIPATED FOR HYDROSTATIC TEST PRESSURE OR SURGE PRESSURE (WORKING PRESSURE TIMES 1.33)

2. IN THE ABSENCE OF A SOILS REPORT, AN AVERAGE SOIL (SOFT CLAY) WITH AN ASSUMED VALUE OF 2,000 PSF BEARING STRENGTH (FROM TABLE B) MAY BE USED.

3. CONCRETE FOR THRUST BLOCKING SHALL BE CLASS 3000 OR COMMERCIAL AT THE DISCRETION OF THE CONTRACTOR.

4. SHACKLE RODS SHALL BE ASTM A-36 WITH MINIMUM YIELD STRESS OF 36KSI (KIPS PER SQ IN). MINIMUM ROD DIAMETER SHALL BE 5/8".

5. NOTES IN FIGURES SUCH AS; "SAME AS 45° BEND" MEANS THE THRUST BLOCK VALUE SHALL BE THE SAME AS DETERMINED FOR A 45° BEND OF THE SAME SIZE.

EXAMPLE

REQUIRED BEARING SURFACE FOR A 90° BEND IN 8" LINE WITH MAXIMUM OPERATING PRESSURE OR TEST PRESSURE OF 200 PSI AND SOIL BEARING STRENGTH OF 2,000 PSF,

$$\frac{\text{THRUST}}{\text{SOIL STRENGTH}} = \text{BEARING AREA (SQ FT)}$$

THRUST = 95(FROM TABLE) X 200 =19,000 LBS

$$\frac{19{,}000 \text{ LBS}}{2{,}000 \text{ PSF}} = 9.5 \text{ SQ FT} = \frac{\text{AREA OF UNDISTURBED}}{\text{SOIL REQUIRED}}$$

IMPORTANT NOTE

EWUA REQUIRES THAT MECHANICAL JOINT RESTRAINT BE USED INSTEAD OF CONCRETE THRUST BLOCKS WHEREVER FEASIBLE AND PRACTICAL.

TABLE B

ALLOWABLE BEARING PRESSURE FOR SOIL TYPES

SOIL TYPE	BEARING PRESSURE LBS/SQ FT
PEAT OR MUCK	0
ALLUVIAL SOIL	1,000
SOFT CLAY	2,000
SAND	4,000
SAND & GRAVEL	6,000
SAND & GRAVEL W/CLAY	8,000
SHALE	12,000
ROCK	20,000

EASTSOUND WATER USERS ASSOCIATION	DATE: 11/2009	HORIZONTAL THRUST BLOCKING N.T.S.	STANDARD DETAIL	DETAIL No. 110

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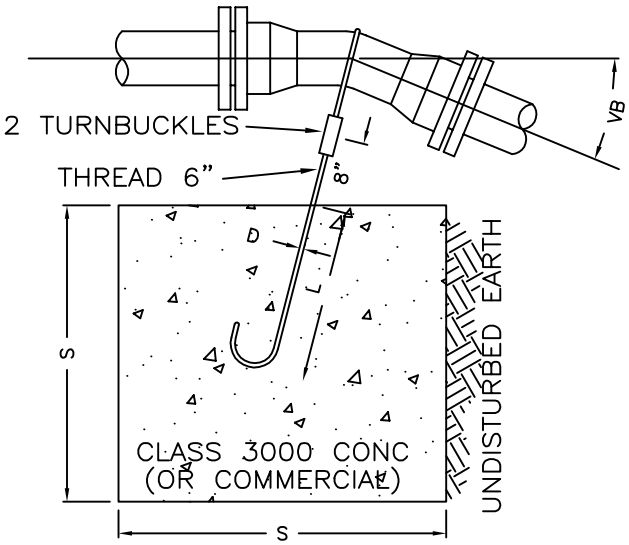
TYPE "A" BLOCKING
FOR 11 1/4°,22 1/2°, 30° VERT BENDS

PIPE SIZE NOM. DIAMETER– INCHES	TEST PRESSURE PSI	VB VERTICAL BEND DEGREES	NO OF CU FT OF CONC BLOCKING	S SIDE OF CUBE FEET	D DIAMETER OF SHACKLE RODS (2) INCHES	L DEPTH OF RODS IN CONCRETE FEET
4	300	11 1/4	8	2.0	3/4	1.5
		22 1/2	11	2.2		2.0
		30	17	2.6		
6	300	11 1/4	11	2.2	3/4	2.0
		22 1/2	25	2.9		
		30	41	3.5		
8	300	11 1/4	16	2.5	3/4	2.0
		22 1/2	47	3.6		
		30	70	4.1		2.5
12	250	11 1/4	32	3.2	3/4	2.0
		22 1/2	88	4.5		3.0
		30	132	5.1		
16	225	11 1/4	70	4.1	7/8	3.0
		22 1/2	148	5.3	1 1/8	4.0
		30	275	6.5	1 1/4	
20	200	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
24	200	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

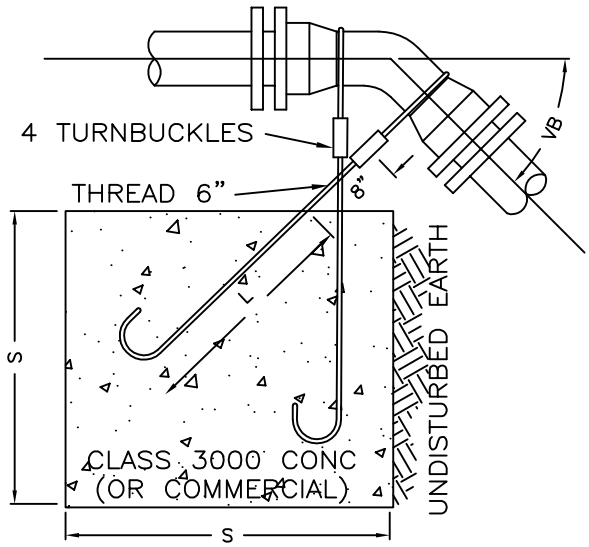


FOR 11 1/4°,22 1/2°, 30° VERT BENDS

TYPE "A" BLOCKING

TYPE "B" BLOCKING
FOR 45° VERT BENDS

PIPE SIZE NOM. DIAMETER– INCHES	TEST PRESSURE PSI	VB VERTICAL BEND DEGREES	NO OF CU FT OF CONC BLOCKING	S SIDE OF CUBE FEET	D DIAMETER OF SHACKLE RODS (4) INCHES	L DEPTH OF RODS IN CONCRETE FEET
4	300	45	30	3.1	3/4	2.0
6			68	4.1		
8			123	5.0		
12	250		232	6.1		2.5
16	225		478	7.8	1 1/8	4.0
20	200		560	8.2	1 1/4	
24			820	9.4	1 3/8	4.5



FOR 45° VERT BENDS

TYPE "B" BLOCKING

IMPORTANT NOTE

EWUA REQUIRES THAT MECHANICAL JOINT RESTRAINT BE USED INSTEAD OF CONCRETE THRUST BLOCKS WHEREVER FEASIBLE AND PRACTICAL.

EASTSOUND WATER USERS ASSOCIATION	DATE: 11/2009	VERTICAL THRUST BLOCKING N.T.S.	STANDARD DETAIL	DETAIL No. 120

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