

## Appendix H

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# Water System Construction Standards

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**CITY OF WOODLAND**  
**ENGINEERING STANDARDS FOR CONSTRUCTION**

**SECTION 5**

**WATER SYSTEM**

**FEBRUARY 24, 2015**

City of Woodland  
300 E. Scott Avenue  
Woodland, Washington 98674  
(360) 225-7999

## **SECTION 5 – WATER SYSTEM**

### **CHAPTER 1 – DESIGN AND CONSTRUCTION SPECIFICATIONS**

#### **5.00 General Requirements**

##### **A. Preconstruction Conference**

No water main construction work shall commence prior to the pre-construction meeting or prior to approval of the engineering plans. After completion of construction and submittal of required documents and fees, final acceptance will be given by the City at which time service will be available by application following payment of fees for water meters.

##### **B. Water Quality**

The quality, taste and odor of water drawn from new construction water mains shall be the same as the water in the existing facility classed as acceptable for use by the City. Should the water not be acceptable for use because of taste, required steps as approved by the City shall be accomplished to attain water quality acceptable for use.

##### **C. Operation of all waterlines valves and appurtenances shall be by City personnel only once new waterlines are connected to the City's existing system, regardless of whether or not the overall project has been accepted by the City.**

#### **5.01 Water Meters**

A. All water meters shall be furnished and set by the City. The owner is required to apply and pay all meter and installation fees prior to the acceptance of the project. The City will install meters and lock off meter setters and turn on as requested by the owner after acceptance by the City. Water meters will be set only after box and setter are installed per the standard details.

B. In subdivisions and short plats, water meter applications will be processed for meter sets and water turned on after acceptance of the water mainline facility by the City and payment of all meter and installation fees by the applicant.

C. All irrigation meters require the installation of certified backflow devices. Certification must be either City or State approved. All irrigation meters will be set and turned on after acceptance of the water system by the City. The City will not accept a water system until all the requirements of these standards have been completed and all the fees have been paid.

D. Adjustments, repairs or replacement of the service line, meter box or setter shall be the responsibility of the property owner.

E. Any deficient water service brought up to standards by the City as requested by a property owner by application shall be billed by the City on a time and material basis

F. Water services are to be single runs from the main line to each meter. Splices

or joints of any kind are not allowed on new services or service line repairs completed by the contractor. Multiple meters on a single service line will only be accepted when all meters serve a single property owner.

- G. Materials and construction shall be in accordance with Section 7-15 of the WSDOT Standard Specifications and the Standard Details.

## **5.02 Cross Connection Control**

Backflow devices shall be installed in accordance with the requirements of the "Accepted Procedure and Practice in Cross Connection Control" manual, the Uniform Plumbing Code and the Codes.

## **5.03 Connections to Existing Pipelines**

- A. Connections may be made to existing pipes under pressure with a tapping machine by determining the size and type of pipe and installing tapping sleeve to fit complete with tapping gate valve. Where cut-ins requiring a shut-down of existing lines are permitted to be made, the work shall be conducted at such a time and in such a manner as to minimize the interruption of service. Cut-in time must be approved by the City. Necessary pipe, fittings and gate valves shall be assembled at the site ready for installation prior to the shutting-off of water in the existing main. Once the water has been shut off, the work shall be performed vigorously and shall not be halted until the line is restored to service. Operation of all water main line valves shall be by the City. The City shall witness all wet taps and cut-in connections and requires forty-eight (48) hours notice and approval by the City.
- B. The Contractor shall have the responsibility of giving at least a forty-eight (48) hour notice to the City and affected customers of intention to disrupt service.
- C. Shut-down of the system at the requested time is not guaranteed. If City personnel are not available at the requested time or if the Contractor does not have the necessary equipment and materials on site, the shut-down will be moved back to allow for re-notification.
- D. Pipes to be abandoned shall be capped with mechanical couplings. Abandoned pipes left in place that are larger than eight inches (8") in diameter must be completely filled with grout.
- E. When tapping water mains, use stainless steel conforming to 18-8 Type 304 stainless steel with a CF 8 cast stainless steel flanged end with ANSI 150 lb drilling. Bolts and hardware shall be Type 304 stainless steel.
- F. Connections to existing mains larger than eight inch (8") diameter shall be via a wet tap unless otherwise approved by the City.
- G. Connections to existing mains smaller than eight inches (8") in diameter shall be by cutting in a tee, unless otherwise approved by the Public Works Director.

- H. Size on size tapping tees are not allowed unless otherwise approved by the Public Works Director.

#### **5.04 Roadway and Railway Crossings**

The Contractor shall use the method which has been designed on the plans and is acceptable to the City and the government or private agency having control of the road. Permits are required and shall be obtained prior to construction approval.

#### **5.05 Trench Excavation**

- A. Clearing and grubbing where required shall be performed within the easement or public right-of-way and as permitted by the property owner and/or governing agencies. Debris resulting from the clearing and grubbing shall be disposed of by the developer.
- B. The work necessary to excavate, bed, and backfill water pipelines shall conform to the requirements of Section 7-9 of the WSDOT Standard Specifications and the Standard Drawings.
- C. Trenching and shoring operations shall not proceed more than one-hundred (100) feet in advance of pipe laying without written approval of the City.
- D. Where a utility crosses under an existing asbestos cement water main or where a trench alters the bedding of an existing asbestos cement water main, the existing A.C. pipe shall be cut three feet (3') minimum from each side of the trench wall and replaced with a corresponding size ductile iron pipe Class 52. The ductile iron pipe shall be connected to A.C. pipe with transition couplings.

#### **5.06 Pipe in Filled Area**

Special treatment may be required at the discretion of the City for pipe installed in fill areas. This treatment may consist of compacting the backfill in six inch (6") layers, careful choice of backfill materials, use of Mechanical Joint Ductile Iron Pipe in short lengths, or such other reasonable method or combinations as may be necessary or as required by the City.

#### **5.07 Pipe Installation for Water Mains**

- A. General  
Pipe shall be laid per Section 7-08 of the Standard Specifications as modified and/or amended herein.
- B. Line and Grade  
Waterlines shall be installed to the line and grade shown on the plans. Construction staking providing both line and grade information shall be provided at locations of all fittings and valves and at intermediate locations spaced not more than 60 feet apart. Pipelines shall not deviate from the straight line at any joint in excess of two inches (2") horizontally and one inch (1") vertically. The Contractor shall pothole and locate existing utilities far enough in advance of

pipe laying operations such that horizontal and vertical changes in pipeline and grade can be achieved with joint deflections.

- C. **Pipe and Fittings Materials**  
Use only PVC C-900 or Class 52 ductile iron pipe and fittings. HDPE or other materials may be approved by the Public Works Director on a case by case basis.
- D. **Bolts**  
Bolts for buried flanged fittings shall be stainless steel. Bolts for mechanical joints shall be NSS Corten steel or Ductile iron only.
- E. **Permissible Deflection of Joints**  
Wherever it is necessary to deflect pipe from a straight line either in a vertical or horizontal plane, or where long-radius curves are permitted, the amount of deflection allowed shall not exceed the values in the following table:

Table 5.1 Maximum Deflection Permitted\*  
18-Foot Length Pipe

Diameter (Inches)	Mechanical Joint Maximum Deflection**		Push-on Joint Maximum Deflection	
	Angle (Degrees- Minutes)	Deflection (Inches)	Angle (Degrees)	Deflection (Inches)
4	8-18	31	5	18
6	7-07	27	5	18
8	5-21	20	5	18
10	5-21	20	5	18
12	5-21	20	5	18

\* The maximum deflection shall be whichever is less, the table or that recommended by the pipe manufacturer.

\*\* Safe deflection for one-hundred fifty pounds (150 lbs.) pressure. For higher pressure, reduce tabulated deflection proportionally ten percent (10%) for each one-hundred fifty pounds (150 lbs.) added pressure.

- F. **Downtime Protection**  
When stopping work for the day, the contractor shall plug pipe ends to prevent rodents, other small animals, or debris from entering the pipe. Use an inflatable ball as a plug in addition to a tight-woven canvas, securely tied around outside of pipe end.
- G. **Detectable Tracer Wire**  
Water main and services shall be installed with a 12 gauge insulated copper tracer wire. Wire shall be terminated at valve boxes and meter boxes. Splices in tracer wire shall be made with a manufactured connection to ensure conductivity through the splice.

## H. Sanitary Sewer Crossings

### 1. Horizontal and Vertical Separation (Parallel)

A minimum horizontal separation of ten feet (10') between sanitary sewers and any existing potable water lines, and a minimum vertical separation of eighteen inches (18") between the bottom of the drinking water line and the crown of the sewer shall be maintained. The distance shall be measured edge to edge (i.e., from the outer diameter of the pipes.) as shown in drawing W – 20.

### 2. Vertical Separation (Perpendicular)

Sewer lines crossing water lines at angles including perpendicular shall be laid below the water lines to provide a separation of at least eighteen inches (18") between the invert of the water line and the crown of the sewer. In the event eighteen inches (18") of vertical separation cannot be achieved or the sewer line is required to be installed above the water line, the following is required.

#### a. Gravity Sewers Passing Under Water Lines

Sewer pipe shall be encased in controlled density fill (CDF) with a minimum compressive strength of 300 psi or in a one quarter-inch thick continuous steel, ductile iron, or pressure rated PVC pipe with a dimension ratio (DR) of 18 or less, with all voids pressure-grouted with sand-cement grout or bentonite. Commercially available pipe skirts and end seals are acceptable. When using steel or ductile iron casing, design consideration for corrosion protection should be considered. Encasement shall extend a minimum of ten feet (10') on each side of the crossing. One full length of sewer pipe shall be centered at the point of crossing so that the joints will be equidistant and as far as possible from the water line. The sewer pipe shall be the longest standard length available from the manufacturer.

#### b. Gravity Sewers Passing Over Water Lines

Water lines shall be protected by providing:

- i. A vertical separation of at least eighteen inches (18") between the invert of the sewer and the crown of the water line.
- ii. Adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking of the water lines.
- iii. The length of sewer pipe shall be centered at the point of crossing so that the joints will be equidistant and as far as possible from the water line. The sewer pipe shall be the longest standard length available.
- iv. A water line encased in a one quarter-inch thick continuous steel, ductile iron, or pressure rated PVC pipe with a dimension ratio (DR) of eighteen



(18) or less, with all voids pressure-grouted with sand-cement grout or bentonite. Commercially available pipe skids and end seals are acceptable. When using steel or ductile iron casing, design consideration for corrosion protection should be considered. Encasement shall extend a minimum of ten feet (10') on each side of the crossing.

c. Pressure Sewers under Water Lines

Pressure sewers shall be constructed only under water lines with pressure rated pipe encased in controlled density fill (CDF) with a minimum compressive strength of 300 psi or in a one quarter-inch thick continuous steel, ductile iron, or pressure rated PVC pipe with a dimension ratio (DR) of eighteen (18) or less, with all voids pressure-grouted with sand-cement grout or bentonite. Commercially available pipe skids and end seals are acceptable. When using steel or ductile iron casing, design consideration for corrosion protection should be considered. Encasement shall extend a minimum of ten feet (10') on each side of the crossing.

I. Separation from Existing Water Systems

New waterline piping shall not be connected to existing systems until all pressure testing and disinfection has been completed. New pipes shall be installed such that there is a physical gap between the existing waterline and the new waterline. Visual inspection of the tie-in to the existing system under working pressure is required prior to backfilling.

**5.08 Pipe Class/ Protection/Cover**

- A. All waterlines shall be PVC C-900 or ductile iron pipe Class 52 unless otherwise noted herein. When crossing under rockeries and retaining walls, pipe shall be installed in a steel casing that extends beyond the footings or rockery face a minimum of five feet (5') and extends beyond the back of rockery or wall equal to the height of the wall or rockery or a minimum of five feet (5').
- B. Watermain depth of cover:
  - 1. Three feet (3') minimum from final grade
  - 2. Six feet (6') maximum from final grade
  - 3. Regardless of the pipe material or size or the amount of cover from finished grade, existing or newly installed pipe shall not be subject to construction traffic, including excavators, trucks, pavers, etc., until the backfill has reached a minimum of two feet (2') above the top of the pipe. Backfill material may be compacted in piles over the top of the pipe, but must not be removed during paving or any other construction activities. The City may require television inspection, removal and reinstallation or other measures as deemed necessary at the Contractor's expense should pipes be subject to construction traffic prior to providing the minimum two feet (2') of cover.
- C. Building setback requirements:
  - 1. Five feet (5') minimum from covered parking to watermain.

2. Ten feet (10') minimum from building (and retaining walls) to watermain.
  3. Twenty feet (20') minimum easement shall be provided between buildings.
- D. All ductile iron pipe and adjacent fittings shall be encased in 8-mil polyethylene per AWWA C-105 where directed by the Public Works Director.

#### **5.09 Bedding and Backfill**

Use crushed surfacing top course for bedding and backfill of all water main pipe installed under pavement, curbs, sidewalks, or usable shoulder. Place bedding and backfill pipe and appurtenances in accordance with the Standard Drawing W-13. Bedding shall be compacted to ninety percent (90%) of the maximum theoretical density as measured by the standard proctor method (AASHTO T-180) prior to placement of the next layer. Backfill material shall be compacted to ninety-five percent (95%) of maximum dry density as measured by the standard proctor method (AASHTO T-180). In non-roadway areas, native material may be used above the pipe zone (twelve inches (12") above pipe) as approved by the Public Works Director.

#### **5.10 Hydrostatic Tests**

The contractor shall make pressure and leakage tests on all newly laid pipe in accordance with Section 7-09.3(23) of the WSDOT Standard Specifications as modified herein. The test duration shall be sixty minutes (60 min.) and the pressure shall not drop more than 5 psi at any time during the test. If the pressure drops more than 5 psi, the test shall be terminated and the sixty minute (60 min.) period started over.

Contractor shall be required to furnish all necessary equipment and material, make all taps in the pipe as required, provide all temporary thrust blocking as required, and conduct the tests. The City's Development Inspector shall witness the test; if the test does not pass inspection for any reason, additional trips required to witness the test shall be at the owner's expense.

- A. **Correction of Excessive Leakage**  
Should any test of pipe laid disclose leakage greater than that allowed, locate and repair the defective joints or pipe until the leakage of a subsequent test is within the specified allowance.
- B. **Testing Against Valves**  
  
Pressure testing against valves will not be allowed unless approved by the Public Works Director.
- C. **Provide temporary two inch (2") blow off assemblies for testing and disinfection of new watermains (where hydrants are not available). Place blow-off at high end of line, where possible.**

#### **5.11 Sterilization and Flushing of Water Mains**

Pipeline intended to carry potable water shall be sterilized before placing in service. All waterlines must be subject to and pass a pressure test prior to starting sterilization procedures. Sterilizing procedures shall conform to AWWA C-601 as hereinafter modified or expanded, and Section 7-09.3(24) of the WSDOT Standard Specifications.

- A. Method of Disinfection  
All pipelines shall be sterilized using a continuous feed method. Placement of dry Calcium Hypochlorite or other chlorine bearing compounds in individual pipe lengths will not be allowed. The potable water pipeline shall be disinfected with a solution containing a minimum of 25 ppm chlorine to maximum 50 ppm chlorine. The disinfecting solution must remain in the pipeline for a period of 24 hours or greater. After the twenty-four (24) hours, all portions of the pipe must have a minimum of 10 ppm. If the chlorine residual is less than twenty-four (24) hours, the line shall be flushed and the disinfection process repeated. If 10 ppm in all portions of the piping, the pipe shall be flushed until the chlorine residual is the same as that of the source of the flushing water. After flushing, the water shall remain in the pipeline for a twenty-four (24) hour period prior to taking the samples.
  
- B. Disposal of Sterilizing Water  
Dispose of sterilizing water in an approved manner. Do not allow sterilizing water to flow into a waterway without adequate dilution or other satisfactory method of reducing chlorine to a safe level. Dechlorination procedures are to be submitted in writing and approved by the Public Works Director prior to flushing system.
  
- C. Collection of Samples  
The Contractor shall hire an independent laboratory to collect and analyze water samples for the presence of bacteria. The City's Inspector shall determine the quantity and location of samples to be taken and witness the sampling completed by the laboratory. Results of all tests shall be given to the Inspector upon completion.

## **5.12 Valves for Water Mains**

- A. Materials and construction shall be in accordance with Section 7-12 of the WSDOT Standard Specifications and the Standard Details.
  
- B. Valve marker posts shall be reinforced concrete posts, (4 x 4) inch on one end, (6 x 6) inch on the other end, forty-two inches (42") long. Valve marker post shall be painted white hi-gloss Rust-oleum with painted black dimension from marker to valve boxes.

## **5.13 Hydrants**

- A. Fire hydrants shall be located to allow a thirty-six inch (36") clear space surrounding the hydrant. For example, street lights, sign posts, protective posts, or retaining walls shall be no closer than thirty-six inches (36") from the nearest portion of a hydrant. There shall also be no obstructions directly in line with any of the ports of the hydrant.
  
- B. Fire hydrants shall have Storz fittings.
  
- C. Materials and construction shall be in accordance with Section 7-14 of the

WSDOT Standard Specifications and the Standard Details.

- D. Approved hydrant is the Waterous WB67 Class 250.

#### **5.14 Cross Connection Control and Backflow Assemblies**

- A. Installation and Testing

Backflow prevention assemblies shall be installed at the water service connection on the customer side of the meter. Backflow assemblies 3" diameter and larger shall be installed in a vault in accordance with these standards. Backflow prevention assemblies one inch (1") and smaller shall be installed in a Rave Meter Box, series 1324 or an approved equal. one and one-half inch (1 ½") and two inch (2") assemblies shall be installed in a series 1730 box, or equal.

All backflow prevention assemblies must be tested upon installation by a State of Washington certified tester. The results of the testing shall be received by the City prior to issuance of "final occupancy".

- B. Backflow Prevention Device Assembly Vaults

Backflow prevention device assembly vaults shall be constructed in accordance with the standard drawings and requirements of this section. Backflow vaults shall be on private property and located outside of public easements.

- C. Fire Services and Domestic Services

1. No part of the backflow prevention assembly shall be submerged in water or installed in a location subject to flooding. In a vault or chamber, adequate drainage shall be provided; and test cocks shall be plugged. The plugs shall not be of dissimilar metals.
2. The backflow assembly shall be protected from freezing and other severe weather conditions.
3. All backflow assemblies shall have a minimum twelve inch (12") clearance on the backside, twenty-four inch (24") clearance on the test-cock side, and twelve inches (12") below the assembly. Adequate clearance (six inches (6") minimum) must be maintained above gate-valve stem at full extension. Headroom of six foot, zero inches (6'-0") is required in vaults without a full opening top. Access to the device and to any vault or chamber shall remain clear at all times.

- D. Special for Fire Service Only

1. Fire Service backflow prevention assemblies shall be installed at the property line, or edge of the public water line easement. The fire service from the public main to the backflow assembly shall be privately owned and meet all City's Standard Drawings.
2. Only approved resilient seat indicating valves are allowed on fireline assemblies.
3. Only approved Double Detector Check Valve Assemblies are to be used for system containment on fire line services in the City. The meter on the bypass assembly shall read in cubic feet.

4. Fire Line Flow and Tamper Switches installed must be connected to a monitored Fire Detection System approved by the Fire Marshal. The tamper switches are required on the OS and Y gate valves in the vault, as well as any other indicating control valves on the fire protection system. Electrical inspection and permit is required.
5. The remote reader (if allowed) shall be rigidly mounted on an exterior building wall (near the domestic meter), enclosed in a metal box with a slot opening which allows reading the remote without opening the box, and at an elevation of five feet (5') above the ground level.

The remote reader shall have the same number configuration as the metering device itself, and read in cubic feet. All wires to the remote reader shall be enclosed in a heavy plastic or rigid metal conduit. All wiring shall be in conformance with appropriate sections of the National Electric Code.

### **5.15 Water System Vault Installations**

To ensure proper operation and accessibility of all vaults, the following requirements shall apply unless otherwise approved by the Public Works Director.

- A. All vaults shall be sealed with Crystal Seal or approved equal on the outside of the vault.
- B. Vault penetrations shall be performed or core drilled to produce a smooth hole. Penetrations shall be sealed with a watertight Link Seal as manufactured by Thunderline or approved equal. Where approved by the Public Works Director, non-shrink grout may be used to seal penetrations. Apply water proof coating over grout. Backfill around vault per the manufacturer's specifications.
- C. Access to all vaults shall be through a double door, H-20 rated hatch. The doors shall open to ninety degrees (90°) and automatically lock with a stainless steel hold-open arm with an integral stainless steel compression spring. The unit shall lock with a stainless steel slam lock with removable key and have a covered, recessed locking hasp. Hinges and all hardware shall be stainless steel.
- D. Provide an aluminum ladder if the vault or chamber depth is three foot, zero inches (3'-0") or greater. Ladders shall include an aluminum ladder extension, Model 1672 as manufactured by Utility Vault Company, or approved equal. At a minimum, ladders shall be braced at the top, bottom and one intermediate location. All non-aluminum accessories shall be stainless steel or hot-dipped galvanized.
- E. Adequate drainage for the vault or chamber shall be provided. Gravity drainage to piped storm systems is allowed provided a check valve is installed. If gravity drainage is not possible, vaults shall be equipped with a sump pump. Vault floors must be sloped towards vault drain or sump. Surface drainage shall be directed away from water system vaults and chambers. The drain from the access door shall be piped directly to the sump or the vault drain.
- F. Vault must be equipped with a moisture proof light fixture if adequate lighting is not available.
- G. Vault is to have no other use, except for use described by these standards.
- H. Vault shall be installed on a subgrade consisting of ¾"-0 gravel base compacted

to 95 percent of maximum density (AASHTO T-99).

- I. Piping shall be installed with a clearance of one (1) to three (3) feet above the vault floor and a minimum clearance of nine inches (9") from the edge of flanges to any wall.
- J. All miscellaneous bolts and fasteners shall be stainless steel unless otherwise approved or noted herein.
- K. Assembly is to be adequately supported from the floor, and suitably restrained from movement. Supports shall consist of steel supports or approved equal; no wood supports shall be used.
- L. All electrical wiring shall be inspected by the Washington State Electrical Inspector (Permit is required).
- M. The assembly shall be readily accessible with adequate room for maintenance.
- N. PRV vaults are unique to each situation. Minimum requirements shall be as listed in Section 5.15. The engineer shall detail the vault on the plans and submit for review. The City will review the vault for size and compliance with the general requirements listed under this section.

#### **5.16 Appurtenances**

- A. Air and Vacuum Release Valves
  - 1. Air and vacuum release valves shall be APCO - Valve and Primer Corporation, "Heavy-Duty", combination air release valve, or equal.
  - 2. Installation shall be as shown on the Standard Details.
  - 3. Piping and fittings shall be copper or brass. Location of the air release valves as shown on the plans is approximate. The installation shall be set at the high point of the line. Water line must be constructed so the air release valve may be installed in a convenient location.

**CITY OF WOODLAND**  
**ENGINEERING STANDARDS FOR CONSTRUCTION**  
**SECTION 5, CHAPTER 2**  
**WATER CONSTRUCTION STANDARD DETAILS**  
**FEBRUARY 24, 2015**

City of Woodland  
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# WOODLAND WATER STANDARDS SHEET INDEX

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## WATER STANDARDS - SHEET INDEX

APPROVED

*Bart Stupp* 11/21/12

PUBLIC WORKS DIRECTOR      DATE

REVISIONS

DATE

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## GENERAL NOTES FOR WATER MAIN INSTALLATION

1. ALL WORKMANSHIP AND MATERIAL SHALL BE IN ACCORDANCE WITH THE WSDOT/APWA STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION HEREIN IDENTIFIED AS THE "STANDARD SPECIFICATIONS", AND AWWA SPECIFICATIONS, EXCEPT AS MODIFIED BELOW OR BY CITY OF WOODLAND STANDARD DETAILS.
2. A PRE-CONSTRUCTION MEETING SHALL BE HELD WITH CITY OF WOODLAND AT LEAST 48-HOURS PRIOR TO THE START OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE CONSTRUCTION SCHEDULES AND TRAFFIC CONTROL PLANS IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS. PROPOSED "EQUIVALENTS" MUST BE SUBMITTED TO THE CITY OF WOODLAND FOR APPROVAL.
3. THE CONTRACTOR SHALL NOTIFY THE CITY PUBLIC WORKS DEPARTMENT AT (360) 225-7999, 48-HOURS PRIOR TO LIVE TAPS OR OTHER CONNECTIONS TO EXISTING WATERMAINS. WHERE CONNECTIONS REQUIRE SHUT-DOWN OF SERVICE, CONNECTION POINTS WILL BE EXPOSED FOR "FIELD VERIFICATION" BY CONTRACTOR AND CONNECTION DETAILS SHALL BE VERIFIED 48 HOURS PRIOR TO DISTRIBUTING SHUT-DOWN NOTICES.
4. CALL UNDERGROUND LOCATE AT 811 A MINIMUM OF 48-HOURS PRIOR TO ANY EXCAVATIONS.
5. UNLESS OTHERWISE ESTABLISHED IN WRITING BY THE CITY, ALL WATER MAINS SHALL BE STAKED FOR GRADES AND ALIGNMENT BY AN ENGINEERING OR SURVEYING FIRM CAPABLE OF PERFORMING SUCH WORK.
6. EXISTING VALVES AND ANY VALVES INSTALLED DIRECTLY TO AND CONNECTED TO A PORTION OF ACTIVE WATER SYSTEM ARE TO BE OPERATED BY CITY OF WOODLAND REPRESENTATIVES ONLY.
7. WATER MAINS SHALL BE PVC IN ACCORDANCE WITH AWWA C900, PRESSURE CLASS AS SPECIFIED ON DRAWINGS OR DUCTILE IRON PRESSURE CLASS 50 OR AS NOTED ON DRAWING.
8. ALL LINES SHALL BE CHLORINATED AND TESTED IN CONFORMANCE WITH THE STANDARD SPECIFICATIONS PRIOR TO USE.
9. HARD COPY AND ELECTRONIC "AS-BUILT" DRAWINGS SHALL BE SUBMITTED TO CITY OF WOODLAND UPON COMPLETION OF THE WORK.
10. ALL WATERMAINS, FIRE HYDRANTS, BLOW OFF ASSEMBLIES, VACUUM BREAKERS, AND WATER SERVICES MUST HAVE LOCATE WIRE INSTALLED.

### GENERAL NOTES FOR WATER MAIN INSTALL

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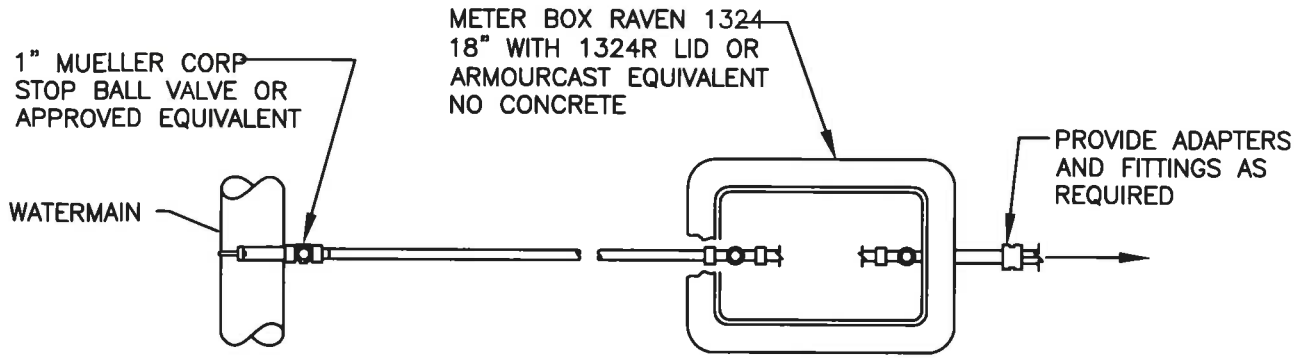
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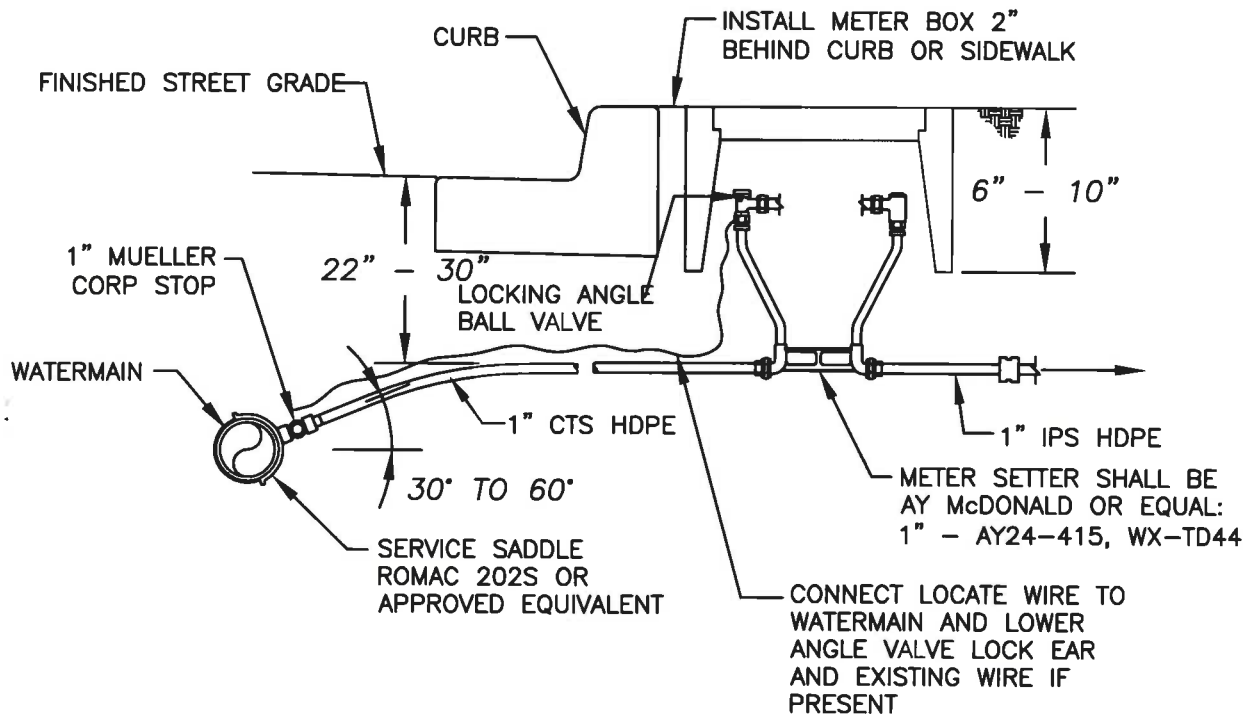
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*Bob Stupa* 11/21/12  
PUBLIC WORKS DIRECTOR      DATE





PLAN VIEW



SECTION VIEW

NOTES:

1. SERVICE LINES ON NEW WATERMAINS SHALL BE PRESSURE TESTED UP TO THE LOCKING ANGLE BALL VALVE AS PART OF THE WATERMAIN TESTING.
2. METER BOXES SHALL HAVE A 4' WOOD STAKE WITH BLUE PAINT BEHIND THE BOX.
3. ALL DOMESTIC AND IRRIGATION METERS SHALL BE SUPPLIED, OWNED, AND INSTALLED BY THE CITY OF WOODLAND.

3/4" AND 1" WATER SERVICE

APPROVED

*Paul Stipp* 11/21/12  
PUBLIC WORKS DIRECTOR DATE

REVISIONS

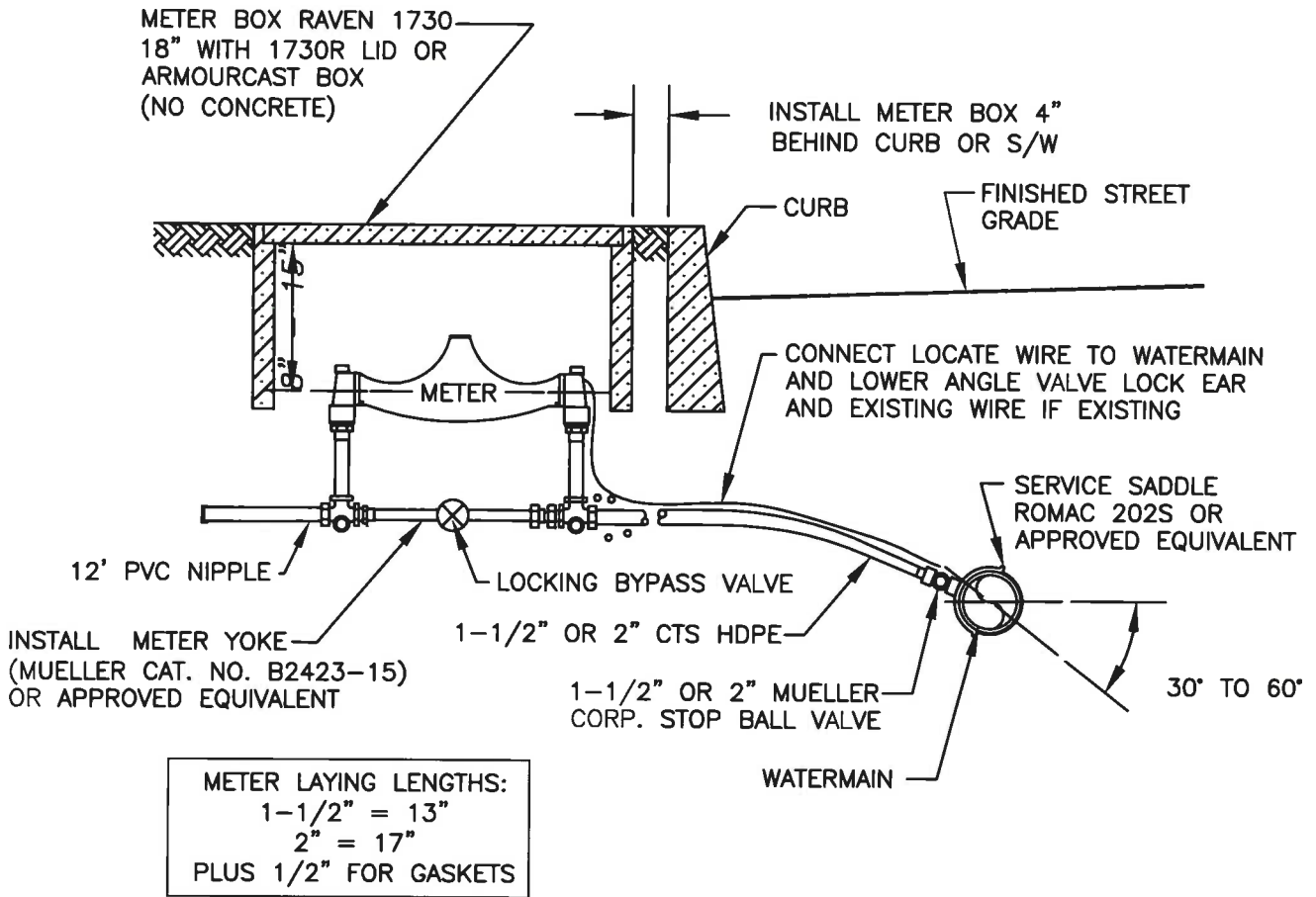
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NOTES:

1. ALL DOMESTIC AND IRRIGATION METERS SHALL BE SUPPLIED, OWNED, AND INSTALLED BY THE CITY OF WOODLAND.
2. PRIOR TO CITY INSTALLATION OF METERS, ALL SERVICE APPLICATIONS MUST BE COMPLETED AND APPROVED. SERVICE FEES PAID IN FULL AND AS-BUILTS SUBMITTED AND APPROVED.
3. CONTRACTOR SHALL CONTACT THE CITY OF WOODLAND PUBLIC WORKS OFFICE (360) 225-7999 48-HOURS PRIOR TO INSTALLING ANY WATER SERVICE CONNECTIONS.
4. METERS WILL NOT BE SET BY THE CITY PRIOR TO DISINFECTION OF THE MAIN AND SERVICE, AND PRIOR TO A SUCCESSFUL BACTERIOLOGICAL TEST.
5. SERVICE LINES ON NEW WATERMAINS SHALL BE PRESSURE TESTED UP TO THE LOCKING ANGLE BALL VALVE AS PART OF THE WATERMAIN TESTING.
6. DURING THE PRESSURE TEST, THE MAIL SHALL BE OPEN FOR INSPECTION OF ALL CORPORATION STOPS.
7. USE 1-7/8" BIT FOR ALL 2" SADDLE TAPS AND 1-3/8" BIT FOR 1-1/2" SADDLE TAPS.
8. METER BOXES ARE NOT ALLOWED IN HARD SURFACED AREAS WITHOUT PRIOR WRITTEN APPROVAL. METER BOXES IN HARD SURFACE AREAS SHALL BE SLIGHTLY HIGHER (1/8" MAX) THAN SURROUNDING GRADE AND BOTH THE BOX AND LID MUST BE TRAFFIC RATED.
9. RAVEN OR ARMOURCAST BOX AND EXTENSION MAY BE ALLOWED WITH 1 1/2" METER SETS ONLY.
10. 1 1/2" METER CAN BE INSTALLED IN A 2" SETTING WITH ADAPTORS.

1-1/2" AND 2" WATER SERVICE

APPROVED

REVISIONS

DATE

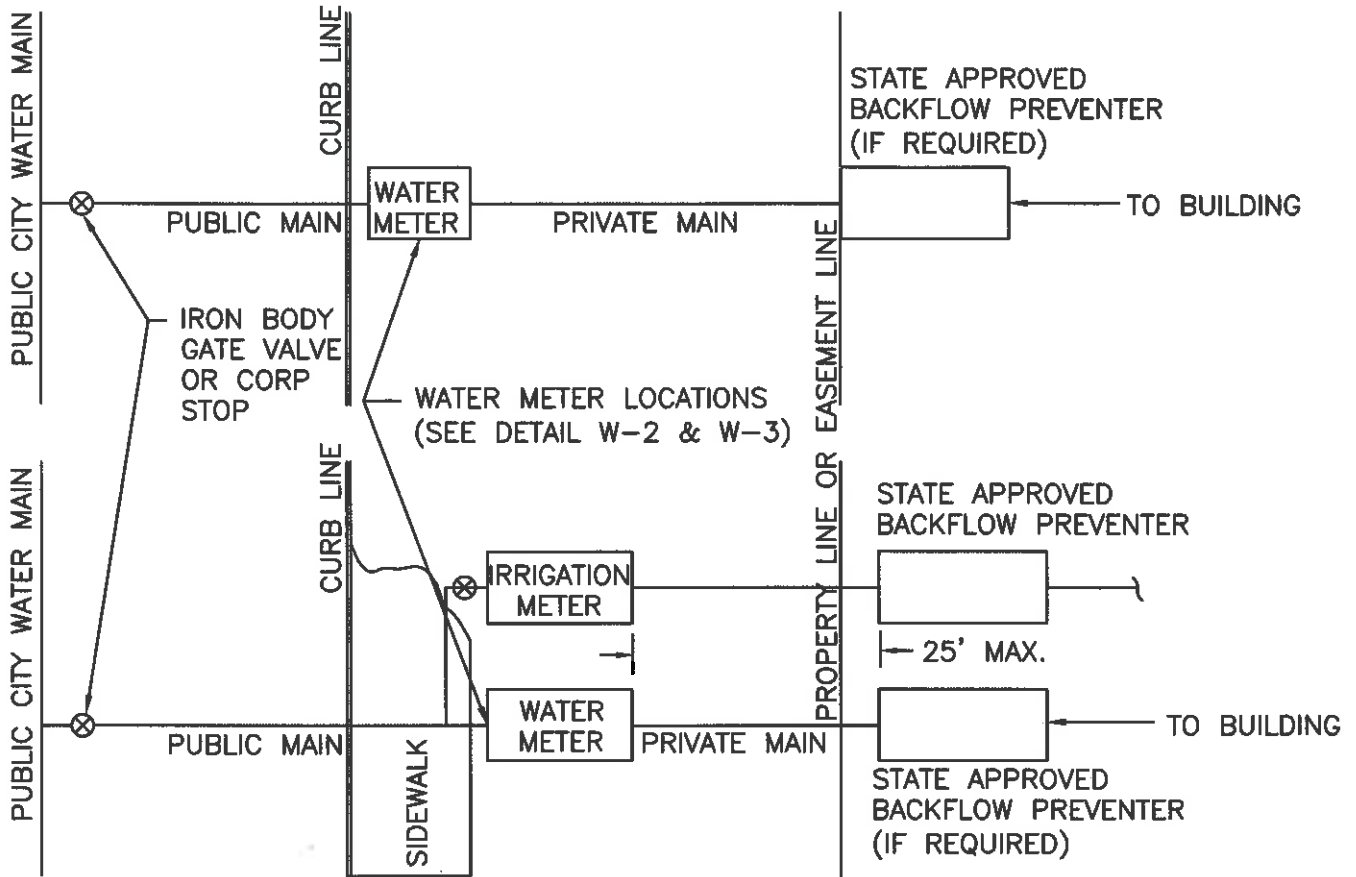
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*Bart Stepp* 11/2/12  
PUBLIC WORKS DIRECTOR DATE

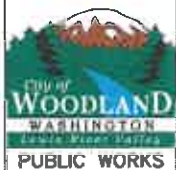
W-03



NOTES:

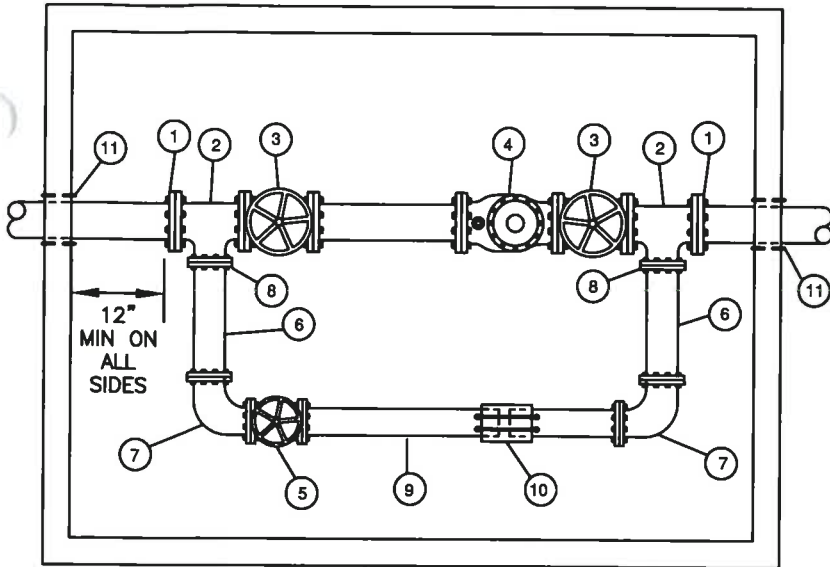
1. ALL NON-SINGLE FAMILY DOMESTIC SERVICES SHALL BE TAPPED SEPARATELY FROM ANY FIRE PROTECTION AND FIRE HYDRANT LEAD PIPING.
2. ALL IRRIGATION METERS SHALL BE PER APPROVED PLAN.
3. IRRIGATION METERS SHALL BE PLACED IN A STANDARD METER BOX WITH READER LID ACCORDING TO METER SIZE (SEE DETAIL W-02 & W-03).
4. EXCEPTIONS TO THESE REQUIREMENTS MAY BE SUBMITTED IN WRITING FOR REVIEW AND APPROVAL.
5. IRRIGATION METERS WILL BE READ DURING REGULAR BILLING CYCLES.

STANDARD METER LOCATIONS



APPROVED	REVISIONS	DATE	DRAWN	DESIGNED
<i>Bart Stupp</i>		1/6/14		
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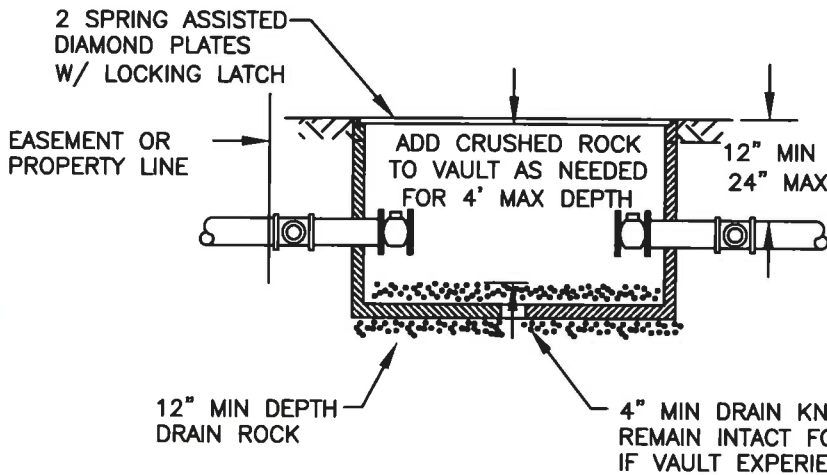
W-04



- ① FLEX X FLG COUPLING
- ② ALL-FLG TEE
- ③ FLG RES. SEATED GATE VALVE W/HAND WHEEL
- ④ COMPOUND METER
- ⑤ GATE VALVE W/HAND WHEEL
- ⑥ BRASS OR DUCTILE IRON NIPPLES
- ⑦ 90° ELBOWS (MATERIAL TO BE SAME AS PIPE)
- ⑧ COMPANION FLG
- ⑨ BRASS OR DUCTILE IRON PIPE
- ⑩ MECHANICAL COUPLING
- ⑪ PIPE SLEEVE

**VAULT**

UTILITY VAULT CO. R.C.P. VAULTS  
 #575-LA-3660P #76632  
 #676-WA-3660P W/#57-TL-B LID



METER SIZE	BY-PASS LINE SIZE	BY-PASS MATERIAL
3" & 4"	2" MIN	COPPER
6"	4"	DUCTILE IRON
8"	6"	DUCTILE IRON

**NOTES:**

1. THE CITY OF WOODLAND WILL SUPPLY, OWN AND MAINTAIN THE METER, METER SPACER, REDUCING TEE, AND STRAINER. CONTACT THE CITY PUBLIC WORKS DEPARTMENT 2 WEEKS PRIOR TO INSTALLATION.
2. ALL METERS SHALL BE INSTALLED BY THE CITY. CONTRACTOR TO INSTALL TEMP. SPACER AS PER NOTE 1.
3. 10 PIPE DIAMETERS OF STRAIGHT PIPE REQUIRED, IN & OUT OF METER (IF USING 6" PIPE, NO BENDS ALLOWED WITHIN 5' OF THE METER IN EITHER DIRECTION [IE: 6" x 10 = 60"]).
4. PIPE AND FIXTURES TO BE SET ON VALVE STANDS INSTALLED ACCORDING TO MANUFACTURERS SPECS.
5. REMOTE READER UNIT SHALL BE LOCATED IN A READILY ACCESSIBLE AREA OUTSIDE THE VAULT, AS APPROVED BY THE CITY.
6. CONTRACTOR SHALL USE APPROPRIATE METHODS TO ENSURE COPPER PIPE, FITTINGS AND JOINTS WILL REMAIN LEAK-TIGHT.
7. METER BOX SHALL NOT BE ALLOWED IN HARD SURFACED AREAS WITHOUT PRIOR WRITTEN APPROVAL. METER BOXES AND LIDS IN HARD SURFACE AREAS SHALL BE SLIGHTLY HIGHER THAN SURROUNDING GRADE AND BOTH MUST BE TRAFFIC RATED.
8. INSTALL OR CONNECT LOCATING WIRE WITH LONG LOOP IN VAULT.

**COMPOUND METER INSTALLATION**

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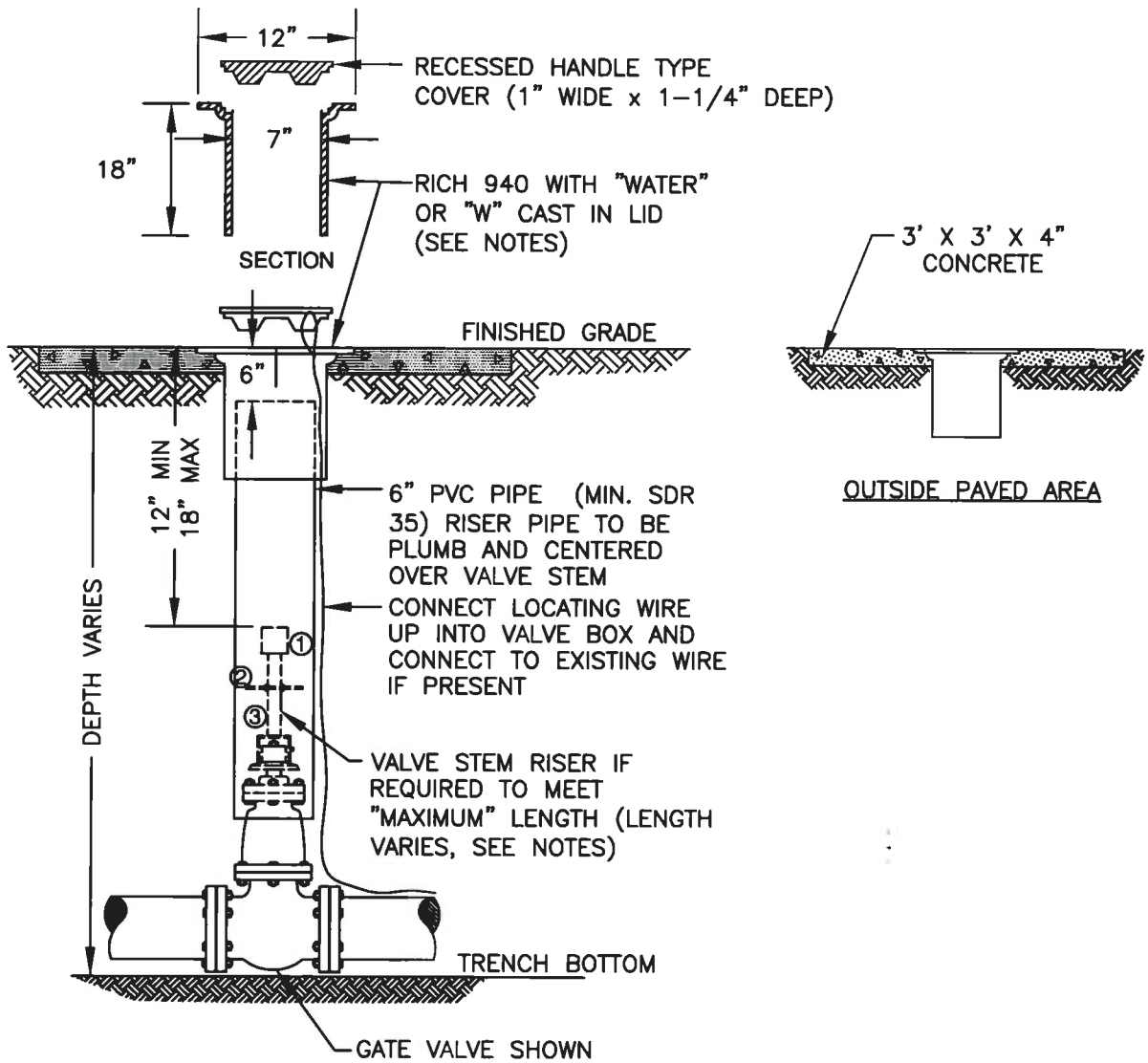
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W-05



NOTES:

1. VALVE STEM EXTENSION TO INCLUDE THE FOLLOWING WELDS TO BE 1/4" FILLET WELD ALL AROUND.
2. VALVE OPERATING NUT OR 1-7/8" X 1-7/8" X 2" HIGH GRADE STEEL.
3. 3/16" THICK X 5-1/5" DIA STEEL GUIDE PLATE SHAFT.
4. 2" X 2" X 3/16" SQUARE STRUCTURAL STEEL TUBING TO FIT OPERATING NUT.
5. FOR NEW VALVES IN EXISTING STREET, RESTORE PAVEMENT PER CITY OF WOODLAND STANDARDS.

STANDARD VALVE BOX AND COVER

APPROVED

REVISIONS

DATE

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 PUBLIC WORKS DIRECTOR DATE

W-06



# GENERAL NOTES FOR BACKFLOW PROTECTION

1. ALL REDUCED PRESSURE AND BACKFLOW DEVICES SHALL BE WASHINGTON STATE APPROVED, PER WAC 246-290.
2. FIRE SPRINKLER AND IRRIGATION SYSTEMS SHALL BE PROTECTED WITH STATE APPROVED BACKFLOW PROTECTION ASPRESCRIBED IN WAC 246-290. IRRIGATION SYSTEMS ARE PROTECTED COMMENSURATE WITH THE DEGREE OF HAZARD AS DEFINED BELOW:
  - HIGH HEALTH HAZARD - IS ASSESSED TO ANY IRRIGATION SYSTEM THAT CONTAINS PUMPS OR INFECTORS FOR THE ADDITION OF CHEMICALS. THIS RISK ASSESSMENT IS ALSO BASED ON THE ADDITIONAL HARZARD POSED BY BACTERIAL CONTAMINATS FOUND ON LAWNS, AND ON THE POSSIBILITY OF CHANGES BEING MADE TO THE IRRIGATION SYSTEM BY THE CUSTOMER. AN APPROVED REDUCED PRESSURE BACKFLOW ASSEMBLY, OR AN APPROVED AIR GAP SEPARTION, SHOULD BE REQUIRED IN ALL CASES WHERE MEANS ARE PROVIDED FOR CHEMICALS OR HERBICIDES TO THE INJECTED INTO THE IRRIGATION SYSTEM, OR WHERE AN AUXILIARY SUPPLY IS ALSO PROVIDED FOR IRRIGATION WATER.
  - LOW HEALTH HAZARD - IS ASSESSED TO ALL IRRIGATION SYSTEMS NOT OTHERWISE ASSESSED AS A HIGH HEALTH HAZARD. THIS RISK ASSESSMENT IS BASED ON THE HAZARD POSED BY BACTERIAL AND CHEMICAL CONTAMINANTS FOUND ON LAWNS, AND ON THE POSSIBILITY OF CHANGES BEING MADE TO THE IRRIGATION SYSTEM BY THE CUSTOMER. AN APPROVED DOUBLE CHECK VALVE ASSEMBLY IS REQUIRED.
3. ALL COMMERCIAL, INDUSTRIAL AND MULTI-FAMILY FACILITIES SHALL BE PROTECTED WITH WASHINGTON STATE APPROVED BACKFLOW PROTECTION.
4. FURTHER BACKFLOW PREVENTION SHALL BE REQUIRED BY THE CITY OF WOODLAND DEPENDENT UPON ACTIVITY (BOILERS, CHILLERS, CHEMICAL ADDITION, BOOSTER PUMPS, WELLS, MEDICAL EQUIP. SODA POP MACHINES, ETC).
5. ALL HOSEBIBS SHALL BE PROTECTED WITH VACUUM BREAKERS.
6. IF CHEMICALS ARE ADDED TO THE FIRE PROTECTION SYSTEM, A REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER IS REQUIRED.
7. IF A WELL IS NOW EXISTING ON-SITE OR IS DRILLED IN THE FUTURE, A REDUCED PRESSURE BACKFLOW ASSEMBLY WILL BE REQUIRED AT EACH METER.
8. WHERE A VAULT IS REQUIRED, A GALV. STEEL WALL MOUNTED CHAMBER LADDER W/EXTENSIONS IS REQUIRED AND SHALL BE CENTERED UNDER THE ACCESS DOOR.
9. DOUBLE CHECK ASSEMBLIES SHALL BE INSTALLED IN EITHER AN APPROVED VAULT OR INSIDE THE BUILDING IN A MAINTAINABLE LOCATION.
10. REDUCED PRESSURE ASSEMBLIES SHALL BE INSTALLED EITHER OUTSIDE ABOVE GROUND OR INSIDE THE BUILDING.
11. ALL BACKFLOW DEVICES SHALL BE PROTECTED FROM FREEZING.
12. BACKFLOW PREVENTION ASSEMBLY VAULTS (I.E.: FIRE AND SERVICE PROTECTION) MUST BE INSTALLED AT THE CUSTOMER'S SIDE OF THE EASEMENT OR PROPERTY LINE. ALTERNATE LOCATIONS MUST BE REQUESTED IN WRITING AND APPROVED BY CITY OF WOODLAND PUBLIC WORKS PRIOR TO INSTALLATION.
13. NO PART OF THE BACKFLOW PREVENTION ASSEMBLY SHALL BE SUBMERGED IN WATER OR INSTALLED IN A LOCATION SUBJECT TO FLOODING. IF A BACKFLOW PREVENTION ASSEMBLY IS INSTALLED IN A VAULT OR BASEMENT, ADEQUATE DRAINAGE SHALL BE PROVIDED.
14. ALL FIRE PROTECTION SERVICES SHALL HAVE A IRON BODY GATE VALVE AT THE PUBLIC MAIN AND SHALL BE PRIVATE AFTER THAT VALVE.
15. ALL DOMESTIC SERVICES WITH BACKFLOW PROTECTION SHALL BE PRIVATE AFTER THE DOMESTIC WATER METER.
16. ALL BACKFLOW PREVENTION DEVICES SHALL BE TESTED AFTER INSTALLATION PRIOR TO ACCEPTANCE AND ANNUALLY THEREAFTER BY A CERTIFIED BACKFLOW ASSEMBLY TESTER. A PARTIAL LIST OF WASHINGTON STATE APPROVED TESTERS IS AVAILABLE UPON REQUEST. TEST RESULTS SHALL BE SENT TO THE CITY OF WOODLAND PUBLIC WORKS DEPARTMENT.

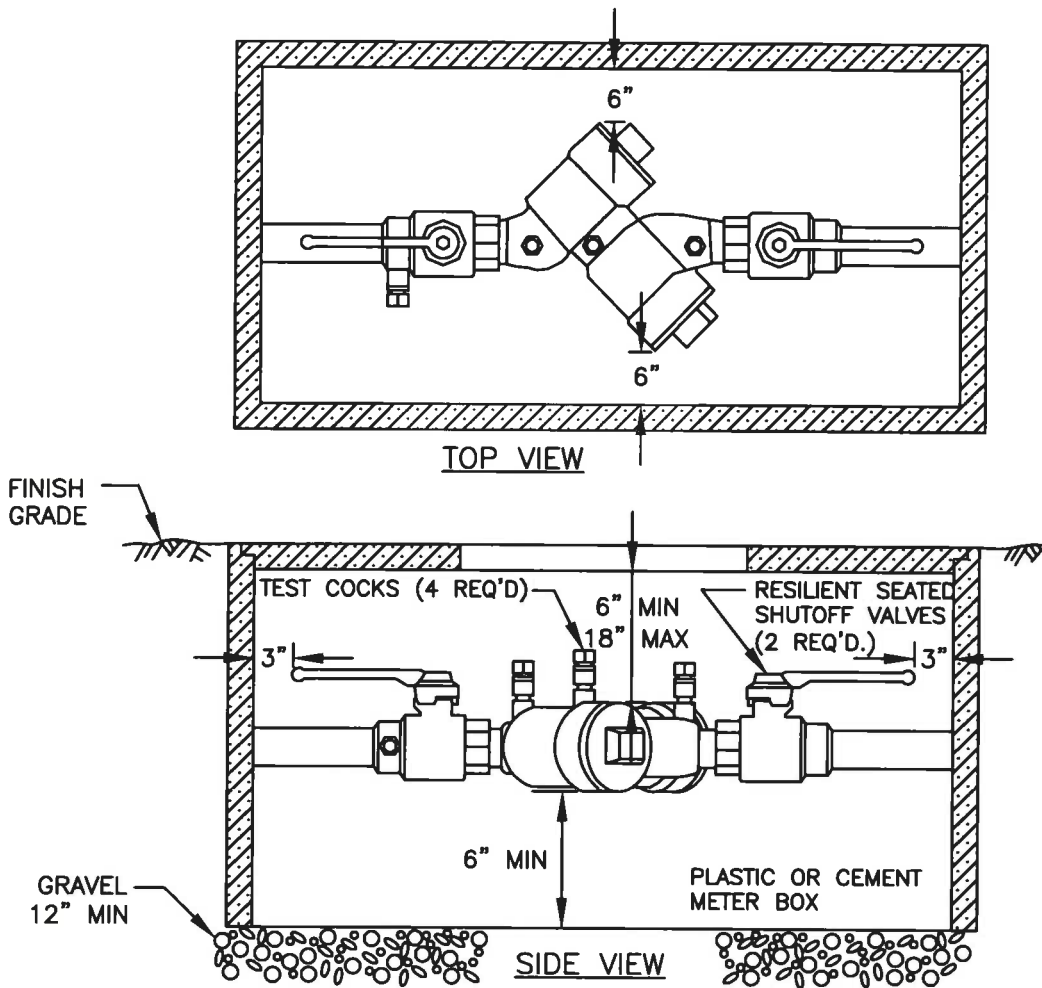
MAIL TEST RESULTS TO: CITY OF WOODLAND - PUBLIC WORKS  
P.O. BOX 9  
WOODLAND, WA 98674



## GENERAL NOTES FOR BACKFLOW PROTECTION

APPROVED	REVISIONS	DATE	DRAWN	DESIGNED
<i>Bart Stipp</i>		11/21/12		
PUBLIC WORKS DIRECTOR		DATE		

W-07



NOTES:

1. APPROVED DOUBLE CHECK VALVE ASSEMBLY (DCVA) TO LAY HORIZONTAL WITH GROUND. (VERTICAL ALLOWED IF APPROVED BY WASHINGTON STATE DEPARTMENT OF HEALTH)
2. DCVA MAY BE INSTALLED ABOVE OR BELOW GROUND PROVIDED ALL CLEARANCES ARE MET.
3. DESIGN FOR BACK SIPHONAGE AND BACK PRESSURE.
4. UNIONIZED ASSEMBLIES REQUIRED.
5. TEST COCKS TO EITHER FACE OUTWARDS OR UPWARDS FROM ASSEMBLY.
6. THOROUGHLY FLUSH LINES PRIOR TO INSTALLATION OF BACKFLOW PREVENTER.
7. DO NOT INSTALL IN AN AREA SUBJECT TO FLOODING.
8. DCVA MUST BE ACCESSIBLE.
9. PROTECT DCVA FROM FREEZING.
10. DCVA SHALL BE APPROVED BY THE STATE OF WASHINGTON
11. PLUMBING PERMIT IS REQUIRED. CONTACT CITY BUILDING DEPARTMENT AT (360) 225-7299.
12. DCVA MUST BE TESTED AFTER INSTALLATION, THEN ANNUALLY BY A WASHINGTON STATE CERTIFIED BACKFLOW TESTER. RESULTS SHALL BE SENT TO THE CITY PUBLIC WORKS DEPARTMENT.

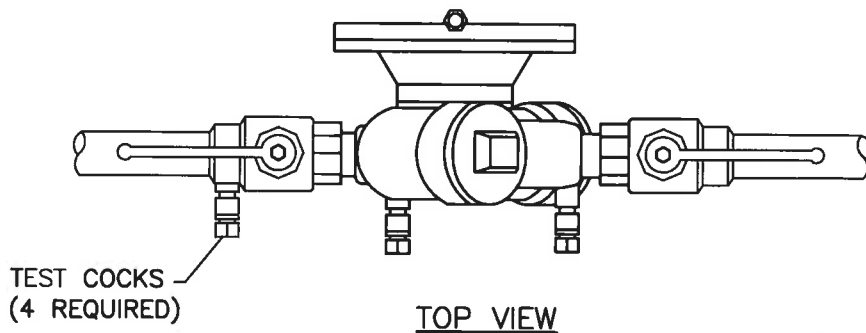


DOUBLE CHECK VALVE ASSEMBLY 2" & SMALLER

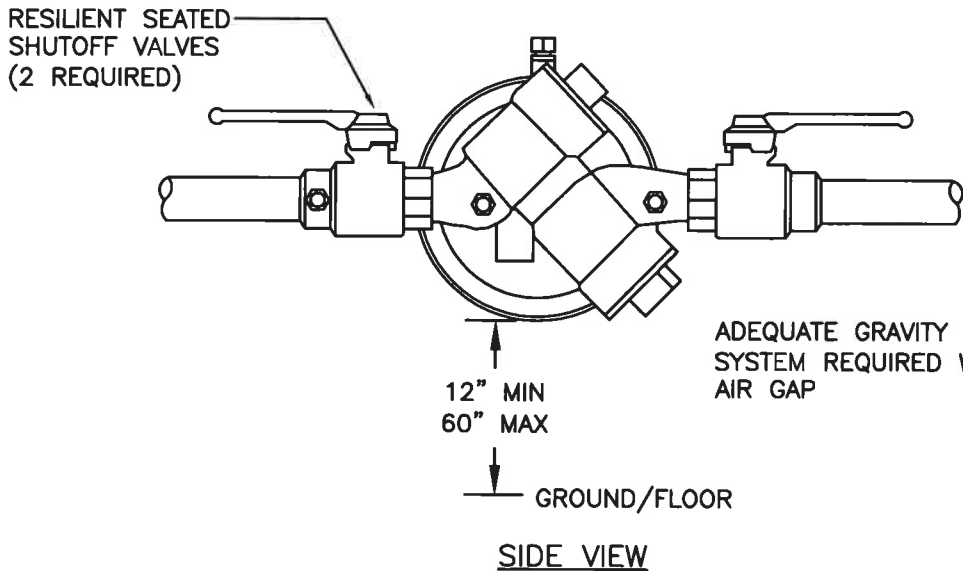
APPROVED	REVISIONS	DATE	DRAWN	DESIGNED
<i>Burt Stepp</i>				
11/21/12				
PUBLIC WORKS DIRECTOR	DATE			

W-08





MIN 12" CLEARANCES AROUND  
BACKFLOW PREVENTER - ALL SIDES,  
TOP AND BOTTOM



ADEQUATE GRAVITY DRAINAGE  
SYSTEM REQUIRED W/APPROVED  
AIR GAP

NOTES:

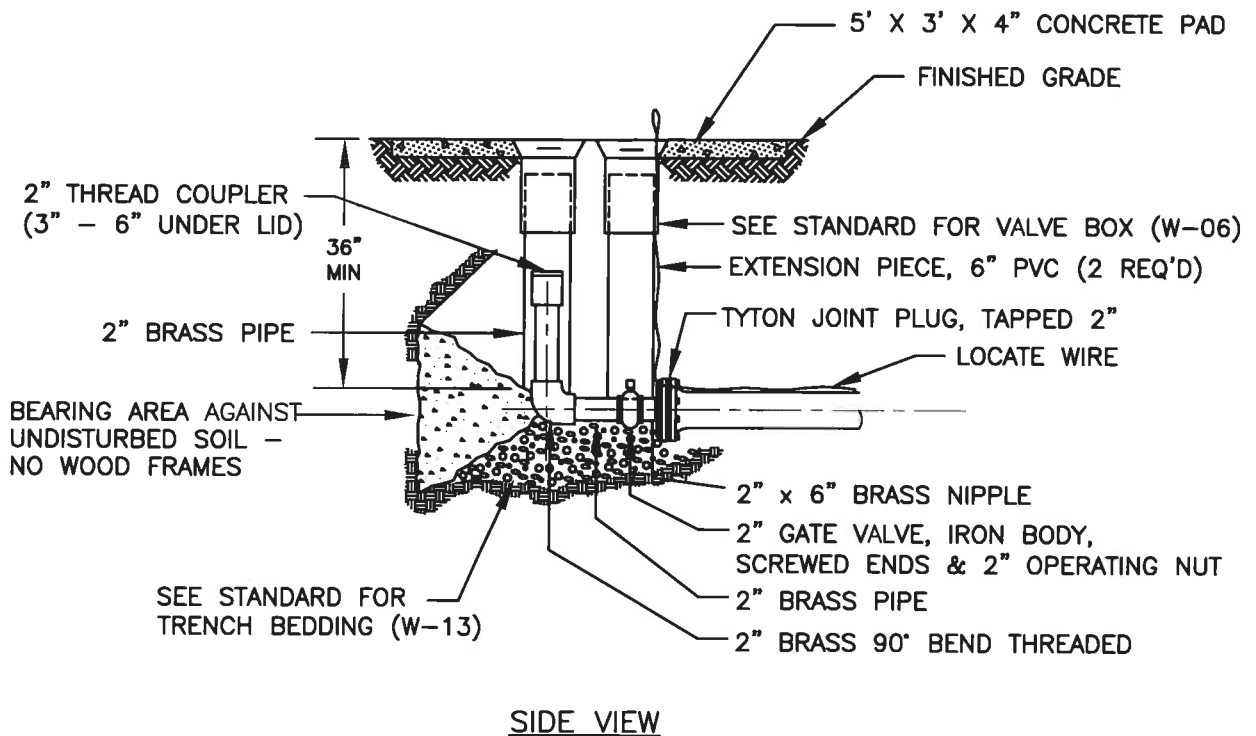
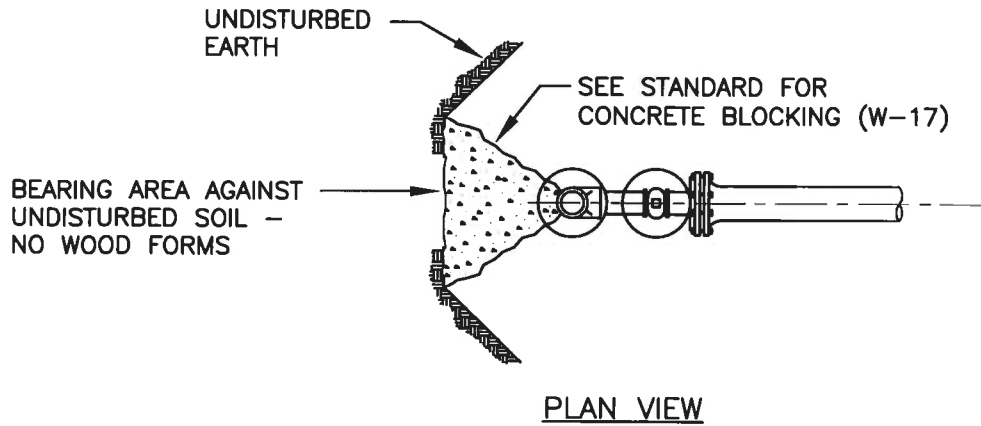
1. APPROVED REDUCED PRESSURE BACKFLOW ASSEMBLY (RPBA) TO LAY HORIZONTAL WITH GROUND (VERTICAL IS ALLOWED IF APPROVED BY WASHINGTON STATE DEPARTMENT OF HEALTH).
2. DESIGN RPBA FOR BACK SIPHONAGE AND BACK PRESSURE.
3. UNIONIZED ASSEMBLIES REQUIRED.
4. THOROUGHLY FLUSH LINES PRIOR TO INSTALLATION OF BACKFLOW PREVENTER.
5. DO NOT INSTALL IN AN AREA SUBJECT TO FLOODING.
6. ABOVE GROUND INSTALLATION ONLY.
7. RPBA MUST BE ACCESSIBLE.
8. PROTECT RPBA FROM FREEZING.
9. A PLUMBING PERMIT IS REQUIRED. CONTACT THE CITY OF WOODLAND BUILDING DEPARTMENT AT (360) 225-7299.
10. RPBA MUST BE TESTED AFTER INSTALLATION, THEN ANNUALLY BY A WASHINGTON STATE CERTIFIED BACKFLOW TESTER. RESULTS SHALL BE SENT TO THE CITY OF WOODLAND PUBLIC WORKS DEPARTMENT.
11. RPBA SHALL BE APPROVED BY THE STATE OF WASHINGTON.



REDUCED PRESSURE BACKFLOW ASSEMBLY 2" & SMALLER

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<i>Bart Stys</i>				
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DATE				

W-09



NOTE:

1. NO WOOD OR TIE DOWNS ALLOWED.

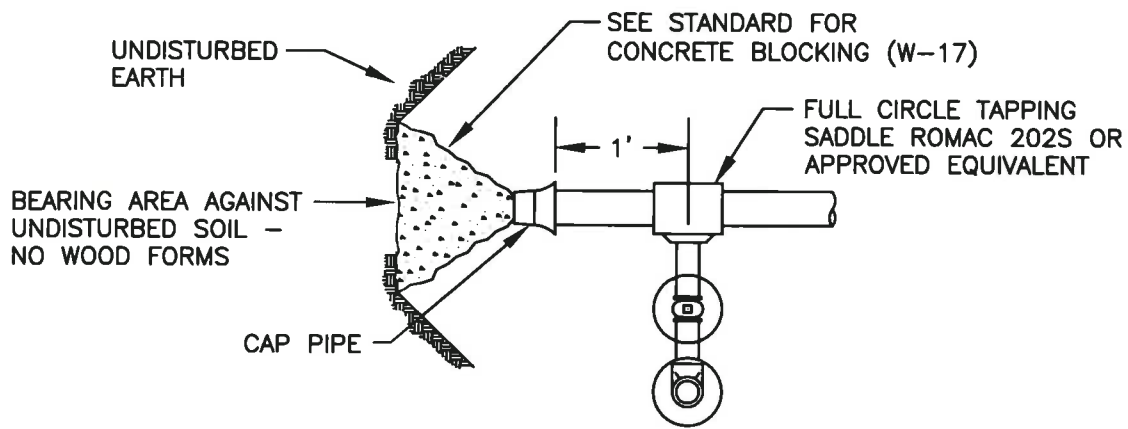


STANDARD BLOW OFF

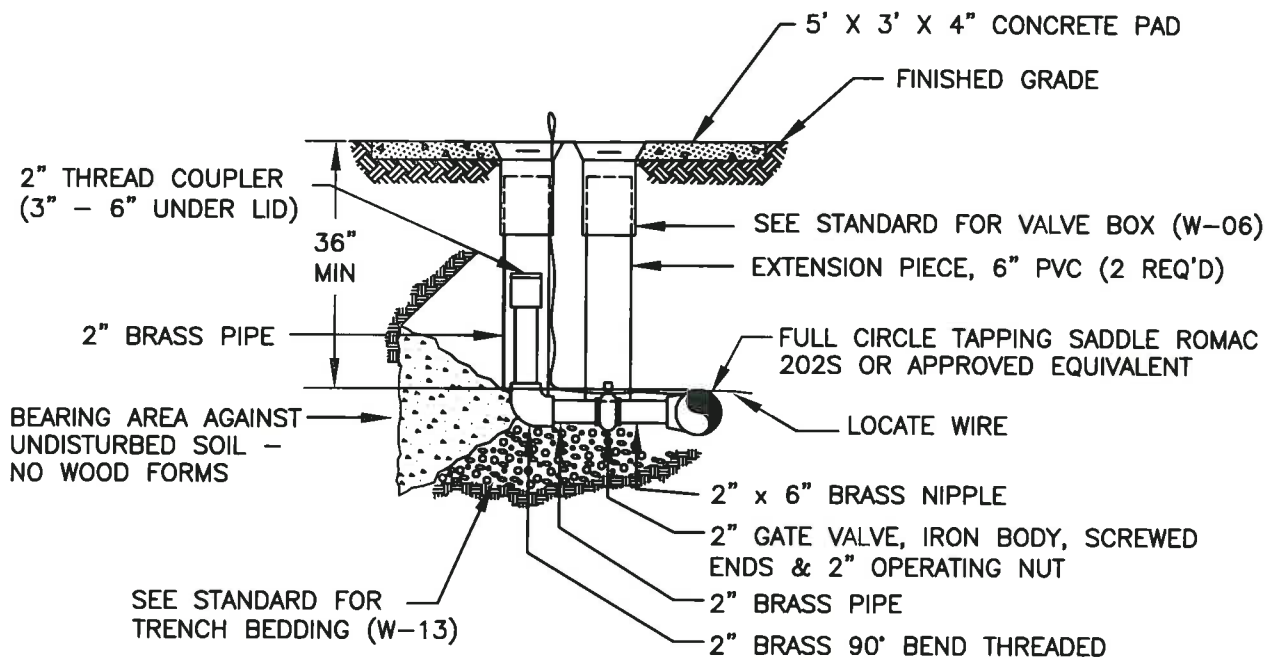
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<i>Bart Stipp</i>				

PUBLIC WORKS DIRECTOR DATE

W-10



PLAN VIEW



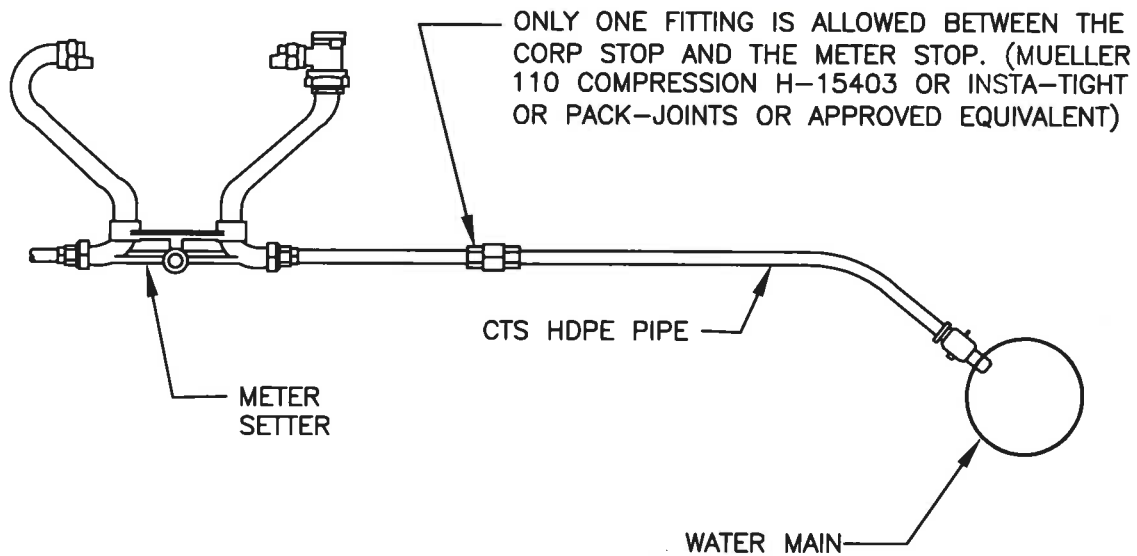
TOP VIEW



SIDE TAP BLOW OFF

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<i>11/21/12</i>				
PUBLIC WORKS DIRECTOR	DATE			

W-11



NOTE:

1. REPLACE ALL SERVICES WHICH MEET ANY OF THE FOLLOWING CONDITIONS:
  - A. METER BOX IS RELOCATED
  - B. SUBSTANDARD EITHER BY MATERIALS OR LACK OF COVER
  - C. THE METER SETTER MUST BE REPLACED
2. ALL SERVICES MUST TERMINATE AT METER SETTER.
3. FOR SERVICE TRANSFERS ONLY, ONE FITTING IS ALLOWED BETWEEN THE CORP STOP AND THE METER STOP.

METER SERVICE TRANSFER AND REPLACEMENT

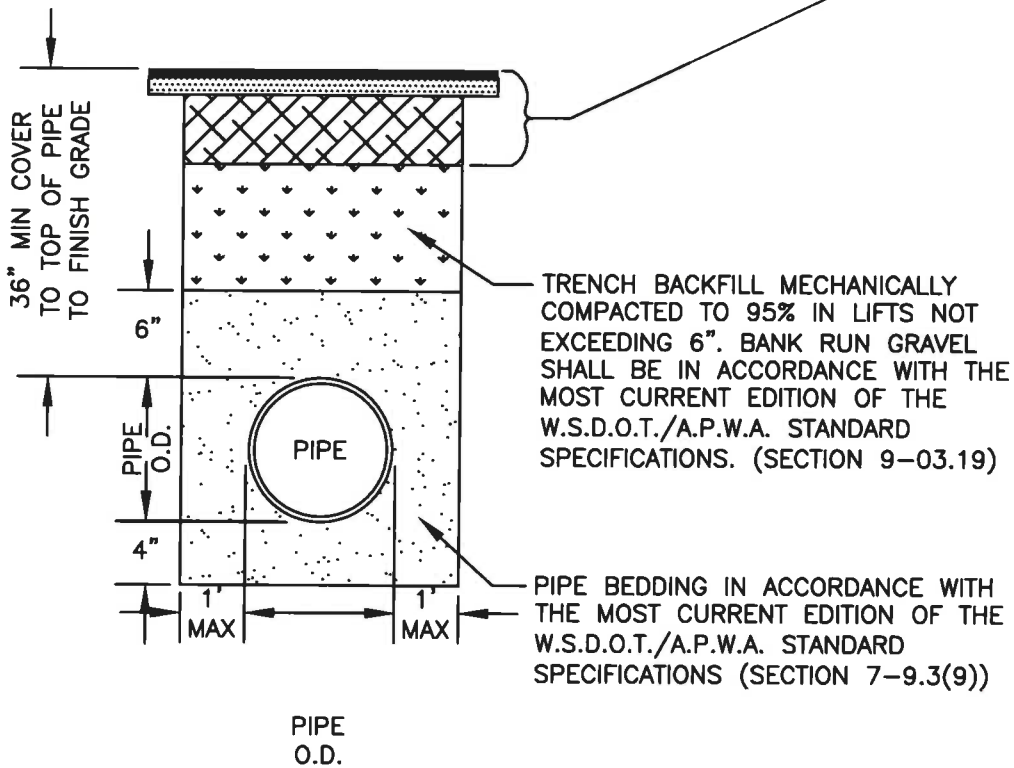


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REVISIONS	DATE	DRAWN	DESIGNED

W-12

FOR THIS ZONE OF THE TRENCH SECTION, SEE CITY, COUNTY OR WSDOT RIGHT OF WAY PERMIT OR STANDARD STREET REPAIR DETAIL. FOR NON-PAVED SURFACES, MATCH EXISTING GRAVEL OR SEEDED LAWN, OR REFER TO APPROVED DRAWINGS.



NOTE:

- CLEAN NATIVE MATERIAL MAY BE USED AS PIPE BEDDING AND TRENCH BACKFILL AS APPROVED BY CITY OF WOODLAND PUBLIC WORKS.



## WATER PIPE TRENCH BEDDING & BACKFILL

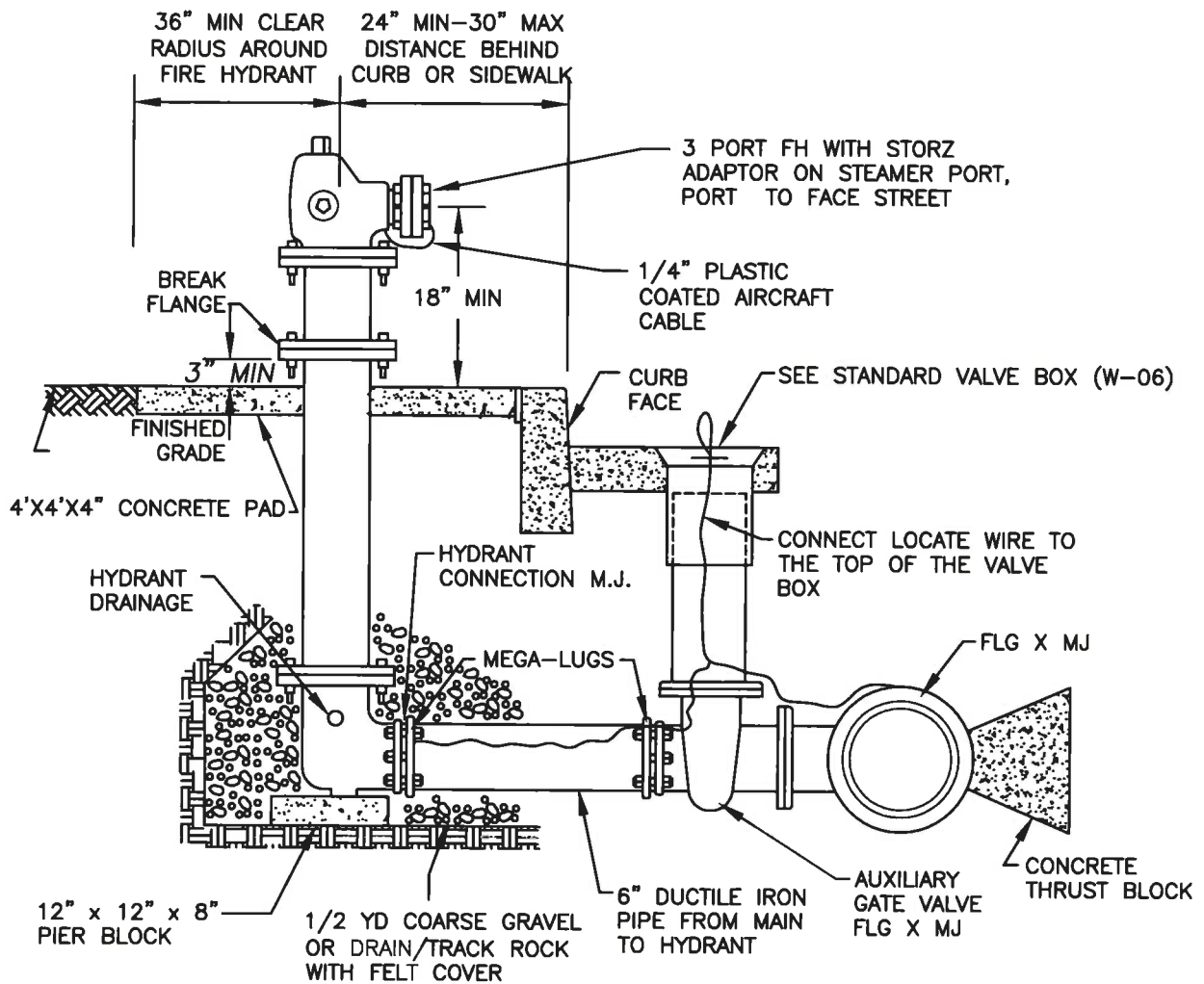
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W-13



NOTES:

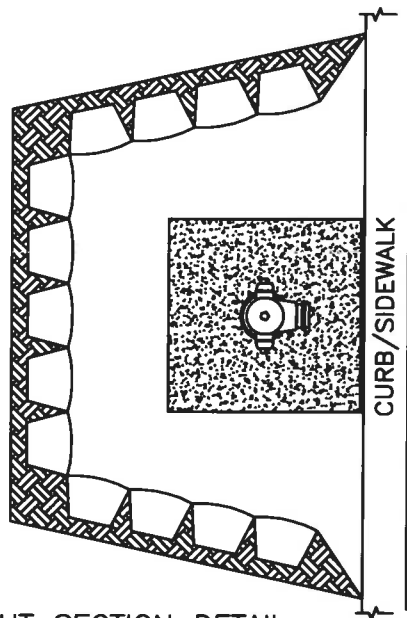
1. HYDRANT TO BE WATEROUS WB67 CLASS 250.
2. HYDRANT TO BE 5-1/4" COMMERCIAL W/ (2) 2-1/2" NST, (1) 4-1/2" NST THREADED PORT(S) WITH (1) 5" TWO LUG QUARTER TURN STORZ OR APPROVED EQUAL PUMPER PORT CONNECTION.
3. STORZ ADAPTORS ARE REQUIRED.
4. FOUR (4) GUARD POSTS TO BE INSTALLED IN UNPROTECTED AREAS (4' RADIUS).
5. FIRE HYDRANT INSTALLATION SHALL BE APPROVED BY THE CITY OF WOODLAND PUBLIC WORKS DEPARTMENT PRIOR TO BACKFILLING.
6. HYDRANTS SHALL NOT BE SET UNTIL LOCATION AND DEPTH ARE APPROVED BY THE CITY OF WOODLAND.
7. FIRE HYDRANTS SHALL BE SHOP PAINTED PRIOR TO INSTALLATION W/ SAFETY YELLOW (RODDA NO. QD81) HIGH GLOSS EQUIPMENT ENAMEL.
8. HYDRANT STANDARD BURY IS 4' UNLESS OTHERWISE NOTED ON THE PLANS, OR WHEN BREAKAWAY JOINT IS STALLED 7" ABOVE FINISHED GRADE.
9. HYDRANT LOCATIONS SHALL BE AS SHOWN ON THE PLANS.
10. JOINT RESTRAINT SYSTEM MAY BE USED FOR INSTALLATIONS OF NOT MORE THAN 18' (ONE PIPE LENGTH).
11. INSTALL LOCATING WIRE AND CONNECT TO EXISTING WIRE IF PRESENT.



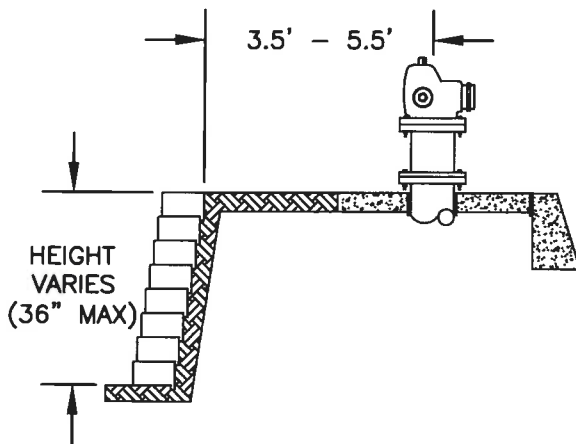
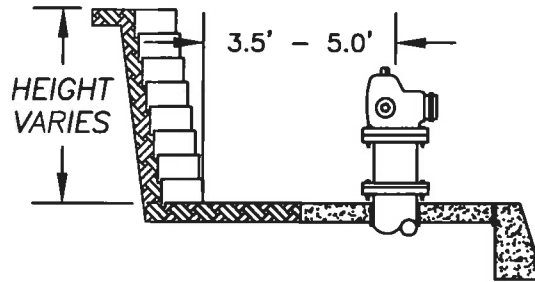
FIRE HYDRANT

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<i>Bert Stepp</i> 11/21/12				
PUBLIC WORKS DIRECTOR				
DATE				

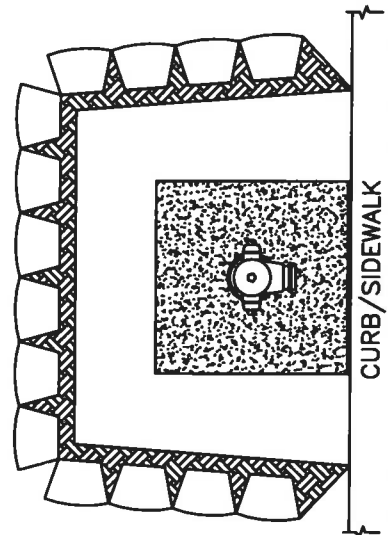
W-14



CUT SECTION DETAIL



FILL SECTION DETAIL



NOTES:

1. CONSULT I.B.C. FOR RETAINING WALL CONSTRUCTION REQUIREMENTS.
2. THE AREA WITHIN THE RETAINING WALL BOUNDARIES FROM THE CURB/SIDEWALK TO THE REAR RETAINING WALL SHALL HAVE A MAXIMUM SLOPE OF 1% IN ANY DIRECTION.
3. THE 4'x4' CONCRETE PAD SHALL HAVE A MAXIMUM SLOPE OF 1%.
4. RETAINING WALL SHALL MAINTAIN A MINIMUM RADIUS OF 3.5' AROUND THE HYDRANT

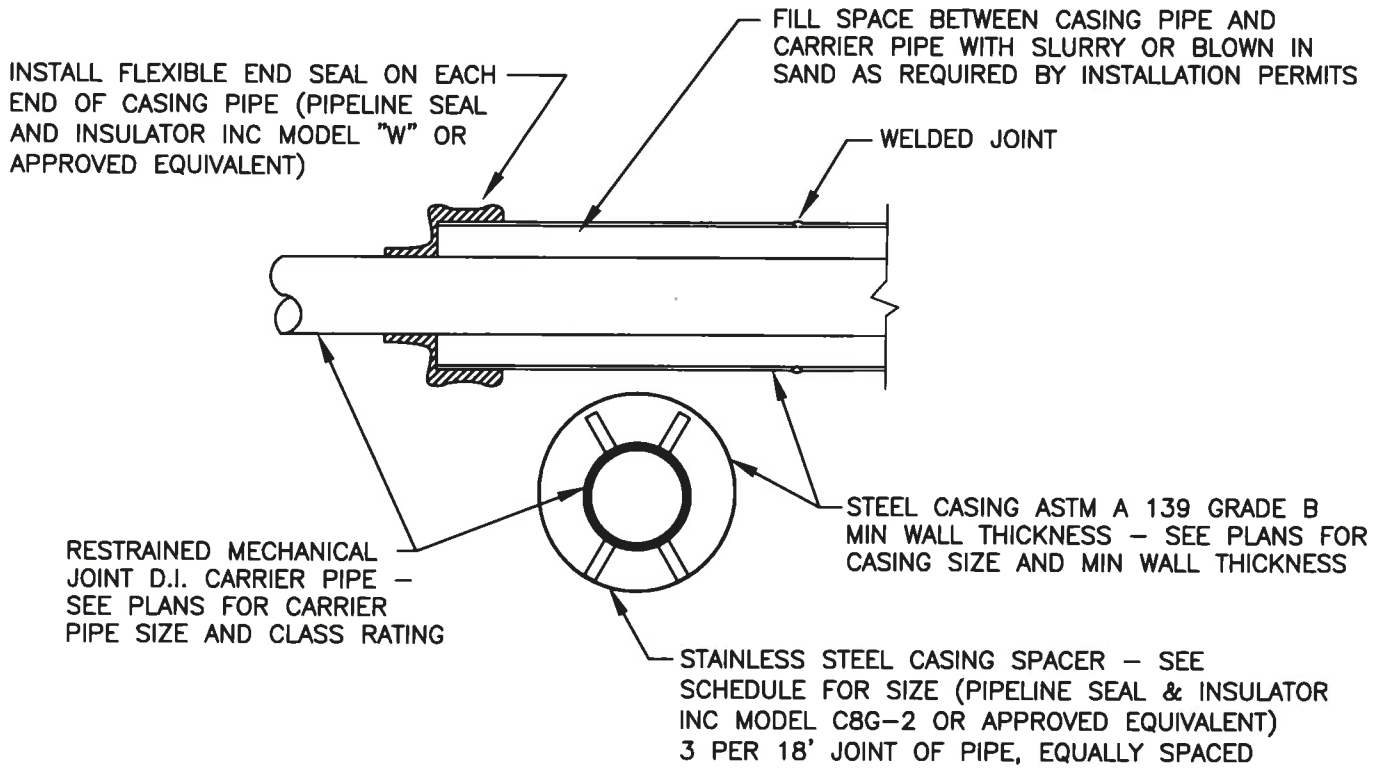
HYDRANT RETAINING WALL DETAIL



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CASING SIZING REQUIREMENTS

CARRIER PIPE	MINIMUM CASING REQUIREMENTS	WALL THICKNESS
4"	16" A36 STEEL	3/8"
6"	16" A36 STEEL	3/8"
8"	24" A36 STEEL	3/8"
10"	24" A36 STEEL	3/8"
12"	24" A36 STEEL	3/8"
16"	36" A36 STEEL	5/8"
24"	48" A36 STEEL	5/8"

NOTES:

1. CASING TO BE EXTENDED 5' BEYOND ANY CURBS, WALLS, STRUCTURES, OR FOOTINGS.
2. PUBLIC AND PRIVATE MAINS SHALL BE PLACED IN SEPARATE CASINGS.
3. FOR CASINGS UNDER RAILROAD TRACKS, WRITTEN PERMISSION FOR THE OWNER OF THE RAILROAD TRACKS IS REQUIRED PRIOR TO OBTAINING CITY OF WOODLAND PERMITS TO PROCEED.
4. NO PRIVATE UTILITIES SHALL BE ALLOWED IN CITY OF WOODLAND CASINGS.



PIPE CASING DETAILS

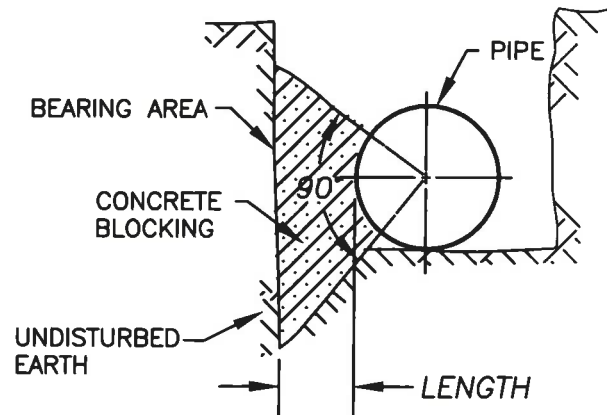
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*Barry Stopp* *Waller*  
 PUBLIC WORKS DIRECTOR DATE

REVISIONS	DATE	DRAWN	DESIGNED

W-16



SOIL BEARING = 2000 LB/S.F.				
PIPE SIZE	HORZ. BENDS	MIN. BEARING AREA S.F.	MIN. VOL. OF BLOCKING C.F.	MIN. LENGTH OF BLOCKING
4"	TEE	2.3	0.8	0.86
	90°	3.2	1.4	1.06
	45°	1.7	0.5	0.73
	22-1/2°	0.9	0.2	0.46
	11-1/4°	-	-	-
6"	TEE	4.7	2.4	1.24
	90°	6.6	4.0	1.53
	45°	3.6	1.6	1.05
	22-1/2°	1.8	0.6	0.66
	11-1/4°	0.9	0.2	0.39
8"	TEE	8.0	5.4	1.63
	90°	11.4	9.0	2.00
	45°	6.2	3.6	1.37
	22-1/2°	3.1	1.3	0.87
	11-1/4°	1.6	0.5	0.51
10"	TEE	12.1	9.9	2.00
	90°	17.1	16.7	2.46
	45°	9.3	6.6	1.69
	22-1/2°	4.7	2.4	1.08
	11-1/4°	2.4	0.9	0.63
12"	TEE	17.1	16.7	2.37
	90°	24.2	28.0	2.93
	45°	13.1	11.2	2.01
	22-1/2°	6.7	4.1	1.28
	11-1/4°	3.4	1.5	0.74
16"	TEE	23.8	27.3	2.73
	90°	33.6	46.0	3.37
	45°	18.2	18.3	2.29
	22-1/2°	9.3	6.7	1.42
	11-1/4°	4.7	2.4	0.80
18"	TEE	29.9	38.5	3.05
	90°	42.2	64.7	3.79
	45°	22.9	25.8	2.57
	22-1/2°	11.7	9.4	1.60
	11-1/4°	5.9	3.3	0.90
24"	TEE	52.3	89.1	4.03
	90°	74.0	149.8	5.00
	45°	40.0	59.7	3.55
	22-1/2°	20.4	21.7	2.11
	11-1/4°	10.3	7.7	1.18



NOTES:

1. ALL BLOCKING SHALL BE POURED AGAINST FIRM UNDISTURBED SOIL.
2. ALL CONCRETE BLOCKING SHALL BE POURED IN PLACE WITHOUT DIRECT CONTACT TO PIPE, FITTINGS OR FLANGES. 15 LB. ASPHALT- IMPREGNATED FELT, OR EQUIVALENT AS APPROVED BY THE INSPECTOR, SHALL BE PLACED BETWEEN THE CONCRETE AND PIPE, FITTINGS OR FLANGES.
3. LAYOUT TO BE APPROVED BY THE INSPECTOR PRIOR TO AND AFTER CONCRETE POUR.
4. CONCRETE FOR ALL BLOCKING SHALL HAVE A 28-DAY MINIMUM COMPRESSIVE STRENGTH OF 2,300 P.S.I.
5. THIS CHART IS NOT APPLICABLE TO VERTICAL BENDS. LOCATION SPECIFIC DESIGN IS REQUIRED FOR SUCH INSTALLATIONS.
6. WHERE THE TRENCH SOIL HAS A BEARING PRESSURE LESS THAN 2000 POUNDS PER SQUARE FOOT, LOCATION SPECIFIC DESIGN IS REQUIRED.

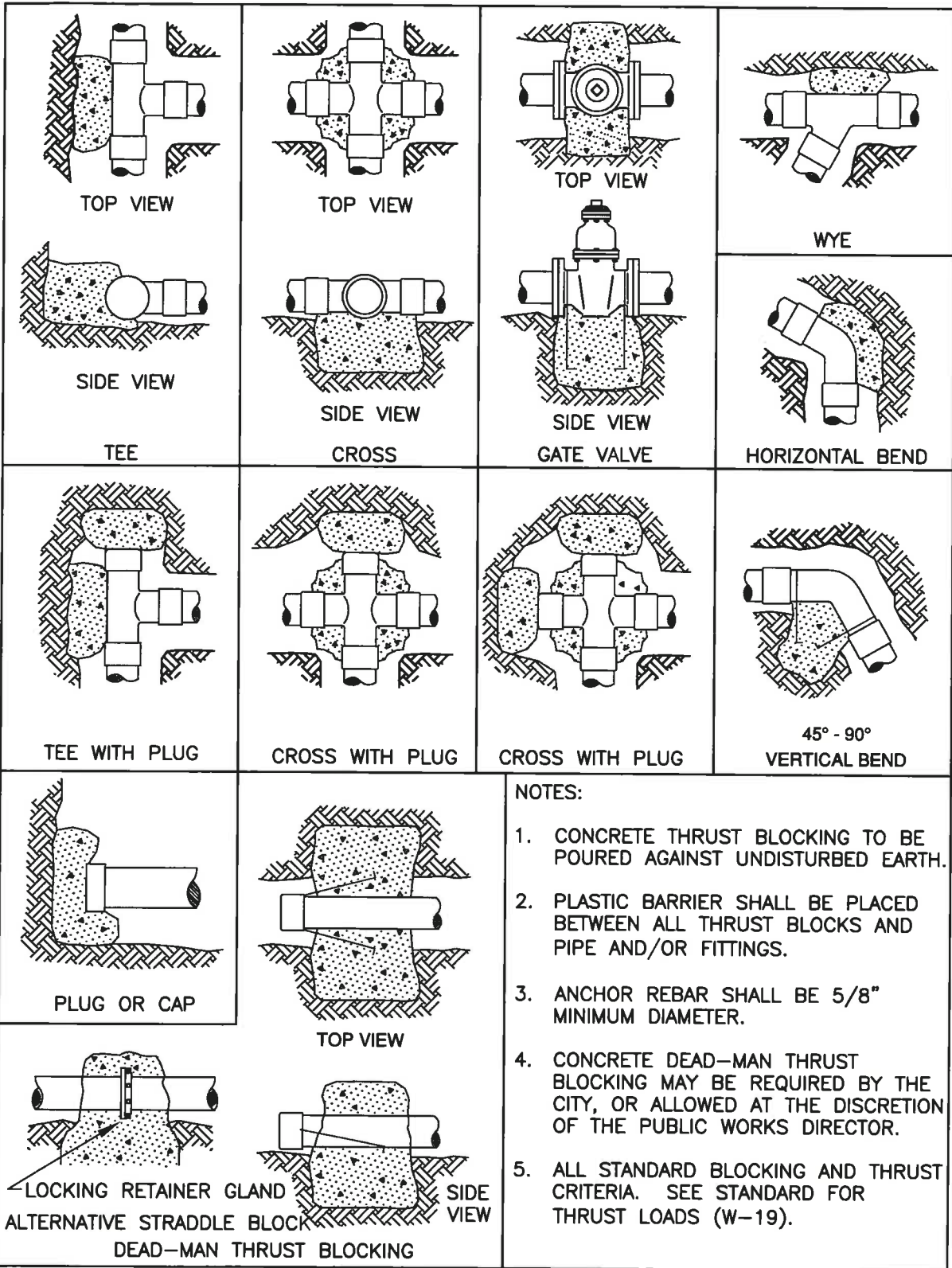
STANDARD THRUST BLOCK



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## THRUST BLOCKING

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## THRUST LOADS

THRUST AT FITTINGS IN POUNDS AT 200 POUNDS PER SQUARE INCH OF WATER PRESSURE

PIPE DIAMETER	90° BEND	45° BEND	22-1/2° BEND	11-1/4° BEND	DEAD END OR TEE
4"	3,600	2,000	1,000	500	2,600
6"	8,000	4,400	2,300	1,200	5,700
8"	14,300	7,700	4,000	2,000	10,100
10"	22,300	12,100	6,200	3,100	15,800
12"	32,000	17,400	8,900	4,500	22,700
14"	43,600	23,600	12,100	6,100	30,800
16"	57,000	30,800	15,700	7,900	40,300

**NOTES:**

1. BLOCKING SHALL BE COMMERCIAL CONCRETE POURED IN PLACE AGAINST UNDISTURBED EARTH. FITTING SHALL BE ISOLATED FROM CONCRETE THRUST BLOCK WITH PLASTIC OR SIMILAR MATERIAL.
2. TO DETERMINE THE BEARING AREA OF THE THRUST BLOCK IN SQUARE FEET (S.F.):  
EXAMPLE : 12" - 90° BEND IN SAND AND GRAVEL 32,000 LBS 3000 LB/S.F. = 10.7 S.F. OF AREA
3. AREAS MUST BE ADJUSTED FOR OTHER PIPE SIZE, PRESSURES AND SOIL CONDITIONS.
4. BLOCKING SHALL BE ADEQUATE TO WITHSTAND FULL TEST PRESSURE AS WELL AS TO CONTINUOUSLY WITHSTAND OPERATING PRESSURE UNDER ALL CONDITIONS OF SERVICE.

## SAFE SOIL BEARING LOADS

FOR HORIZONTAL THRUSTS WHEN THE DEPTH OF COVER OVER THE PIPE EXCEEDS 2 FEET

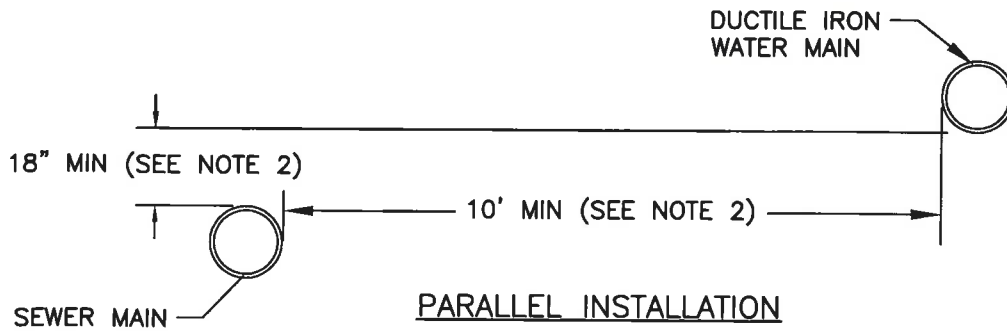
SOIL	POUNDS PER SQUARE FOOT
MUCK, PEAT	0
SOFT CLAY	1,000
SAND	2,000
SAND & GRAVEL	3,000
SAND & GRAVEL CEMENTED WITH CLAY	4,000
HARD SHALE	10,000



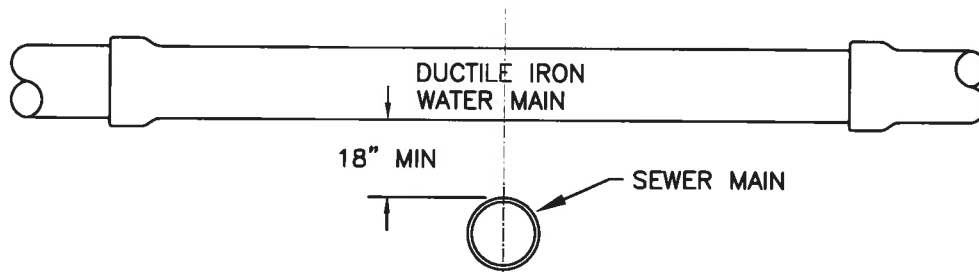
## THRUST LOADS

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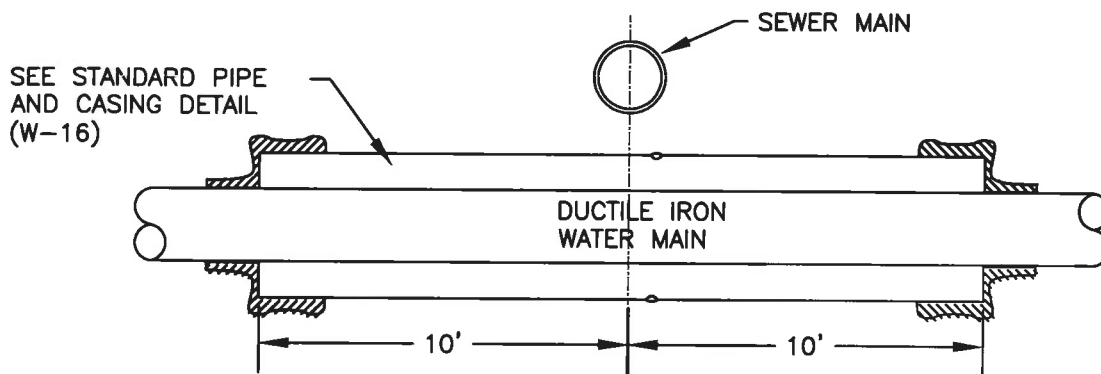
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PARALLEL INSTALLATION



CROSSING WATER OVER SEWER



CROSSING WATER UNDER SEWER

NOTES:

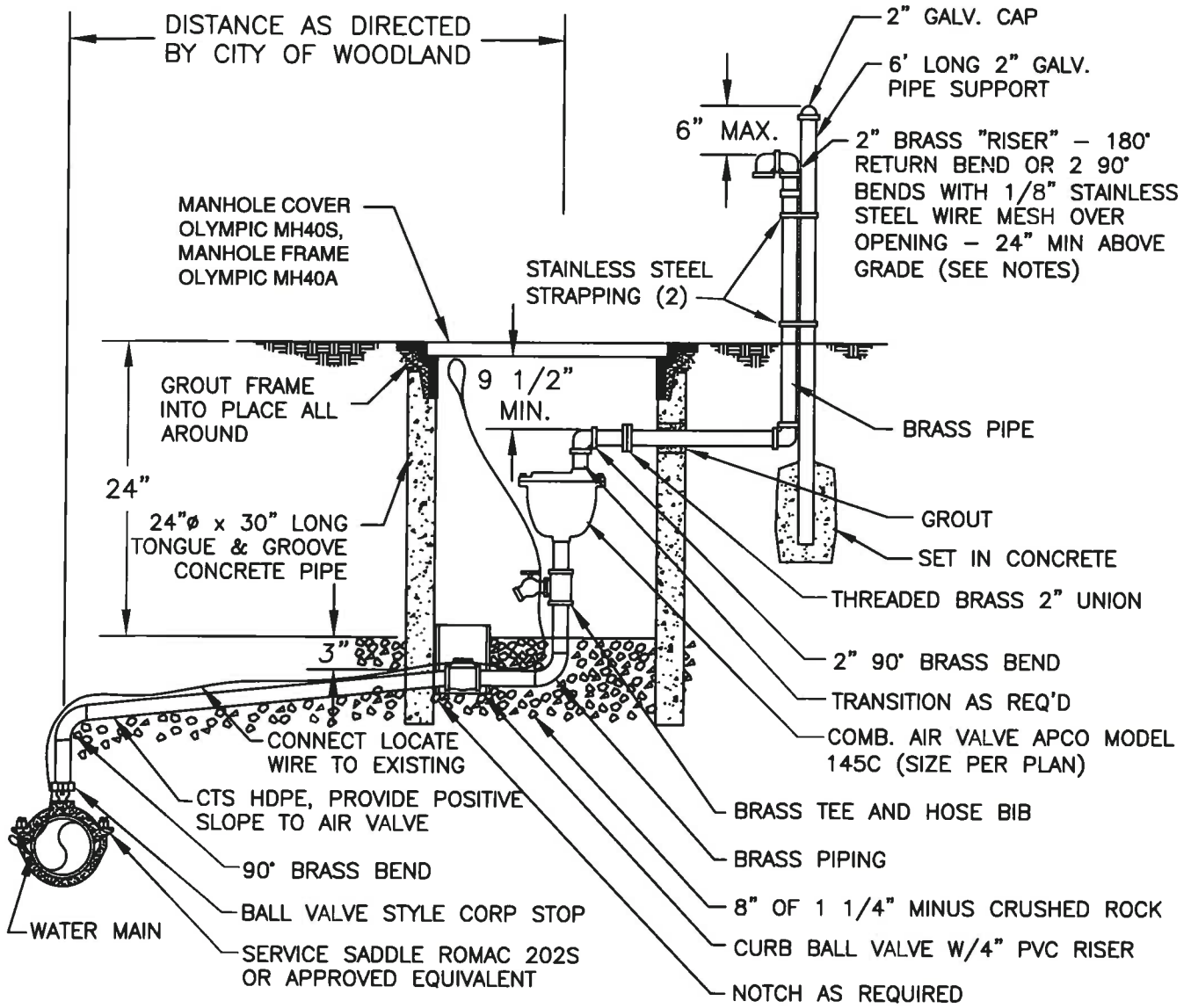
1. EXCEPTIONS SHALL BE APPROVED BY THE CITY OF WOODLAND IN WRITING.
2. WHERE MINIMUM CLEARANCES CANNOT BE MET, THE SEWER MAIN SHALL BE PLACED IN SEPARATE TRENCHES AND CONSTRUCTED OF MATERIALS EQUIVALENT TO THE CITY OF WOODLAND WATER MAIN STANDARDS, INCLUDING PRESSURE TESTING. ADEQUATE RESTRAINT SHALL BE PROVIDED TO ALLOW TESTING TO OCCUR.
3. ALL SEWER CROSSINGS OVER OR UNDER WATER MAINS SHALL MAXIMIZE THE JOINT SEPARATION BY USING THE LONGEST STANDARD LENGTH PIPE AVAILABLE FROM THE MANUFACTURER FOR BOTH THE WATER AND SEWER MAINS. BOTH PIPES SHALL BE CENTERED AT THE POINT OF CROSSING.
4. ALL SEWER CROSSING OVER WATER MAINS SHALL BE CONSTRUCTED OF MATERIALS EQUIVALENT TO THE CITY OF WOODLAND WATER MAIN STANDARDS, INCLUDING PRESSURE TESTING



WATER AND SEWER SPACING

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NOTES:

1. VALVE ASSEMBLY SHALL BE SET AT THE HIGH POINT OF THE LINE.
2. A MINIMUM OF ONE 4" ADJUSTMENT RING MUST BE PROVIDED IN TRAFFIC AREA SETTINGS. SADDLE TAP, PIPING & VALVE TO MATCH COMBINATION AIR VALVE INLET SIZE (SEE PLAN). ADJUSTMENT RINGS AND MANHOLE RING TO BE GROUTED, WATER TIGHT.
3. TERMINATE EXHAUST INSIDE VAULT WITH 90° BEND (DOWN) AND WIRE MESH IF VAULT IS DRAINED TO DAYLIGHT.
4. LOCATE WIRE SHALL INCLUDE A LOOP THAT CAN BE REACHED FROM OPEN COVER.

COMBINATION RELEASE AIR VALVE

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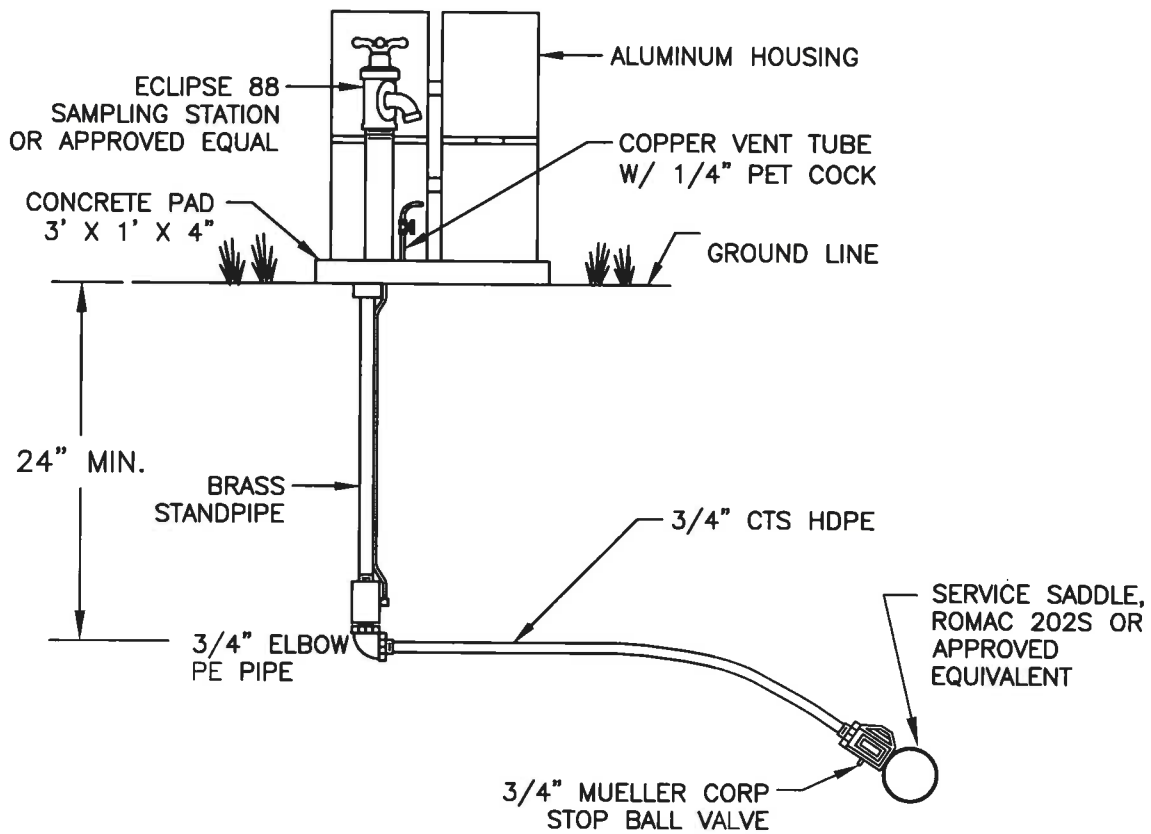
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NOTES:

1. SAMPLING STATIONS SHALL BE 24" BURY, WITH A 3/4" FIP INLET, AND A (3/4" HOSE) NOZZLE.
2. ALL STATIONS SHALL BE ENCLOSED IN A LOCKABLE, NONREMOVEABLE, ALUMINUM-CAST HOUSING.
3. WHEN OPENED, THE STATION SHALL REQUIRE NO KEY FOR OPERATION, AND THE WATER WILL FLOW IN AN ALL BRASS WATERWAY.
4. ALL WORKING PARTS WILL ALSO BE OF BRASS AND BE REMOVABLE FROM ABOVE GROUND WITH NO DIGGING. EXTERIOR PIPING SHALL BE BRASS.
5. A COPPER VENT TUBE WILL ENABLE EACH STATION TO BE PUMPED FREE OF STANDING WATER TO PREVENT FREEZING AND TO MINIMIZE BACTERIA GROWTH.
6. ECLIPSE NO. 88 BRASS SAMPLING STATION SHALL BE INSTALLED.
7. INSTALL LOCATE WIRE.
8. POUR 3' X 1' X 4" CONCRETE PAD.



SAMPLING STATION

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# Standard Abbreviations

<p>AB ANCHOR BOLT AC ASPHALTIC CONCRETE, ACOUSTIC ADJ ADJUSTABLE AL ALUMINUM ALT ALTERNATE AMB AMBIENT APPROX APPROXIMATELY ASSY ASSEMBLY AUTO AUTOMATIC AUX AUXILIARY</p> <p>BF BLIND FLANGE BLDG BUILDING BV BALL VALVE</p> <p>CB CATCH BASIN CDF CONTROL DENSITY FILL CEM CEMENT CFM CUBIC FEET PER MINUTE CJ CONSTRUCTION JT CL CENTERLINE CLR CLEAR CO CLEANOUT COMB COMBINATION CONC CONCRETE, CONCRETING CPLG COUPLING CSTC CRUSHED SURFACING TOP COURSE CTR CENTER CTS COPPER TUBE SIZE CSBC CRUSHED SURFACING BASE COURSE</p> <p>D DRAIN, DECANT DI DUCTILE IRON DIA, <math>\phi</math> DIAMETER DWG(S) DWG(S)</p> <p>E EAST EA EXHAUST AIR, EACH ECC ECCENTRIC ELEV. ELEVATION (ELEV) ELECT ELECTRICAL E.O.P. EDGE OF PAVEMENT EQUIP EQUIPMENT EQUIV EQUIVALENT EX. EXISTING EXH EXHAUST EXP EXPANSION, EXPOSED EXT EXTERIOR</p> <p>FF FINISH FLOOR FIP FEMALE IRON PIPE FLEX FLEXIBLE FLG FLANGE FLR FLOOR</p> <p>GALV GALVANIZED GPD GALLONS PER DAY GPM GALLONS PER MINUTE GV GATE VALVE</p>	<p>H HIGH, HORIZONTAL HB HOSE BIB HDPE HIGH DENSITY POLYETHYLENE HOA HAND-OFF-AUTO HP HORSEPOWER HT HEIGHT HZ HERTZ (CYCLES PER SECOND)</p> <p>ID INSIDE DIAMETER IPS IRON PIPE SIZE</p> <p>JB JUNCTION BOX JT JOINT</p> <p>LB POUND(S) LVR LOUVER LW LOCATE WIRE MAG MAGNETIC MAINT MAINTENANCE MAT'L MATERIAL MAX MAXIMUM MCC MOTOR CONTROL CENTER MIN MINIMUM, MINUTE MJ MECHANICAL JOINT</p> <p>N NEUTRAL, NORTH NC NORMALLY CLOSED NE NORTH EAST NEG NEGATIVE NO NORMALLY OPEN, NUMBER NPSH NET POSITIVE SUCTION HEAD NRS NONRISING STEM NTS NOT TO SCALE</p> <p>OD OUTSIDE DIAMETER OH OVER HEAD OPNG OPENING</p> <p>PE PLAIN END, POLYETHYLENE PEN PENETRATION PH PHASE PL PROPERTY LINE PLCS PLACES PLY PLYWOOD PP POWER POLE PRES PRESSURE PRV PRESSURE REDUCING (RELIEF) VALVE PS PRESSURE SWITCH, PRESSURE SENSOR PSI POUNDS PER SQUARE INCH PVC POLYVINYL CHLORIDE PVMT PAVEMENT</p> <p>R RADIUS, RISER R/C REINFORCED CONCRETE RD ROOF DRAIN, ROAD RED REDUCED(R) REINF REINFORCED REQ'D REQUIRED RPM REVOLUTIONS PER MINUTE R/W RIGHT OF WAY</p>	<p>S SOUTH SCH SCHEDULE SEC SECOND SHT SHEET SIM SIMILAR SOLN SOLUTION SPEC SPECIFICATION SQ SQUARE SS SANITARY SEWER, SOLID SST STAINLESS STEEL STA STATION STD STANDARD, STUD STL STEEL STRUCT STRUCTURAL</p> <p>T TRAP, TOP, TANGENT TB TERMINAL BOX, TOP &amp; BOTTOM T/B TOP OF BANK TC TOP OF CURB/CONCRETE TDH TOTAL DYNAMIC HEAD TESCP TEMPORARY EROSION AND SEDIMENTATION CONTROL PLAN THRD THREAD(ED) TOW TOP OF WALL TRANS TRANSITION TS TOP OF SLAB/SLOPE TYP TYPICAL</p> <p>UG UNDERGROUND UH UNIT HEATER U/P UTILITY POLE</p> <p>VAC VACUUM, VOLTS ALTERNATING CURRENT VAR VARIES, VARIABLE VC VERTICAL CURVE VERT VERTICAL VTR VENT THROUGH ROOF</p> <p>W WEST, WATER W/ WITH W/O WITHOUT WSDOT WASHINGTON STATE DEPARTMENT OF TRANSPORTATION WSEL WATER SURFACE ELEVATION WT WATERTIGHT, WEIGHT WWF WELDED WIRE FABRIC</p> <p>XFMR POWER TRANSFORMER XP EXPLOSION PROOF</p> <p># NUMBER, POUNDS &amp; AND @ AT <math>\phi</math> DIAMETER, PHASE</p>
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## STANDARD ABBREVIATIONS



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