CHAPTER SIX

CHAPTER SIX

WATER

6.1 General

Any extension of the Tumwater Water System must be approved by the Department of Public Works and, all extensions must conform to the State Department of Health and the Coordinated Water System Plan and the City Water Comprehensive Plan.

In designing and planning for any development, it is the developers responsibility to see that adequate water for both domestic use and fire protection is attainable. The developer must show, in the proposed plans, how water will be supplied and whether adequate water pressure and flow will be attained in case of fire. An analysis of the system may be required if it appears that the system might be inadequate.

Prior to the release of any water meters, all Public Works improvements must be completed and approved including granting of right-of-way or easements, and all applicable fees must be paid.

In development where water or any private utility work and public street improvements are required, no paving of the public right-of-way shall occur until all utility improvements in the street construction area are complete.

6.2 Design Standards

The design of any water extension/connection shall conform to City Standards.

The layout of extensions shall provide for the future continuation and/or "looping," of the existing system as determined by the City. The General Notes that follow shall be included on any plans dealing with water system design.

6.3 General Notes (Water Main Installation)

A. All workmanship and material shall be in accordance with City of Tumwater standards and the 1994 State of Washington Standard Specifications for Road, Bridge and Municipal construction, latest edition.

B. A preconstruction meeting shall be held with the City prior to the start of construction.

C. Water mains equal to or less than twelve inches in diameter shall be AWWA C900 Class 150, C905 Class 235, or ductile iron cement mortar lined thickness Class 50. All water mains larger than 12 inches in diameter shall be AWWA C905, Class 235 cement mortar-lined thickness Class 50 or ductile iron.

D. Gate valves shall be resilient wedge, NRS (Non Rising Stem) with O-rings seals. Valve ends shall be mechanical joint or ANSI flanges. Valves shall conform to AWWA 509-80. Valves shall be Mueller, M & H, Kennedy, Clow R/W or Waterous Series 500. Existing valves shall be operated by City employees only.

E. Hydrants shall be the dry barrel type and one of the following: Waterous, M & H, Mueller, or Clow. Hydrants shall be bagged until system is approved. All hydrants shall be equipped with Storz adapters.

F. All lines shall be chlorinated and tested in conformance with the above referenced specification (See Note A above).

G. All pipe and services shall be installed with 14 gauge coated copper wire, wrapped around the pipe, brought up and tied off at top of valve box.

H. Provide traffic control plan(s) as required in accordance with MUTCD.

I. All water mains shall be staked for grades and alignment by an engineering or surveying firm capable of performing such work.

J. Call Underground Locate at 1-800-424-5555 a minimum of 48 hours prior to any excavations.

K. Where connections require "field verification", connection points will be exposed by contractor and fittings verified 48 hours prior to distributing shut-down notices.

L. At any connection to an existing line where a new valve is not installed, the existing valve must be pressure tested to City standards prior to connection. If an existing valve fails to pass the test, the contractor shall make the necessary provisions to test the new line prior to connection to the existing system or install a new valve.

M. No lot line watermains are allowed.

6.4 Main Line

A. Water mains shall be sized to provide adequate domestic, plus fire flow at the required residual pressure. Fire flow requirements will be determined by the Building Safety Official/Fire Marshall, however, the quantity of water required will in no case be less than 1,000 GPM at 20 psi residual pressure.

The minimum water main size shall meet minimum fire flow requirements and be equal to or larger than six inches for looped lines and eight inches for dead end lines as long as fire flow requirements can be met. Larger size mains are required in specific areas outlined in the Water Comprehensive Plan. Nothing shall preclude the City from requiring the installation of a larger sized main in areas not addressed in the Water Comprehensive Plan if the City determines a larger size is needed to meet fire protection requirements or for future service. Oversizing agreements may be negotiated with the City.

B. All pipe for water mains shall have flexible gasketed joints and shall comply with one of the following types:

Ductile Iron Pipe: Ductile iron pipe shall conform to AWWA C 151 Class 50 and have a cement mortar lining conforming to AWWA C 104. All pipes shall be joined using non-restrained joints which shall be rubber gaskets, push on type or mechanical joint, conforming to AWWA C 111.

PVC Pipe: All PVC pipe shall conform to the latest revision of the following specifications: Four inch through 12 inch pipe shall meet AWWA C900 Class 150. or ASTM 2241 Class 200 standards. Fourteen inch through 20-inch pipe shall meet AWWA C905 Class 235 standards.

C. All fittings for ductile iron pipe or PVC pipe shall be ductile iron compact fittings conforming to AWWA C 153 or Class 250 gray iron conforming to AWWA C 110 and C 111. All shall be cement mortar lined conforming to AWWA C 104. Plain end fittings shall be ductile iron if mechanical joint retainer glands are installed on the plain ends. All fittings shall be connected by flanges or mechanical joints.

D. All pipe and services shall be installed with 14 gauge coated copper wire, taped to the top of pipe, brought up and tied off at the tope of the valve box.

E. The minimum cover for all water mains from top of pipe to finish grade shall be 42 inches unless otherwise approved.

6.5 Connection To Existing Water Main

The developer's engineer shall be responsible for determining the scope of work for connection to existing water mains. See detail WA-12.

It shall be the contractor's responsibility to field verify the location and depth of the existing main and the fittings required to make the connections to the existing mains.

6.6 Service Interruption

The contractor shall give the City a minimum of 48 hours notice of any planned connection to an existing pipeline. This includes all cut-ins and live taps. Notice is required so any disruptions to existing services can be scheduled. Either the contractor will notify customers involved or affected by the water service interruption or the City will charge the contractor for the cost of said notification. The contractor shall make every effort to schedule water main construction with a minimum interruption of water service. In certain situations, the City may dictate scheduling of water main shutdowns so as not to impose unnecessary shutdowns during specific periods to existing customers.

6.7 Hydrants

A. The lead from the service main to the fire hydrant shall be ductile iron cement mortar lined Class 50 no less than six inches in diameter.

B. Fire Hydrants, shall be 5-1/4 inch commercial, with two, 2-1/2 inch NST outlet/port, and one 4-1/2 inch NST threaded outlet/port and equipped with one 5 inch two lug quarter turn Storz fitting or approved equal pumper outlet/port connection. The hydrant shall be the dry barrel type and shall be of the "safety" or break-away style.

   Hydrants shall be Waterous, Mueller, M & H, or Clow dry barrier type. All hydrants shall be bagged until system is approved.

C. The Department of Public Works and the Building Safety Official/Fire Marshall work together to insure that adequate hydrant spacing and installation are achieved.

   Unless otherwise required by the governing authority, the following guidelines shall apply for hydrant number and location:

   1. At least one hydrant shall be installed at all intersections.

2. Hydrant spacing shall be consistent with the Water Comprehensive Plan.

3. When any portion of a proposed building is in excess of 150 feet from a water supply on a public street on-site hydrants shall be required.

D. Fire hydrants shall be set as shown in standard plan number WA-9.

E. For requirements regarding use, size and location of a fire department connection (FDC) and/or post indicator valve contact the Building Official/Fire Marshall. Location of FDC shall be shown on water plans.

F. Where needed, the Department of Public Works or Building Official/Fire Marshall may require hydrants to be protected by two or more posts, each four inches in diameter by five feet in height made of either reinforced concrete or steel. Adequate clear zone is three foot radius as shown on the detail.

G. Fire hydrants must be installed, tested, and accepted prior to the issuance of a full building permit.

6.8 Valves

All valves and fittings shall be ductile iron with ANSI flanges or mechanical joint ends with restraints. All existing valves shall be operated only by City employees.

Valves shall be installed in the distribution system at sufficient intervals to facilitate system repair and maintenance, but in no case shall there be less than one valve every 1,000 feet. Generally, there shall be two valves on each tee and three valves on each cross. Specific requirements for number of valves, configuration and spacing will be made at the plan review stage.

A. Gate valves up to twelve inch; the design, materials and workmanship of all gate valves shall conform to AWWA C509-80 latest revision. Gate valves shall be resilient wedge non-rising stem (NRS) with two internal O-ring stem seals. Gate valves shall be Mueller, M & H, Kennedy, Clow R/W or Waterous Series 500.

Gate valves shall be used on all six to twelve inch lines.

B. Butterfly valves shall be used on all lines 14 inches and larger. Butterfly valves shall conform to AWWA C504, Class 150B, with cast iron short body and O-ring stem seals and shall be the worm gear type. Butterfly valves shall be Mueller, Linseal III, Kennedy, Pratt Ground hog, or Allis Chalmers.

C. Valve Box; all valves shall have a standard water valve box set to grade with a cast iron riser from valve to within four to six inches of valve box top. If valves are not set in paved area, a three foot by three foot by four inch concrete pad shall be set around each valve box at finished grade. In areas where valve box falls in road shoulder, the ditch and shoulder shall be graded before placing asphalt or concrete pad. See WA-13.

D. Valve marker posts shall be four inch by four-inch reinforced concrete or schedule 40 steel posts five feet long stamped with "W" and distance to valve. Post shall be painted with one base coat and two coats white oil base enamel. See WA-14.

6.9 Casing

Steel casing pipe shall be schedule 20 steel or equal. Pipe spacers shall be Cascade style CC5 with eight-inch runners as available from Cascade Waterworks, or approved equal. Casing pipe and spacer shall be sized for pipe being installed. Install minimum of three spacers per section of pipe.

6.10 Air and Vacuum Release Valve

Air and vacuum release valves shall be APC0 145C combination air release valve. Installation shall be as set forth in WA-10.

The installation shall be set at the high point of the line when required. Where possible, pipes are to be graded to prevent the need for an air release valve. Air release valves may not be required when services are in the vicinity.

6.11 Blowoff Assembly

If a fire hydrant is not located at the end of a dead end main, a blowoff assembly shall be required. On water mains which will be extended in the future, the valve which operates the blowoff assembly shall be the same size as the main and provided with a concrete thrust block. The pressure rating for blowoff assemblies shall be 200 psi. Installation shall be as set forth in WA-11.

6.12 Backflow Prevention

All water system connections to serve buildings or properties with domestic potable water, fire sprinkler systems, or irrigation systems shall comply with the minimum backflow requirement as established by the State Department of Health and the City of Tumwater.

The installation of all backflow devices is required to protect the existing water system and users from possible contamination. Installation dates, manufacturer and installer of the device will be filed with the Public Works Department before acceptance occurs. Proof of test certification is required prior to acceptance.

The City shall have the authority to inspect all backflow preventive devices connected to the City's water system.

6.13 Service Connection

A. All service connections relating to new development shall be installed by the developer at the time of mainline construction. After the lines have been constructed, tested and approved, the owner may apply for a water meter. The City will install a water meter after the application has been made and all applicable fees have been paid. Water meters will be set only after system is inspected and approved. Refer to standard detail for further information.

B. When water is desired to a parcel fronting an existing main but not served by an existing setter, an application must be made to the City. Upon approval of the application and payment of all applicable fees, the City will tap the main, and install the service line, the meter, box, and setter.

C. Service lines shall be a minimum of one inch high density polyethylene pipe, minimum pressure class 200 psi. No glued joints will be accepted. Service lines shall be installed 90 degrees off the main. 14 gauge copper wire wrapped around the pipe shall be installed on all service lines.

   Service saddle shall be all bronze with stainless steel straps. All clamps shall have rubber gasket and iron pipe threaded outlets.

   Corporation stop shall be all bronze and shall be Ford type F1101 or approved equal with iron pipe threads conforming to AWWA C 800. Stainless steel inserts shall be used with pack joints and polyethylene pipe.

D. Master meters will not be allowed for service to more than one building. An approved backflow prevention system must be installed in conjunction with any master meter. Deviations from this may be granted by the Director of Public Works.

6.14 Water Main/Sanitary Sewer Crossings

The Contractor shall maintain a minimum of 18 inches of vertical separation between sanitary sewers and water mains. The minimum cover for water main of 42 inches may be reduced to 30 inches upon approval by the City to provide for as much vertical separation as possible.

The longest standard length of water pipe shall be installed so that the joints will fall equidistant from any sewer crossing. In some cases where minimum separation cannot be maintained, it may be necessary to encase the water pipe and/or sewer service in pipe or concrete. No concrete shall be installed unless specifically directed by the City.

6.15 Irrigation

All irrigation systems shall be installed with an approved backflow prevention assembly approved by AWWA and the Department of Health.

Irrigation sprinklers shall be situated so as to not wet any public street or sidewalk.

6.16 Staking

All surveying and staking shall be performed by an engineering or surveying firm capable of performing such work. The engineer or surveyor directing such work shall be licensed by the State of Washington.

A preconstruction meeting shall be held with the City prior to commencing staking. All construction staking shall be inspected by the City prior to construction.

The minimum staking of waterlines shall be as follows:

A. Stake centerline alignment every 50 feet (25 feet through curve sections) with cuts and/or fills to bottom of trench maintaining 42 inches of cover over pipe. Centerline cuts are not required when road grade is to finished subgrade elevation.

B. Stake location of all fire hydrants, hydrant flange elevations, tees, water meters, setters and other fixtures with cut or fill to finished grade.

6.17 Trench Excavation

A. Clearing and grubbing where required shall be performed within the easement or public right-of-way as permitted by the City and/or governing agencies. Debris resulting from the clearing and grubbing shall be disposed of by the owner or contractor in accordance with the terms of all applicable permits.

B. Trenches shall be excavated to the line and depth designated by the City to provide a minimum of 42 inches of cover over the pipe. Except for unusual circumstances where approved by the City, the trench sides shall be excavated vertically and the trench width shall be excavated only to such widths as are necessary for adequate working space as allowed by the governing agency. The trench shall be kept free from water until joining is complete. Surface water shall be diverted so as not to enter the trench. The owner shall maintain sufficient pumping equipment on the job to insure that these provisions are carried out.

C. The contractor shall perform all excavation of every description and whatever substance encountered, including boulders, rocks, roots and other obstructions shall be entirely removed or cut out to the width of the trench and to a depth six inches below water main grade. Where materials are removed from below water main grade, the trench shall be backfilled to grade with material satisfactory to the City and thoroughly compacted.

D. Trenching and shoring operations shall not proceed more than 100 feet in advance of pipe laying without approval of the City, and shall be in conformance with Washington Industrial Safety and Health Administration (WISHA) and Office of Safety and Health Administration (OSHA) Safety Standard.

E. The bottom of the trench shall be finished to grade with hand tools in such a manner that the pipe will have bearing along the entire length of the barrel. The bell holes shall be excavated with hand tools to sufficient size to make up the joint.

F. Trench excavations shall be designed and constructed to prevent the migration of surface and/or subsurface water.

G. See Section 4.19 of this Guide for trench backfill and restoration requirements.

6.18 Thrust Blocking

Location of thrust blocking shall be shown on plans. Thrust block concrete shall be Class B poured against undisturbed earth. A plastic barrier shall be placed between all thrust blocks and fittings.

See standard detail numbers WA-6 to WA-8 for thrust block locations and calculations.

6.19 Backfilling

Backfilling and surface restoration shall closely follow installation of pipe so that not more than 100 feet is left exposed during construction hours without approval of the City. Selected backfill material shall be placed and compacted around and under the water mains by hand tools to a height of six inches above the top of the water main. The remaining backfill shall be compacted to 95 percent of the maximum density in traveled areas, 90 percent outside traveled area. Where governmental agencies other than the City have jurisdiction over roadways, the backfill and compaction shall be done to the satisfaction of the agency having jurisdiction. If suitable backfill material, as determined by the City, is not available from trenching operations, the City may order the placing of bedding conforming to APWA Standard Specification 9-03 around the water main and gravel base conforming with Section 9-03 of the Standard Specifications for backfilling the trench.

6.20 Hydrostatic Tests

Prior to the acceptance of the work, the installation shall be subjected to a hydrostatic pressure test of 200 psi for 15 minutes, and any leaks or imperfections developing under said pressure shall be remedied by the contractor. No main shall be hydrostatically tested until the lines are flushed of chlorine. The main shall be tested between valves. Insofar as possible no hydrostatic pressure shall be placed against the opposite side of the valve being tested. Test pressure shall be maintained while the entire installation is inspected.

The contractor shall provide all necessary equipment and shall perform all work connected with the tests. Tests shall be made after all connections have been made. This is to include any and all connections as shown on the plan. The contractor shall perform the test to assure that the equipment to be used for the test is adequate and in good operating condition and the air in the line has been released before requesting the City to witness the test.

6.21 Sterilization and Flushing

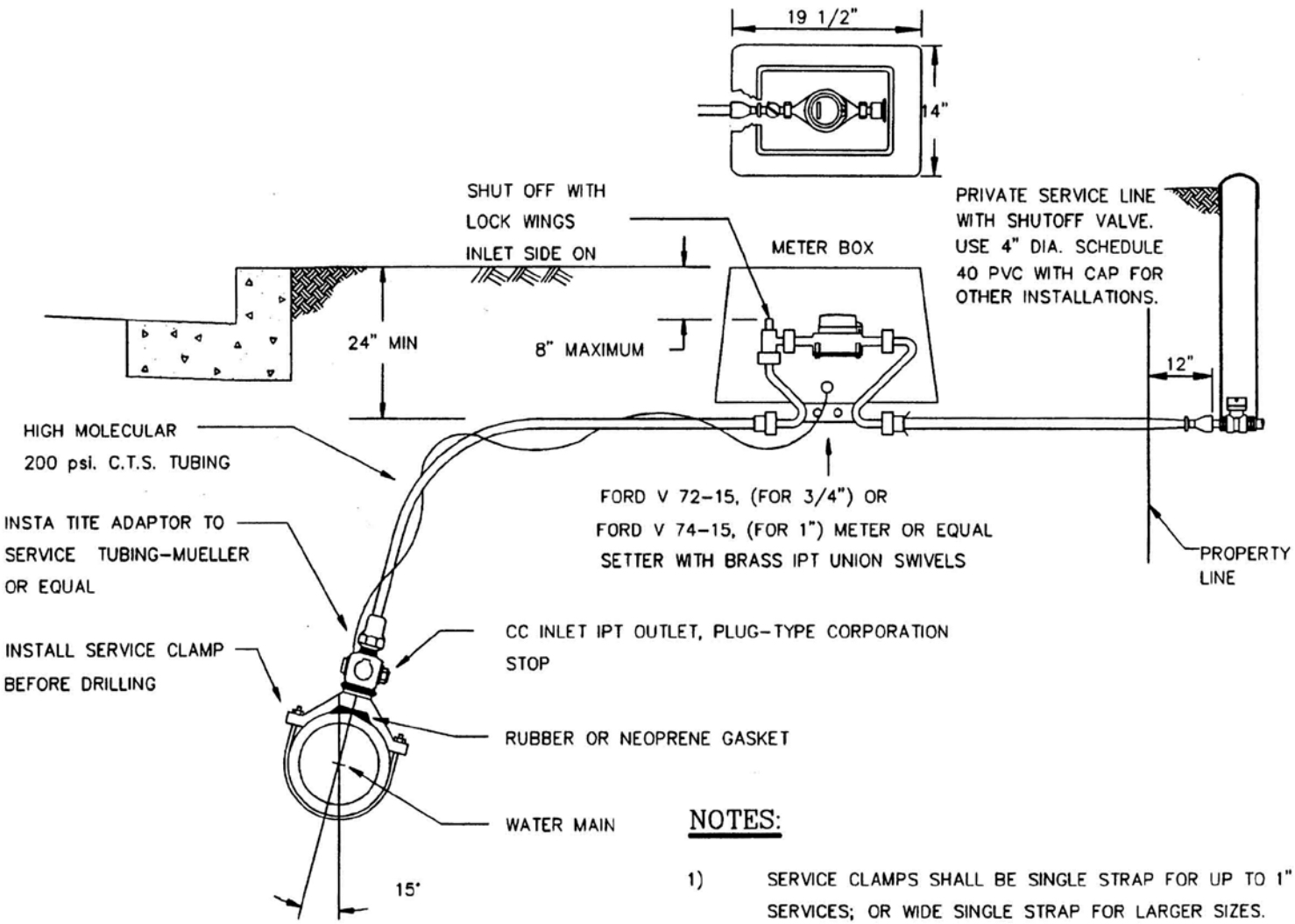
Sterilization of water mains shall be accomplished by the contractor in accordance with the requirements of the Washington State Department of Health and in a manner satisfactory to the City. At no time shall chlorinated water for a new main be flushed into a body of fresh water. This is to include lakes, rivers, streams, drainage ways, and any and all other waters where fish or other natural water life can be expected.

When a chlorine concentration has been established throughout the line, the valves shall be closed and the line left undisturbed for a minimum 24 hours. The line shall then be thoroughly flushed and water samples taken by the City at least 24 hours after flushing and disinfecting for approval by the Thurston County Health Department. Should the initial treatment result in an unsatisfactory bacteriological test, the original chlorination procedure shall be repeated by the contractor until satisfactory results are obtained. The sample can only be taken on Mondays, Tuesdays, and Wednesdays until noon. Testing and sampling shall take place after all underground utilities are installed and compaction of the roadway section is complete.

CHAPTER 6 - WATER
LIST OF DRAWINGS

CITY OF TUMWATER

TYPICAL 3/4" & 1" WATER SERVICE AND METER PLACEMENT



NOTES:

1) SERVICE CLAMPS SHALL BE SINGLE STRAP FOR UP TO 1" SERVICES; OR WIDE SINGLE STRAP FOR LARGER SIZES. DIRECT TAPS ARE NOT ALLOWED.

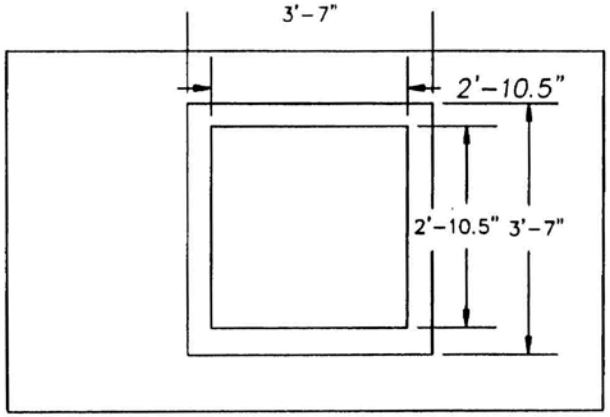
2) INSULATED No. 12 AWG COPPER TRACER WIRE REQUIRED ON ALL SERVICE LINES.

DRAWN BY:	STD. PLAN NO.
BDH	WA-01
CHECKED BY: JRN	DATE: 05-30-95

COMPOUND WATER METER WITH BYPASS FOR 3", 4", 6" & 8" SIZE

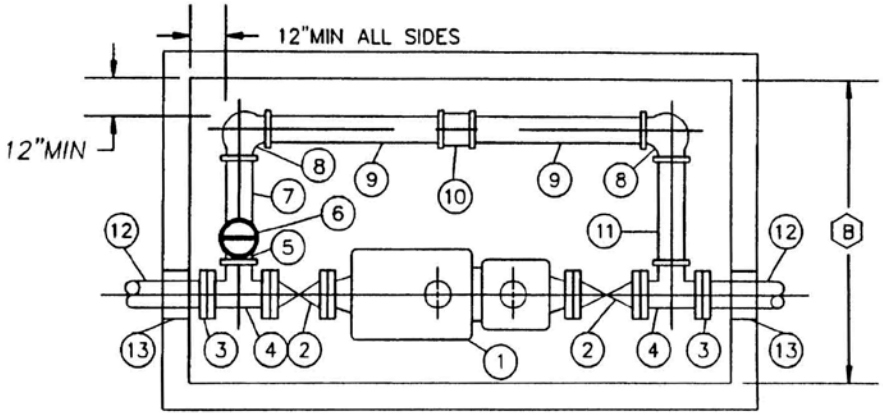
CITY OF TUMWATER

DRAWN BY:	STD. PLAN NO.
BDH	WA-02
CHECKED BY: JRN	DATE: 05-30-95



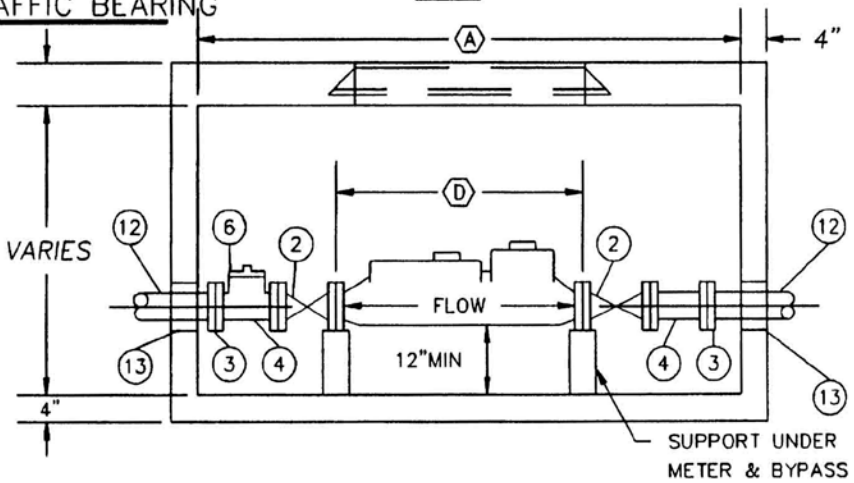
LID COVER

- FOR NON-TRAFFIC BEARING 3" & 4"METERS-
  LID COVER #5736 (OLYMPIC FOUNDRY)
  OR EQUAL
- FOR TRAFFIC BEARING 3" & 4" METERS-
  LID COVER #5737-H (OLYMPIC FOUNDRY)
  OR EQUAL
- FOR 6" & 8" METERS-
  LID COVER #5739 (OLYMPIC FOUNDRY)
  OR EQUAL



PLAN

6" MINIMUM
8" TRAFFIC BEARING



ELEVATION

CITY OF TUMWATER

COMPOUND WATER METER WITH BY-PASS
FOR 3", 4", 6", & 8" SIZES

MATERIALS LIST FOR

3-INCH METER INSTALLATION

1. 3" COMPOUND METER-BADGER, HERSEY, NEPTUNE, SENSUS
2. 3" FLG VALVE WITH HAND WHEEL-MUELLER
3. 3" FLEX BY FLANGE COUPLING
4. 3" X 1 1/2" TAPPED FLG TEE C.I.
5. 1 1/2" CLOSE NIPPLE G.I.P.
6. 1 1/2" WINGED STOP (LOCKABLE)
7. 1 1/2" X 12" LGTH. PIECE G.I.P.
8. 1 1/2" 90 E11
9. 1 1/2" X 31" LGTH. PIECE G.I.P.
10. 1 1/2" COMPRESSION COUPLING
11. 1 1/2" X 18" LGTH. PIECE G.I.P.
12. 3" X 36" LGTH. THREADED BOTH ENDS G.I.P.
13. 6" SLEEVE

A = 86" ; B = 68" ; D = 24"

4-INCH METER INSTALLATION

1. 4" COMPOUND METER-HERSEY
2. 4" FLG VALVE WITH HAND WHEEL-MUELLER
3. 4" FLEX BY FLANGE COUPLING
4. 4" X 2" TAPPED FLG TEE C.I.
5. 2" CLOSE NIPPLE G.I.P.
6. 2" WINGED STOP (LOCKABLE)
7. 2" X 12" LGTH. PIECE G.I.P.
8. 2" 90 E11
9. 22" X 31" LGTH. PIECE G.I.P.
10. 2" COMPRESSION COUPLING
11. 2" X 18" LGTH. PIECE G.I.P.
12. 4" X 36" LGTH. THREADED BOTH ENDS G.I.P.
13. 6" SLEEVE

A = 91" ; B = 70" ; D = 29"

6-INCH METER INSTALLATION

1. 6" COMPOUND METER-HERSEY
2. 6" FLG VALVE WITH HAND WHEEL-MUELLER
3. 6" FLEX BY FLANGE COUPLING
4. 6" X 4" TAPPED FLG TEE C.I.
5. 4" CLOSE NIPPLE C.I. PIPE
6. 4" WINGED STOP (LOCKABLE)
7. 4" X 12" LGTH. PIECE C.I. PIPE THREADED
8. 4" 90 E11 FLG
9. 4" X 31" LGTH. PIECE C.I. PIPE THREADED
10. 4" COMPRESSION COUPLING
11. 4" X 18" LGTH. PIECE C.I. PIPE THREADED
12. 6" X 36" LGTH. PIECE C.I. PIPE THREADED
13. 8" SLEEVE

A = 114" ; B = 78" ; D = 36 1/2"

8-INCH INSTALLATION

1. 8" COMPOUND METER-HERSEY
2. 8" FLG VALVE WITH HAND WHEEL-MUELLER
3. 8" FLEX BY FLANGE COUPLING
4. 8" X 6" TAPPED FLG TEE C.I.
5. 6" CLOSE NIPPLE C.I. PIPE
6. 6" WINGED STOP (LOCKABLE)
7. 6" X 12" LGTH. PIECE C.I. PIPE THREADED
8. 6" 90 E11 FLG
9. 6" X 31" LGTH. PIECE C.I. PIPE THREADED
10. 6" COMPRESSION COUPLING
11. 6" X 18" LGTH. PIECE C.I. PIPE THREADED
12. 8" X 36" LGTH. PIECE C.I. PIPE THREADED
13. 10" SLEEVE

A = 136" ; B = 116" ; D = 53"

NOTES

1.) DRAINAGE MUST BE PROVIDED FOR METER PIT.
2.) PIPE LENGTHS MAY BE CHANGED DUE TO VARYING LENGTHS IN METERS USED
3.) METER PIT MAY BE EXTENDED WHEN P.R.V. IS REQUIRED.
4.) ON ALL METERS 3" AND ABOVE A FLEX-COUPLING SHALL BE INSTALLED IN THE OUTLET LINE WITHIN THE METER BOX.

DRAWN BY:	CHECKED BY:	DATE:
BDH	JRN	05-30-95

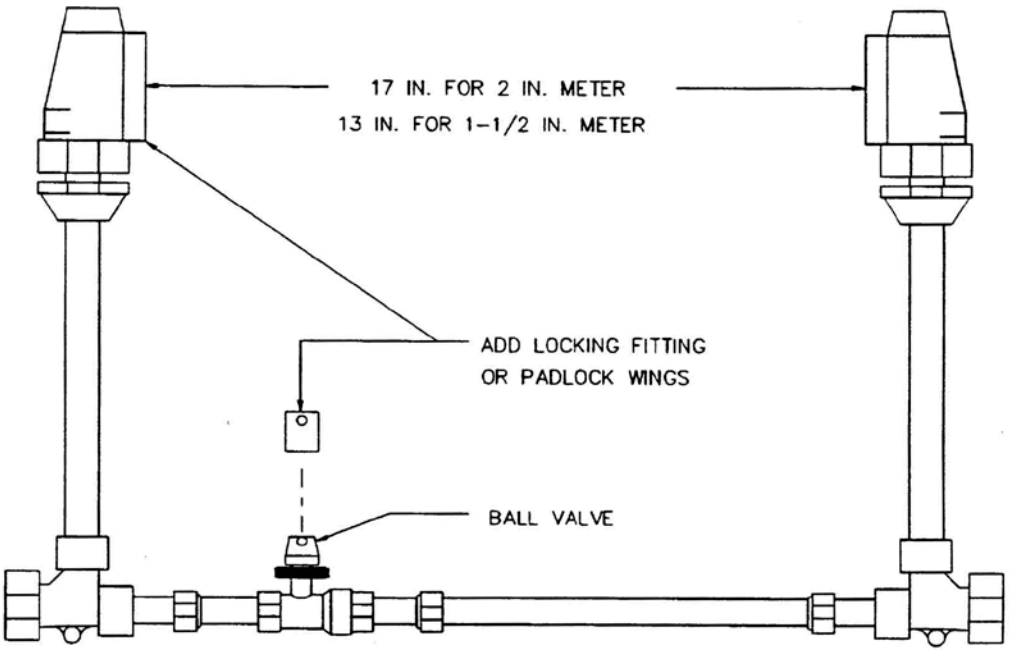
STD. PLAN NO. WA-03

FORD ALL BRASS AND COPPER CUSTOMSETTER

NOT TO SCALE

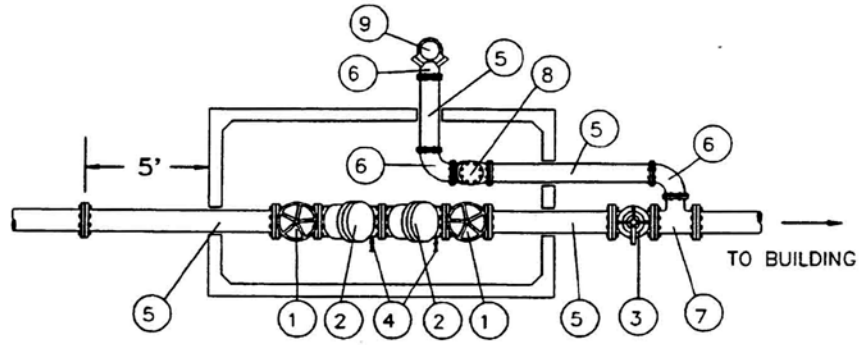
FOR 1-1/2" AND 2" FLANGED METERS
CUSTOMSETTER WITH BY-PASS
FLANGED VALVE ON BOTH INLET AND OUTLET
USE 15" OR 18" DEPTH

NOTE: USE GALVANIZED STEEL INSTEAD OF POLYTUBE FOR SERVICE LINE.
SEE TYPICAL 3/4", 1" WATER SERVICE DETAIL.

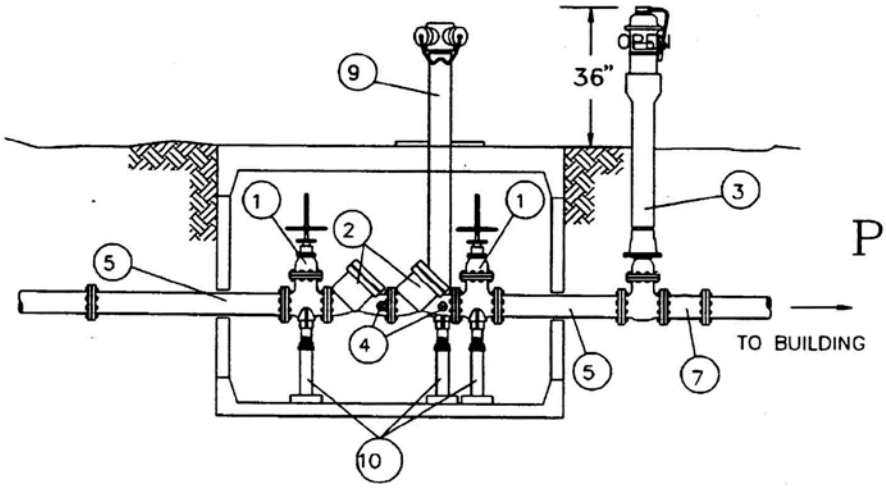


HEIGHT	FOR 1-1/2" METER	FOR 2" METER
	CATALOG NUMBER:	CATALOG NUMBER:
15"	FORD VVF66-15BXLENGTH	VVF77-15BXLENGTH
18"	FORD VVF66-18BXLENGTH	VVF77-18BXLENGTH
(OR EQUAL)		

CITY OF TUMWATER	DRAWN BY: BDH	STD. PLAN NO. WA-04
FORD BRASS AND COPPER CUSTOMSETTER	CHECKED BY: JRN	DATE: 05-25-95



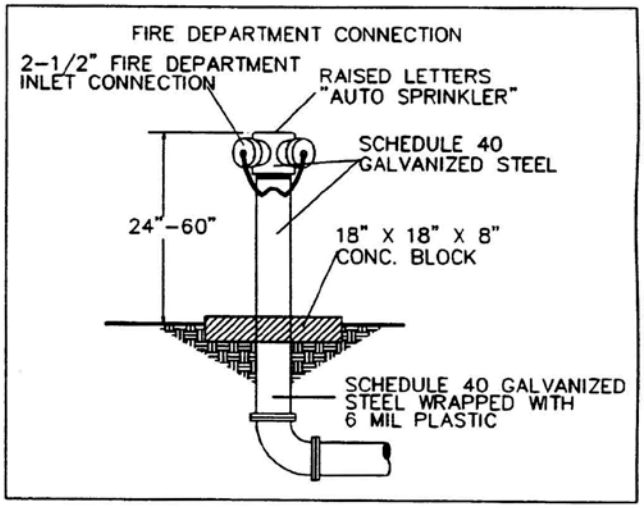
PLAN



PROFILE

MATERIAL LIST:

1. OS&Y GATE VALVE W/HANDWHEEL FL X FL
2. DOUBLE DETECTOR (DSHS APPROVED) CHECK VALVE FL X FL
3. POST INDICATOR VALVE
4. 3/4" BALL VALVE (TEST COCK)
5. CLASS 52 DI WALL PIPE FL X FL
6. CLASS 52 DI 90° BEND FL X FL
7. CLASS 52 DI TEE FL X FL
8. SWING CHECK VALVE W/BALL DRIP ASSEMBLY
9. FIRE DEPARTMENT CONNECTION
10. VALVE STANDS
11. WHERE PIPING PASSES THROUGH CONCRETE WALL PROVIDE 2" CLEARANCE W/ WATERPROOF MASTIC OR FLEXIBLE SEALANT



GENERAL NOTES:

A. PIPE FROM VAULT TO BUILDING SHALL BE CLASS 52 DI.

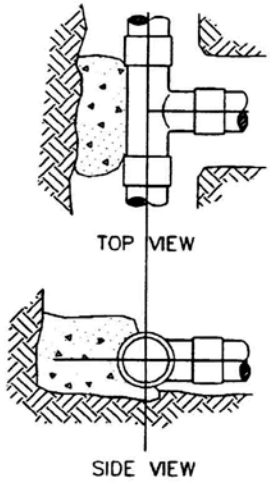
B. TAMPER SWITCHES SHALL BE INSTALLED ON 1 AND 3 CONNECTED TO BUILDING FIRE ALARM SYSTEM.

C. INSTALL PLUGS ON ALL TEST COCKS. FINGER TIGHTEN.

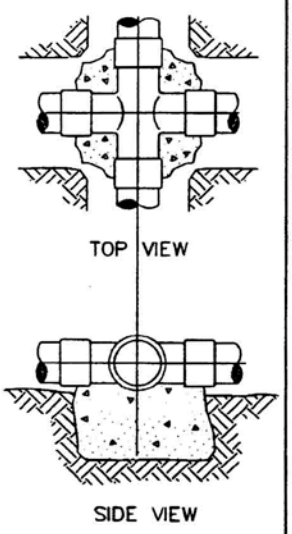
D. DIAMETER OF PIPE AND. FITTINGS = ____

E. ALL PIPING SHALL BE A MINIMUM OF 4" DIA. AS PER NFPA13.

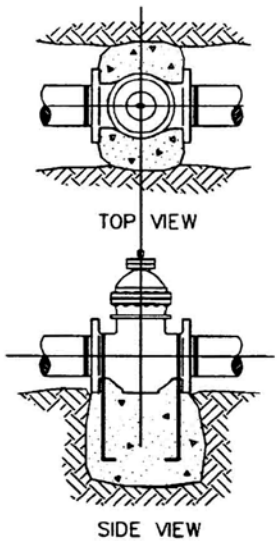
CITY OF TUMWATER	DRAWN BY: BDH	STD. PLAN NO. WA-05
SINGLE SERVICE DOUBLE CHECK VALVE ASSEMBLY W/FDC	CHECKED BY: JRN	DATE: 5-1-95



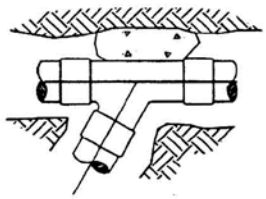
TEE



CROSS

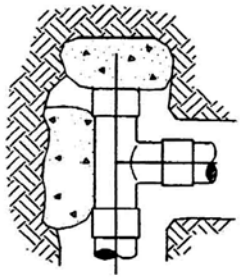


GATE VALVE

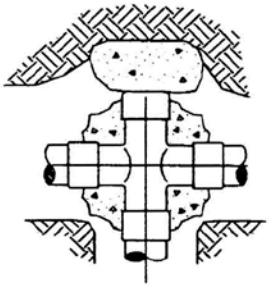


WYE

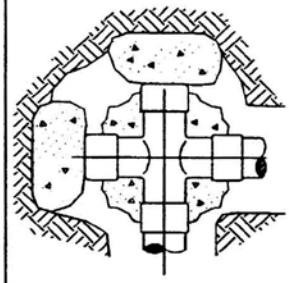
HORIZ. BEND



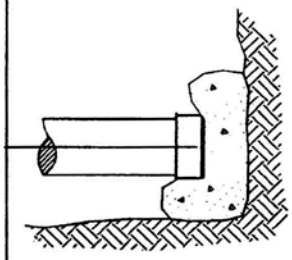
TEE WITH PLUG



CROSS WITH PLUG



CROSS WITH PLUGS



PLUG OR CAP

45° – 90° VERTICAL BEND

NOTES:

1. CONCRETE THRUST BLOCKING TO BE POURED AGAINST UNDISTURBED EARTH.
2. PLASTIC BARRIER SHALL BE PLACED BETWEEN ALL THRUST BLOCKS & FITTINGS.
3. ANCHOR REBAR SHALL BE 5/8" MINIMUM DIAMETER.

CITY OF TUMWATER	DRAWN BY: SRJ	STD. PLAN NO. WA–06
STANDARD BLOCKING DETAIL SHEET 1 OF 2	CHECKED BY: JRN	DATE: 05–02–95

NOTES:

1. CONCRETE THRUST BLOCKING TO BE POURED AGAINST UNDISTURBED EARTH.
2. KEEP CONCRETE CLEAR OF JOINT AND ACCESSORIES.
3. THE REQUIRED THRUST BEARING AREAS FOR SPECIAL CONNECTIONS ARE SHOWN ENCIRCLED ON THE PLANS; e.g. (15) INDICATES 15 SQUARE FEET BEARING AREA REQUIRED.
4. IF NOT SHOWN ON PLANS REQUIRED BEARING AREAS AT FITTING SHALL BE AS PRESSURE(S) AND ALLOWABLE SOIL BEARING STRESS(ES) STATED IN THE SPECIAL SPECIFICATIONS.
5. BEARING AREAS AND SPECIAL BLOCKING DETAILS SHOWN ON PLANS TAKE PRECEDENCE OVER BEARING AREAS AND BLOCKING DETAILS SHOWN ON THIS STANDARD DETAIL.

BEARING AREA OF THRUST BLOCKS IN SQ. FT.

FITTING SIZE	TEE, WYE PLUG OR CAP	90° BEND PLUGGED CROSS	TEE PLUGGED ON RUN A_1	TEE PLUGGED ON RUN A_2	45° BEND	22.5° BEND	11.5° BEND
4	1.0	1.4	1.9	1.4	1.0		
6	2.1	3.0	4.3	3.0	1.6	1.0	
8	3.8	5.3	7.6	5.4	2.9	1.5	1.0
10	5.9	8.4	11.8	8.4	4.6	2.4	1.2
12	8.5	12.0	17.0	12.0	6.6	3.4	1.7
14	11.5	16.3	23.0	16.3	8.9	4.6	2.3
16	15.0	21.3	30.0	21.3	11.6	6.0	3.0
18	19.0	27.0	38.0	27.0	14.6	7.6	3.8
20	23.5	33.3	47.0	33.3	18.1	9.4	4.7
24	34.0	48.0	68.0	48.0	26.2	13.6	6.8

NOTE:

ABOVE BEARING AREAS BASED ON TEST PRESSURE OF 150 psi AND AN ALLOWABLE SOIL BEARING STRESS OF 2,000 POUNDS PER SQUARE FOOT. TO COMPUTE BEARING AREAS FOR DIFFERENT TEST PRESSURES AND SOIL BEARING STRESSES, USE STANDARD PLAN TEMP-41.

CITY OF TUMWATER	DRAWN BY: SRJ	STD. PLAN NO. WA-07
STANDARD BLOCKING DETAIL SHEET 2 OF 2	CHECKED BY: JRN	DATE: 05-30-95

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 CEMENT CONCRETE CLASS "B" 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.

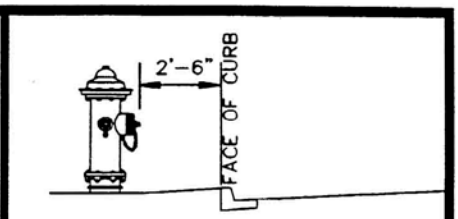
4. BLOCKING SHALL BE ADEQUATE TO WITHSTAND FULL TEST PRESSURE AS WELL AS TO CONTINUOUSLY WITHSTAND OPERATING PRESSURE UNDER ALL CONDITIONS OF SERVICE.

SAFE SOIL BEARING LOADS

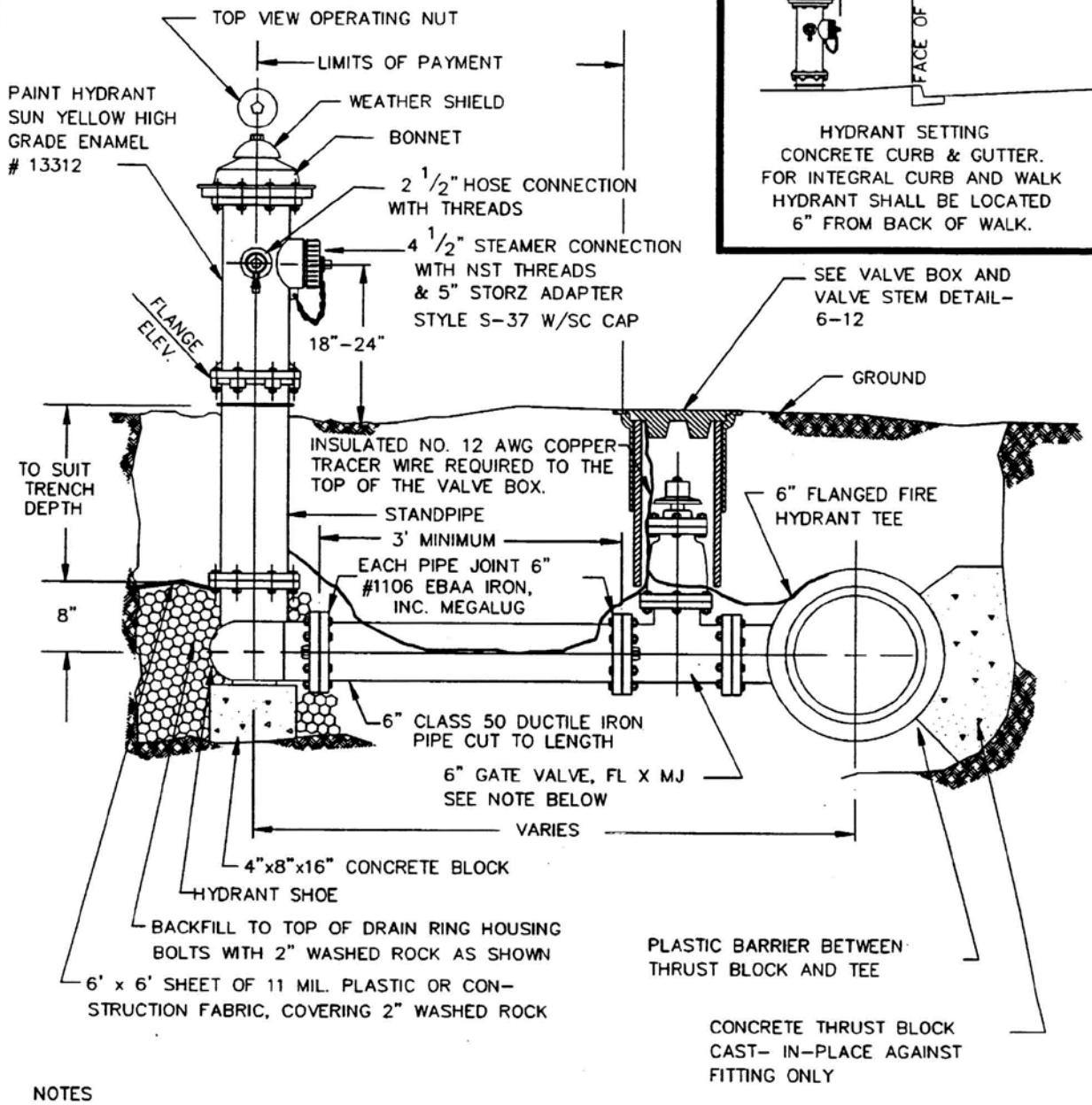
FOR HORIZONTAL THRUSTS WHEN THE DEPTH OF COVER OVER THE PIPE EXCEEDS 2 FEET

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

CITY OF TUMWATER	DRAWN BY: SRJ	STD. PLAN NO. WA-08
THRUST LOADS	CHECKED BY: JRN	DATE: 05-02-95



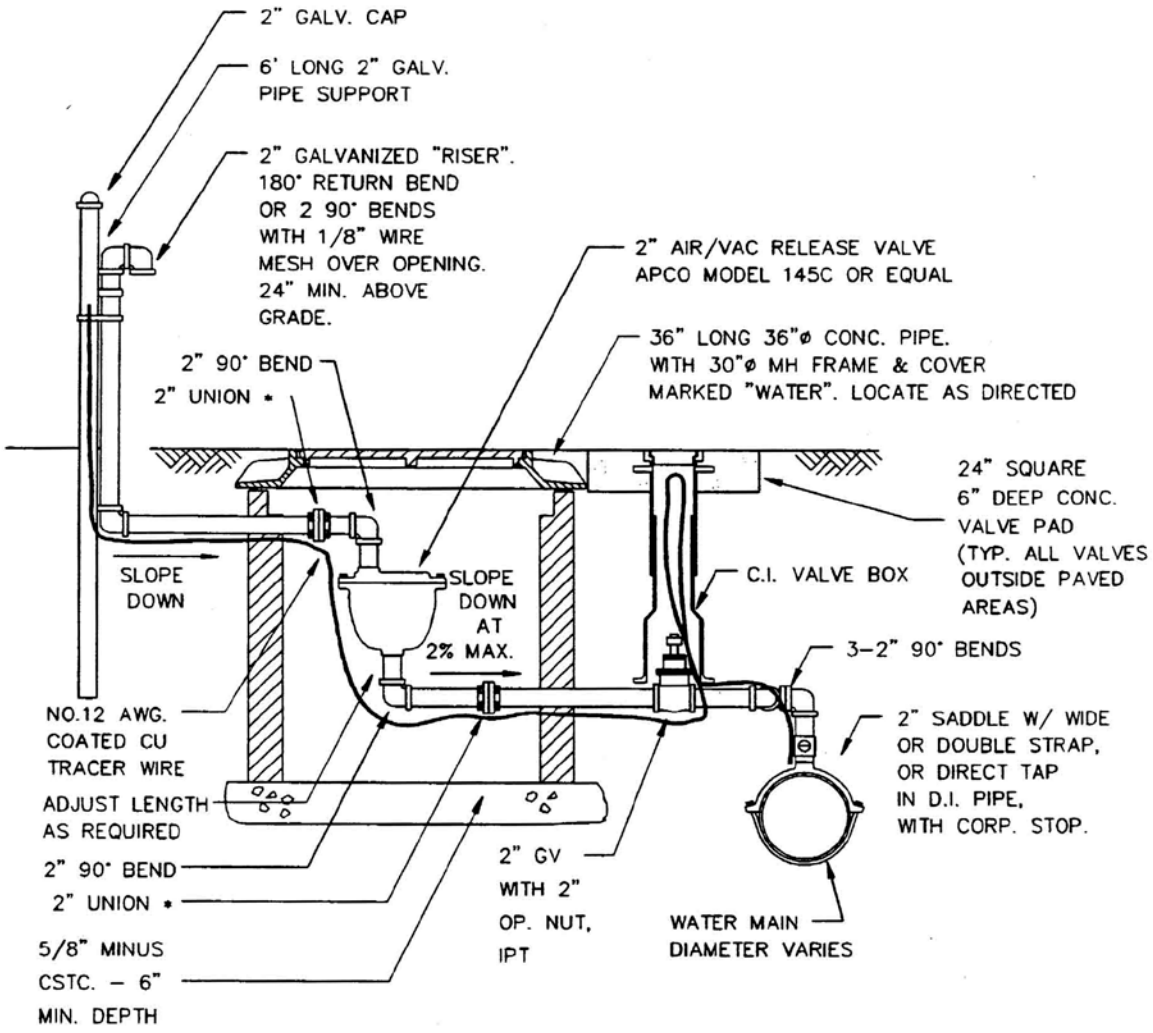
HYDRANT SETTING
CONCRETE CURB & GUTTER.
FOR INTEGRAL CURB AND WALK
HYDRANT SHALL BE LOCATED
6" FROM BACK OF WALK.



NOTES

1. A MINIMUM THREE FOOT RADIUS UNOBSTRUCTED WORKING AREA SHALL BE PROVIDED AROUND ALL HYDRANTS. FOUR GUARDPOSTS TO BE INSTALLED IN UNPROTECTED AREAS.
2. HYDRANT SHALL BE WATEROUS PACER, DRESSER M & H RELIANT STYLE 929, MUELLER CENTURION, OR CLOW F-2500.
3. GATE VALVES SHALL BE RESILIENT WEDGE NRS WITH O-RINGS SEALS. VALVE ENDS SHALL BE MECHANICAL JOINT BY ANSI FLANGES. VALVES SHALL CONFORM TO AWWA 509-80. VALVES SHALL BE MUELLER M & H, KENNEDY, CLOW R/W OR WATEROUS SERIES 500.

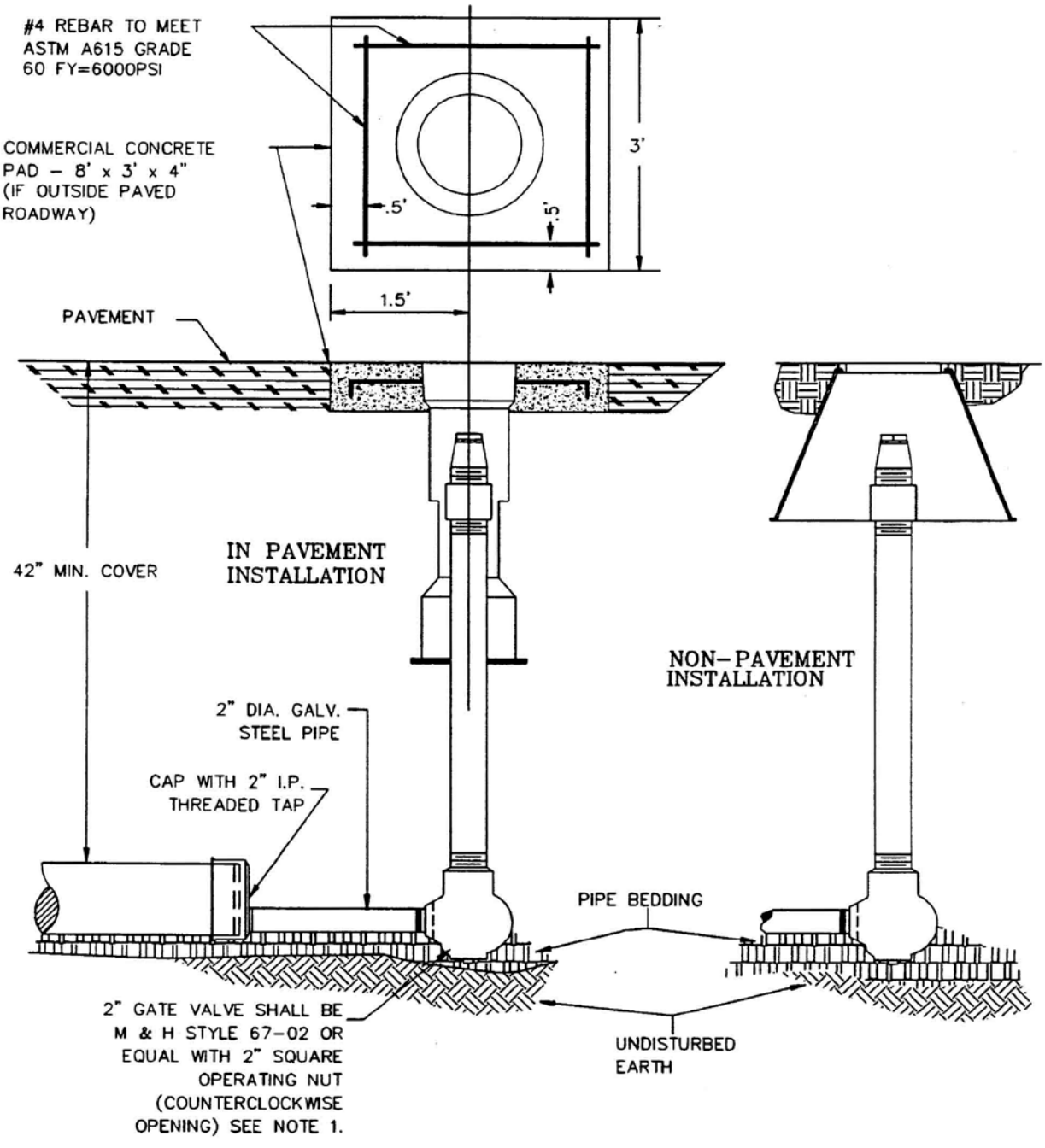
CITY OF TUMWATER	DRAWN BY: BDH	STD. PLAN NO. WA-9
FIRE HYDRANT	CHECKED BY: JRN	DATE: 5-1-95



NOTES:

1) ALL PIPE TO BE SCHED. 40 GALV. (EXCEPT AS NOTED)
2) GROUT STRUCTURE AT PIPE ENTRIES.
3) FILL VAULT WITH VERMICULITE.
4) GROUT MH COVER TO PIPE.
5) FASTEN VENT TO POST WITH SS STRAP.
6) FASTEN SCREEN TO BEND W/ SS CLAMP
7) 2" UNIONS TO BE CONSTRUCTED OF TWO 2" COMPANION FLANGES. CONNECT WITH STAINLESS BOLTS.

CITY OF TUMWATER	DRAWN BY: SRJ	STD. PLAN NO. WA-10
AIR RELEASE VALVE DETAIL	CHECKED BY: JRN	DATE: 05-25-95



NOTES:

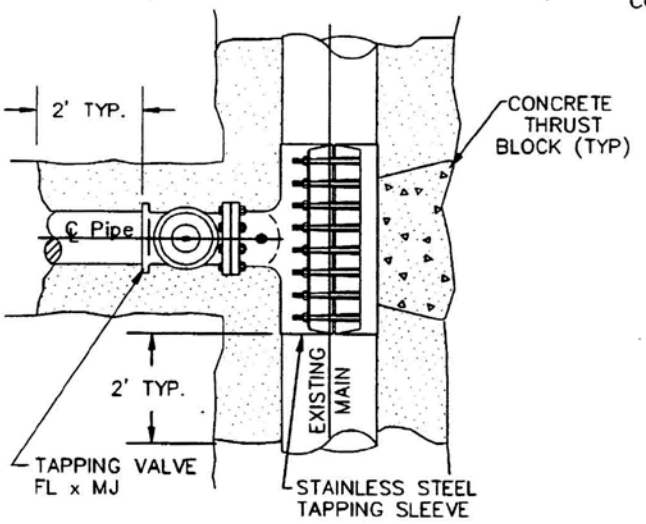
1. ON WATERMAINS WHICH WILL BE EXTENDED IN THE FUTURE, THE VALVE WHICH OPERATES THE BLOWOFF ASSEMBLY SHALL BE THE SAME SIZE AND PROVIDED WITH A CONCRETE THRUST BLOCK.

2. THESE ASSEMPLIES COMPLY WITH THE #2000 SPECS AND DETAILS MANUFACTURED BY KUPFERLE FOUNDRY.

CITY OF TUMWATER	DRAWN BY: SRJ	STD. PLAN NO. WA–11
2" BLOWOFF ASSEMBLY	CHECKED BY: JRN	DATE: 05–30–95

LIVE TAP

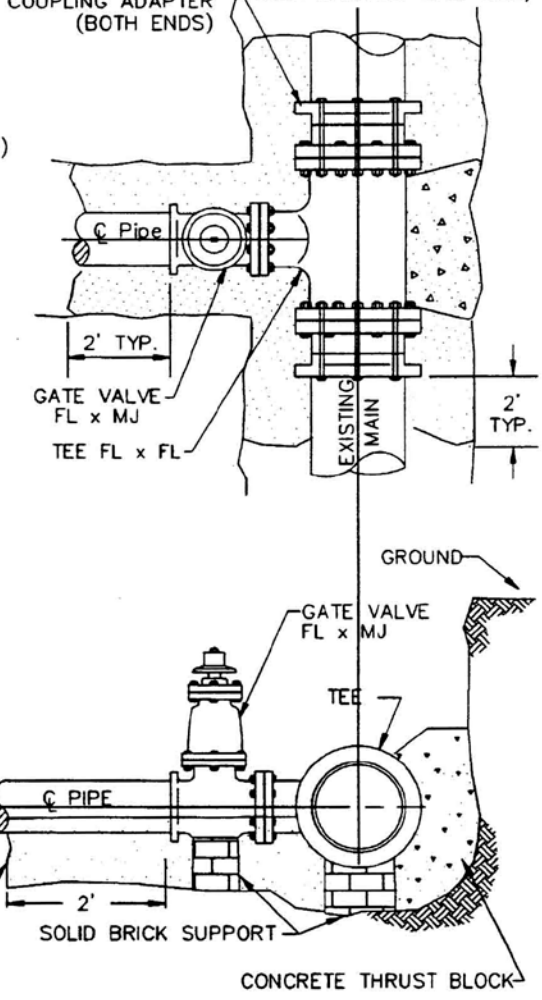
(SIZE LESS THAN EXISTING MAIN SIZE)



VALVE AND SLEEVE SHALL BE SUPPORTED AND BACKFILLED AS SHOWN BELOW–RIGHT.

CUT–IN–TEE

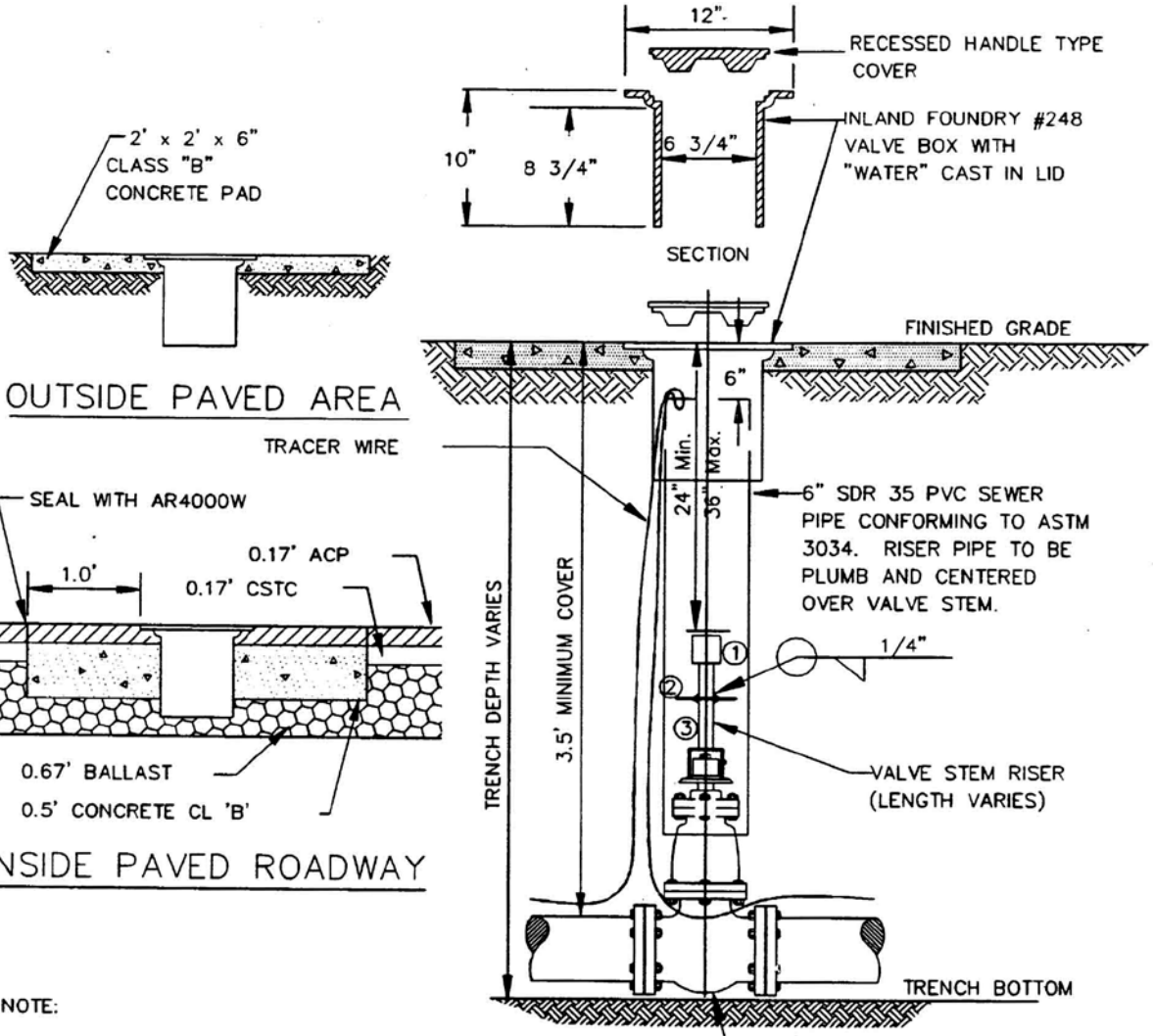
(SAME SIZE OR LARGER THAN EXISTING MAIN SIZE)



NOTES:

1. 11 MIL PLASTIC OR CONSTRUCTION FABRIC SHALL BE WRAPPED AROUND PIPE AND FITTINGS BEFORE THRUST BLOCK AND BACKFILL ARE POURED.
2. CONTROLLED DENSITY BACKFILL IS A PLANT MIX CONSISTING OF : 3100# SAND, 450# WATER, AND ONE SACK (94#) OF CEMENT.
3. MJ CUT IN TEES SHALL NOT BE PERMITTED.
4. SUPPORT VALVE AND SLEEVE CONTINUOUSLY THROUGH INSTALLATION.

CITY OF TUMWATER CONNECTION TO EXISTING MAIN	DRAWN BY: BDH	STD. PLAN NO. WA–12
	CHECKED BY: JRN	DATE: 05–30–95



NOTE:

ALL VALVES MUST HAVE 14 GUAGE COATED COPPER TRACER WIRE TIED OFF AT VALVE BODY. EXTENDED OUTSIDE PVC RISER PIPE THEN EXTENDED ONE FOOT TOP OF VALVE BOX.

VALVE STEM EXTENSION LEGEND

① VALVE OPERATING NUT OR 1 7/8" X 1 7/8" X 2" HIGH GRADE STEEL WELDED TO GUIDE PLATE.

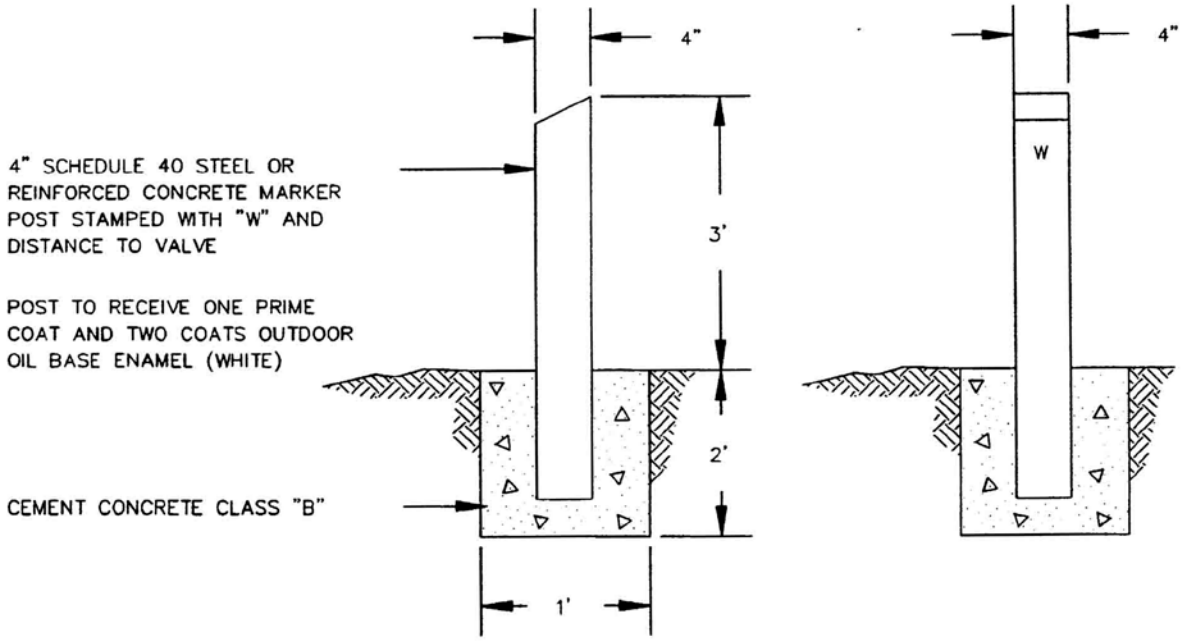
② 3/16" Thk X 5 1/5" DIA STEEL GUIDE PLATE WELDED TO RISER SHAFT.

③ 2"X2"X 3/16" SQUARE STRUCTURAL STEEL TUBING TO FIT OPERATING NUT. LENGTH AS REQUIRED.

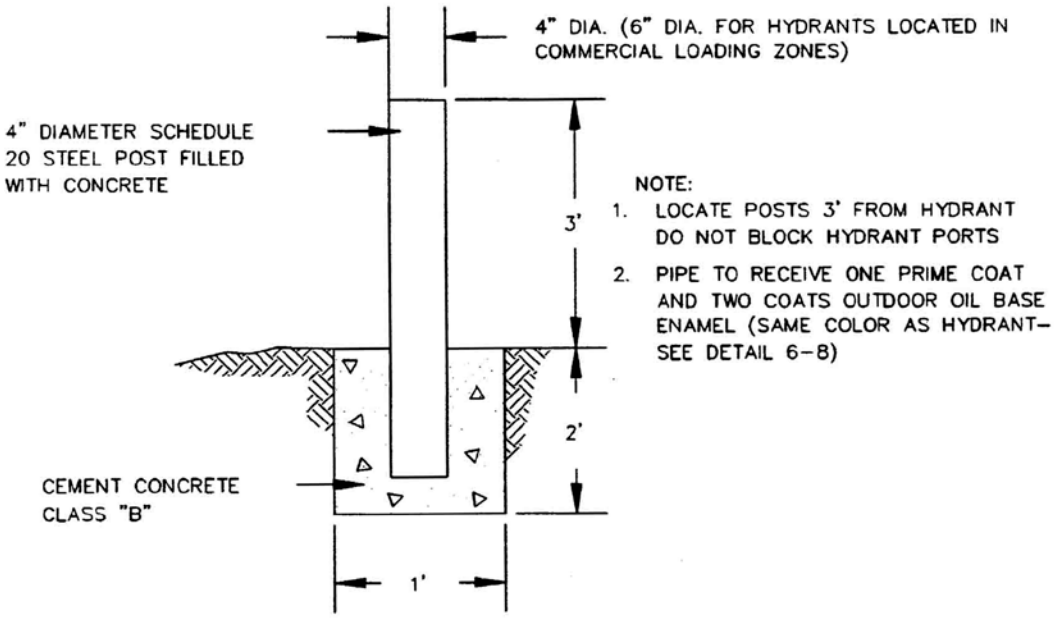
NOTE:

ALL WELDS TO SHAFT SHALL BE FILLET WELD ALL AROUND, AS SPECIFIED ABOVE

CITY OF TUMWATER	DRAWN BY: BDH	STD. PLAN NO. WA-13
STANDARD VALVE BOX	CHECKED BY: JRN	DATE: 5-1-95



VALVE MARKER POST



HYDRANT GUARDPOST

CITY OF TUMWATER	DRAWN BY: BDH	STD. PLAN NO. WA–14
VALVE MARKER POST & HYDRANT GUARDPOST DETAIL	CHECKED BY: JRN	DATE: 5–1–95

CHAPTER SEVEN

CHAPTER SEVEN

SANITARY SEWER

7.1 General

Sanitary sewerage refers to waste water derived from domestic, commercial and industrial pretreated waste to which storm, surface, and ground water are not intentionally admitted. Pretreatment shall follow all the requirements as set forth by LOTT.

Any extension of Tumwater's sanitary sewer system must be approved by the Public Works Department and must conform to the City of Tumwater Comprehensive Sanitary Sewer Plan, Thurston County Health Department, Department of Ecology (DOE), and State Department of Health (DOH) requirements.

Within the corporate City limits where a public sewer is available it must be used. Where public sewer is not available within the City limits, connection is required provided that the sewage from the structure originates within 200 feet of the public sewer, except in the case of private residential or commercial developments where the developed property abuts a right-of-way in which a public sewer is located or where a service connection is otherwise provided. In this case, connection of all structures generating sewage shall be required to connect to the public sewer regardless of distance from the public sewer.

In new development where sanitary sewer improvements or any private utility work and public street improvements are required, no paving of the public right-of-way shall occur until all utility improvements in the right-of-way are complete.

Anyone who wishes to extend or connect to the City's sewer system should contact the Development Services Division.

7.2 Marking Side Sewers

The location of side sewers at the property line shall be marked by the Contractor with a 2 by 4 wooden stake 4 feet long buried in the ground a depth of 3 feet. The lower end shall have a 2 by 4 cleat nailed to it to prevent withdrawal of the stake. The exposed 1 foot shall be painted traffic white and the depth to the side sewer or tee shall be indicated in black paint on the 2 by 4. In addition, a length of 12 gauge galvanized wire shall be provided to extend from the plugged end of the side sewer or tee. The upper end shall emerge at the 4 foot stake, but shall not be fastened to it.

7.3 Sanitary Sewer/Water Main Crossings

See Department of Ecology Sewage Works Design for requirements regarding sewer and water separation.

7.4 Staking

All surveying and staking shall be performed by an engineering or surveying firm capable of performing such work. The engineer or surveyor directing such work shall be licensed by the State of Washington.

A preconstruction meeting shall be held with the City prior to commencing construction.

The minimum staking of sewer lines shall be as follows:

A. Centerline alignment must be staked with cuts and/or fills to flowline every 25 feet.

B. Manholes must be staked with hubs to include invert elevations of all pipes and top of rim elevations to finished grade.

C. Location of valves, fixtures and septic tank shall be staked for force mains.

7.5 Trench Excavation

See the WSDOT/APWA specification for requirements regarding trench excavation.

7.6 Backfilling

See the WSDOT/APWA specification for requirements regarding backfilling.

7.7 Street Patching and Restoration

See Section 4.19 of this Guide for trench backfill and restoration requirements.

7.8 Testing

Prior to acceptance and approval of construction, the following tests shall apply to each type of construction.

A. Gravity Sewer

1. Prior to acceptance of the project, the gravity sewer pipe shall be subject to a low pressure air test per WSDOT/APWA Specifications. The contractor shall furnish all equipment and personnel for conducting the test under the observation of the City inspector. The testing equipment shall be subject to the approval of the City.

   The contractor shall make an air test for his own purposes prior to notifying the City to witness the test. The acceptance air test shall be made after trench is backfilled and compacted and the roadway section is completed to final grade excluding paving.

   All wyes, tees, and end of side sewer stubs shall be plugged with flexible joint caps, or acceptable alternates, securely fastened to withstand the internal test pressures. Such plugs or caps shall be readily removable and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.

   Immediately following the pipe cleaning, the pipe installation shall be tested with low-pressure air.

2. A water test of all manholes is also required. The water test shall be made by the contractor first by filling the manhole up with water and letting it sit for 24 hours to allow the water to saturate the concrete. After 24 hours the manhole shall be filled to the top of the cone. The water cannot drop more than 0.05 gallons in 15 minutes per foot of head above invert to pass.

B. Force Main

1. Prior to acceptance of the project, the pressure line and service lines shall be subjected to a hydrostatic pressure test of 200 psi for 4 hours and any leaks or imperfections developing under said pressure shall be remedied by the owner. No air will be allowed in the line. The main shall be tested between valves. Insofar as possible, no hydrostatic pressure shall be placed against the opposite side of the valve being tested. The pressure test shall be maintained while the entire installation is inspected.

   The contractor shall provide all necessary equipment and shall perform all work connected with the tests. Tests shall be made after all connections have been made. This is to include any and all connections as shown on the plan. The contractor shall perform all tests to assure that the equipment to be used for the test is adequate and in good operating condition and the air in the line has been released before requesting the City to witness the test.

2. A water test for all wet wells in accordance with the manhole water test for gravity sewer shall be required.

3. Pump operation, alarms, and electrical inspection of all lift stations is required.

GRAVITY SEWER

7.9 General

All sewers shall be designed as a gravity sewer lines or as outlined in the Tumwater Sanitary Sewer Comprehensive Plan. Gravity sewer will extend from the comprehensive plan main line sewers as far as gravity sewer service will allow.

7.10 Design Standards

The design of any sewer extension/connection shall conform to City Standards, DOE Standards, and any applicable standards as set forth herein.

The layout of extensions shall provide for the future continuation of the existing system as determined by the City. New gravity sewer systems shall be designed on the basis of an average daily per capita flow of sewage of not less than 100 gallons per day. See the following DOE table on Design Basis for Sewage. This figure is assumed to cover normal infiltration, but an additional allowance shall be made where conditions are unfavorable. Generally, laterals and sub-main sewers should be designed to carry, when running full, not less than 400 gallons daily per capita contributions of sewage. When deviations from the foregoing per capita rates are used, a description of the procedure used for sewer design shall be submitted to the Development Services Department for review and approval.

The General Notes on the following page shall be included on any plans dealing with gravity sanitary sewer design.

GENERAL NOTES (SANITARY SEWER MAIN INSTALLATION)

1. All workmanship and materials shall be in accordance with City of Tumwater standards and the latest edition of the State of Washington Standard Specifications for Road, Bridge and Municipal Construction (WSDOT/APWA).

2. City of Tumwater datum shall be used for all vertical control. A benchmark list is available from the Public Works Department.

3. All approvals and permits required by the City of Tumwater shall be obtained by the contractor prior to the start of construction.

4. If construction is to take place in the County right-of-way, the contractor shall notify the County and obtain all the required approvals and permits

5. A preconstruction meeting shall be held with the City of Tumwater Construction Inspector prior to the start of construction.

6. The City of Tumwater Construction Inspector shall be notified a minimum of 48 hours in advance of a tap connection to an existing main.

7. The contractor shall be fully responsible for the location and protection of all existing utilities. The contractor shall verify all utility locations prior to construction by calling the Underground Locate Line at 1-800-424-5555 a minimum of 48 hours prior to any excavation.

8. Gravity sewer main shall be PVC, ASTM D 3034 SDR 35 or ASTM F 789 with joints and rubber gaskets conforming to ASTM D 3212 and ASTM F 477.

9. Precast manholes shall meet the requirements of ASTM C 478. Manholes shall be Type 1-48" manhole or larger unless otherwise specified on the plans. Joints shall be rubber gasketed conforming to ASTM C 443 and shall be grouted from the inside. Lift holes shall be grouted from the outside and inside of the manhole.

10. Side sewer services shall be PVC, ASTM D 3034 SDR 35 with flexible gasketed joints. Side sewer connections shall be made by a tap to an existing main or a wye branch from a new main.

11. All sewer mains shall be field staked for grades and alignment by a licensed engineering or surveying firm qualified to perform such work.

12. Bedding of the sewer main and compaction of the backfill material shall be required in accordance with the above mentioned specification (See note 1).

13. Temporary street patching shall be allowed for as approved by the City Engineer. Temporary street patching shall be provided by placement and compaction of one inch maximum asphalt concrete cold mix. Contractor shall be responsible for maintenance as required.

14. Erosion control measures shall be taken by the contractor during construction to prevent infiltration of existing and proposed storm drainage facilities and roadways.

15. Provide traffic control plan(s) in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) as required.

16. It shall be the responsibility of the contractor to have a copy of these approved plans on the construction site at all times.

17. Any changes to the design shall first be reviewed and approved by the project engineer and the City of Tumwater.

18. All lines shall be cleaned and pressure tested in conformance with the above referenced specifications (See note 1). A water test of all manholes in accordance with Tumwater standard is also required. Testing shall take place after all underground utilities are installed and compaction of the roadway subgrade is completed.

19. Prior to backfill, all mains and appurtenances shall be inspected and approved by the City of Tumwater Construction Inspector. Approval shall not relieve the contractor for correction of any deficiencies and/or failures as determined by subsequent testing and inspections. It shall be the contractor's responsibility to notify the City of Tumwater for the required inspections.

20. All sanitary sewer mains shall be placed in public right-of-way or if in easement areas, provide 12 foot wide paved (six inch ballast, two inch crushed, two inch asphalt) access to all manholes. No lot line sewer mains will be allowed.

21. All mains will be dedicated to the City for maintenance with appropriate bills of sale and easements.

22. City ownership of the main and lateral will go to the property line or easement if a cleanout exists at this point. If no cleanout exists, City responsibility ends at the limit of the main.

Taken from : "Criteria for Sewage Works Design"
By : State of Washington Department of Ecology.
October 1985

Table 2. DESIGN BASIS FOR NEW SEWAGE WORKS

Discharge Facility	Design Units	Flow* (gpd)	BOD (lb/day)	SS (lb/day)	Flow Duration (hr)
Dwellings	per person	100	0.2	0.2	24
Schools with showers and cafeteria	per person	16	.04	.04	8
Schools without showers and with cafeteria	per person	10	.025	.025	8
Boarding schools	per person	75	0.2	0.2	16
Hotels at 65 gal/person (rooms only)	per room	130	0.26	0.26	24
Trailer courts at 3 persons/ trailer	per trailer	300	0.6	0.6	24
Restaurants	per seat	50	0.2	0.2	16
Interstate or through highway restaurants	per seat	180	0.7	0.7	16
Interstate rest areas	per person	5	0.01	0.01	24
Service stations	per vehicle serviced	10	0.01	0.01	16
Factories	per person per 8-hr shift	15-35	0.03-0.07	0.03-0.07	Operating Period
Shopping centers	per 1,000 sq ft of ultimate floor space	200-300	0.01	0.01	12
Hospitals	per bed	300	0.6	0.6	24
Nursing homes	per bed	200	0.3	0.3	24
Homes for the aged	per bed	100	0.2	0.2	24
Doctor's office in medical center	per 1,000 sq ft	500	0.1	0.1	12
Laundromats, 9 to 12 machines	per machine	500	0.3	0.3	16
Community colleges	per student and faculty	15	0.03	0.03	12
Swimming pools	per swimmer	10	0.001	0.001	12
Theaters, drive-in type	per car	5	0.01	0.01	4
Theaters, auditorium type	per seat	5	0.01	0.01	12
Picnic areas	per person	5	0.01	0.01	12
Resort camps, day & night, with limited plumbing	per campsite	50	0.05	0.05	24
Luxury camps with flush toilets	per campsite	100	0.1	0.1	24

*Includes normal infiltration

7.11 Mainline-Gravity

A. Size: Sewer mains shall be sized for the ultimate development of the tributary area. Nothing shall preclude the City from requiring the installation of a larger sized main if the City determines a larger size is needed to meet the requirements for future service.

The minimum size for submains and mains shall be eight inch inside diameter. The minimum size for a lateral shall be six inches.

The design is subject to all other design requirements as noted in this Chapter.

B. Material. Sewer main shall be PVC, ASTM D 3034, SDR 35 or ASTM F 789 with joints and rubber gaskets conforming to ASTM D 3212 and ASTM F 477.

C. Depth. Gravity sewer will typically have a minimum ~~depth~~ cover of 2 1/2 feet with minimum slope dependent upon the line size, adequate head room within manholes for maintenance personnel and vertical clearance between water and sewer lines. Actual depth will be determined by slope, flow, velocity and elevation of existing system.

D. All building sewer connections to the main shall be made with a tee connection. All new mains connecting to existing mains shall require the installation of a new manhole if not made at an existing manhole.

7.12 Connection to Existing System

A. Connection of new pipe lines to existing manholes shall be accomplished by using provided knock-outs. Where knock-outs are not available, the manhole shall be core drilled for connection. The transition of connecting channels shall be constructed so as not to interrupt existing flow patterns.

B. Connection of a pipe line to a system where a manhole is not available shall be accomplished by pouring concrete base and setting manhole sections. The existing pipe shall not be cut into until approval is received from the City.

C. Connections to manholes requiring a drop shall follow the criteria as outlined in the "Drops" section later in this chapter.

D. Connections where an existing stub out is not available or where a new building sewer is the same size as the existing main shall be accomplished by the installation of a new manhole. Deviations to this may be approved by the Director of Public Works.

E. Taps shall not protrude into the exiting main. A City inspector shall be notified 48 hours prior to any tap of a City sewer.

7.13 Manholes

Precast manholes shall meet the requirements of ASTM C 478 with either a precast base or a cast-in-place base made from 3000 psi structural concrete. Manholes shall be Type 1, 48 inch diameter minimum. The minimum clear opening in the manhole frame shall be 24 inches. Joints shall be rubber gasketed conforming to ASTM C 443 and shall be grouted from the inside. Lift holes shall be grouted from the outside and inside of the manhole. Manholes constructed of other materials may be approved by the Director of Public Works. Material specifications need to be submitted for review before an alternate material will be considered. See SW-1 through 3 for details.

Eccentric manhole cone shall be offset so as not to be located in the tire track of a traveled lane.

Manhole frames and covers shall be cast iron casting marked "Sewer" conforming to the requirements of ASTM A-30, Class 25, and shall be free of porosity, shrink cavities, cold shuts or cracks, or any surface defects which would impair serviceability. Repairs of defects by welding or by the use of smooth-on or similar material will not be permitted. Manhole rings and covers shall be machine-finished or ground-on seating surfaces so as to assure non-rocking fit in any position and interchangeability.

Where lock-type castings are called for, the casting device shall be such that the cover may be readily released from the ring and all movable parts shall be made of non-corrosive materials and otherwise arranged to avoid possible binding.

All casting shall be coated with a bituminous coating prior to delivery to the job site.

Safety steps shall be fabricated of polypropylene conforming to an ASTM D-4101 specification, injection molded around a 1/2 inch ASTM A-615 grade 60 steel reinforcing bar with anti-slip tread. Steps shall project uniformly from the inside wall of the manhole. Steps shall be installed to form a continuous vertical ladder with rungs equally spaced on 12 inch centers.

Gravity sewers shall be designed with straight alignment between manholes.

Manholes shall be provided at a maximum of 300 foot intervals, at intersections, and at changes in direction, grade or pipe size.

Minimum slope through the manhole shall be 1/10th of one foot from invert in to invert out.

Manhole Sizing shall be determined by the following criteria:

A. 48" Manhole

1. Two connecting pipes, 8 inch to 12 inch diameter

2. Three connecting pipes, 8 inch to 10 inch diameter, perpendicular

3. Four connecting pipes, 8 inch diameter, perpendicular

B. 54" Manhole

1. Two connecting pipes, 8 inch to 12 inch with more than 45 degree deflection

2. Three connecting pipes, 10 inch to 12 inch diameter, perpendicular

3. Four connecting pipes, 10 inch to 12 inch diameter, perpendicular

C. 72" Manhole

1. Two connecting pipes, 15 inch to 18 inch diameter with less than 45 degree deflection

2. Three connecting pipes, 15 inch diameter, perpendicular

3. Four connecting pipes, 15 inch diameter, perpendicular

In the above criteria "deflection" refers to the angle between any two pipe channels in the manhole.

For other pipe configurations, the size of the manhole shall be approved by the City.

The above configurations will provide adequate shelves and room for maintenance.

7.14 Slope

All sewers shall be designed and constructed to give mean velocities, when flowing full, of not less than 2.0 feet per second based on Mannings formula using an "n" valve of 0.013. Use of other practical "n" values may be permitted by the City if deemed justifiable on the basis of research or field data submitted. The following minimum slopes should be provided, however, slopes greater than these are desirable.

Sewer Size (Inches)	Minimum % Slope % (Feet per 100')
6	1.00 (0.0100 Ft/Ft)
8	0.40 (0.0040 Ft/Ft)
10	0.28 (0.0028 Ft/Ft)
12	0.22 (0.0022 Ft/Ft)
14	0.17 (0.0017 Ft/Ft)
15	0.15 (0.0015 Ft/Ft)
16	0.14 (0.0014 Ft/Ft)
18	0.12 (0.0012 Ft/Ft)
21	0.10 (0.0010 Ft/Ft)
24	0.08 (0.0008 Ft/Ft)
27	0.07 (0.0007 Ft/Ft)
30	0.06 (0.0006 Ft/Ft)
36	0.05 (0.0005 Ft/Ft)

Sewers shall be laid with uniform slope between manholes.

7.15 Increasing Size

Manholes shall be provided where pipe size changes occur.

Where a smaller sewer joins a larger one, the invert of the larger sewer should be lowered sufficiently to maintain the same energy gradient.

7.16 High Velocity Protection

Where velocities greater than 15 feet per second are expected, special provisions such as thrust blocking and restrained piping materials_shall be installed to protect against displacement by erosion and shock.

7.17 Drops

Straight grades between invert out of last manhole and connection to existing are preferred over drop connections whenever possible. Care must be taken when designing steep grades or sweeps so as not to create a situation of excessive velocity or excavation. Grade changes associated with "sweeps" shall not be allowed unless otherwise approved by the Director of Public Works.

An outside drop connection shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches, the invert shall be filleted to prevent solids deposition.

An inside drop connection will not be allowed by the City unless otherwise approved by the Director of Public Works.

Outside drop structures shall be constructed with ASTM D-3034, SDR35 PVC or epoxy lined ductile iron pipe Class 52 and epoxy lined cast iron fillings. The entire drop connection shall be encased in concrete.

Outside drop structures shall be constructed per drawing number SW-4.

7.18 Cleanouts

Cleanouts are not an acceptable substitute for manholes, however, they may be used in lieu of manholes at the end of 8 inch diameter lines of not more than 150 feet in length. This does not include a 6 inch building sewer to serve one or two single family dwellings. Location of cleanout for building sewer is governed by the Uniform Plumbing Code as adopted.

There will be a cleanout at the property line for all side sewer laterals, with similar diameter to the size of the lateral in the right-of-way. The unit will be at the finish ground grade but no higher than 12 inches above ground. See detail SW-5.

7.19 Building/Side Sewer

A building or side sewer refers to the extension from a building sewer beginning two feet outside the outer foundation wall at the structure to the sanitary sewer main or to a cleanout located at the right-of-way or easement line. Building sewers from the main to the right-of-way line shall be minimum 4 inch diameter. Maintenance of the building sewer is the responsibility of the property owner. Prior to connection of a building sewer to the public sewer a connection permit must be obtained from the City. Materials and design criteria for a building sewer are covered by the Uniform Plumbing Code (UPC) as adopted. Inspection of the building sewer is the responsibility of the Development Services Division.

LIFT STATIONS

7.20 General

All lift stations will be designed to serve the appropriate basin as identified in the Tumwater "Comprehensive Sanitary Sewer Plan".

7.21 Design Standards

The design of any lift station shall conform to City standards and the Department of Ecology's "Criteria of Sewage Works Design" and the "Ten State Standards". In addition, the plans shall include the following:

1. An overall site drawing of the lift station showing the location of all components including elevations;

2. Service size, voltage and enclosure type and location in relation to the pump station;

3. A list of specific materials used including quantity description and manufacturer name;

4. A schematic and line diagram of the service and motor control center and lift stations;

5. The electrical shall be designed to meet state and local electrical code requirements;

6. The plans shall show all applicable telemetry installation with schematics; and

7. An operation and maintenance manual from the lift station manufacturer shall be supplied.

8. A lift station emergency by-pass connection shall be installed.

A design report shall be submitted with each lift station demonstration its conformance with the standards as outlined above and shall address the following items:

Pump Data
- Size and type (no variable speed pumps allowed)
- horsepower
- pump curves
- head capacity
- velocity

Motor	- size and type - cycle length - type of mount
Controls	- type
Telemetry	- alarm system (must be compatible with City system)
Housing	- size and type - ventilation - humidity control - interior lighting - access
Auxiliary Power	- provision for connection required of all lift stations and may be required to furnish auxiliary generator at the direction of the City
Well Sizing	- type. - storage capacity
Maintenance	- warranty - tools and equipment required
Electrical Service	- size and type - source
Corrosion Protection	- type of materials - coatings - linings - maintenance
Site Layout	- location of lift station on property
Testing	- operational - pressure
Piping and Valves	- Size and type - Bypass

PRESSURE SEWER (FORCE MAIN)

7.22 General

Low pressure systems, i.e., force mains may be considered for situations where high ground water table or topography make gravity sewer impractical. STEP systems are addressed separately later in this chapter.

7.23 Design Standards

The design of any sewer extension/ connection shall conform to City standards, Department of Ecology's "Criteria of Sewage Works Design". and any applicable standards as set forth herein.

The layout of extensions shall provide for the future continuation of the existing system as determined by the City. In addition, main extensions shall be extended to and through the site of the affected property fronting the main.

The system shall be designed at full depth of flow on the basis of an average daily per capita flow as shown on the table (DOE Criteria for Sewage Works Design) following Section 6.10. A friction factor of 0.013 shall be used for Mannings "n" value.

New sewer systems shall be designed by methods in conjunction with the basis of per capita flow rates. Methods shall include the use of peaking factors for the contributing area, allowances for future commercial and industrial areas, and modification of per capita flow rates based on specific data. Documentation of the alternative method used shall be provided along with plans.

The applicable City of Tumwater General Notes shall be included on any plans dealing with pressure sanitary sewer design.

7.24 Force Main

A. Material. Force mains for sizes up to 12 inches shall be ductile iron AWWA Cl51 Class 50 or PVC C900 with ductile iron fittings and gasketed joints. For 14 to 24 inch mains, pipe shall be ductile iron AWWA C151 Class 50 or PVC C905 with ductile iron fittings and gasketed joints. A more rigid pipe may be required where unlimited trench widths occur. All ductile iron pipe and fittings shall be epoxy coated or PE lined and designed for use with corrosive materials.

B. Depth. Force mains shall have a minimum 36 inches of cover to top of pipe. See Chapter 5 for sanitary sewer/water main crossing requirements.

C. Velocity. The minimum velocity allowed is 2 feet per second (fps) at average Dry Weather Flow. 2 fps is required to maintain solids in suspension although 3 fps is desired to scour settled solids. Maximum velocity allowed shall be 8 fps.

7.25 Surge Protection

PVC is subject to fatigue failure due to cyclic surge pressures. The pressure sewer shall be constructed to minimize rapid changes in velocities and include a properly sized surge tank.

7.26 Air/Vacuum Valves

Air release valves and air/vacuum valves shall be located at the high points of the line within a standard 48 inch manhole or a comparable sized, approved vault. Air release valves shall be fitted with an activated carbon canister to absorb compounds with disagreeable odors prior to releasing the air to the surrounding area. Grades shall be designed to minimize the need for air/vacuum valves when practical. Vehicular access to valve is required for maintenance.

7.27 Force Main Drain

Provisions to drain a force main to facilitate repairs or to temporarily remove a force main from service shall be provided. This may be accomplished through the use of a valved tee connected to a drain line at the low point of the line. A manhole shall be set over the force main at the valved tee.

7.28 Thrust Blocking

Location of thrust blocking shall be shown on plans. Thrust block concrete shall be Class B poured against undisturbed earth. A plastic barrier shall be placed between all thrust blocks and fittings.

Designed and approved restraining joint systems may be allowed in lieu of thrust blocking. Restraining joint brand, type, and size shall be specified on the plans.

7.29 Force Main Termination

Hydrogen sulfide odors (H_2S) and the buildup of sulfuric acid (H_2SO_4) occur in the operation of a force main. To mitigate these conditions, some type of control method(s) shall be used. This may include chemical addition at the pump station and/or the re-aeration of the waste water at or near the terminus. Re-aeration may include the following:

1. Construction of a vault housing an aspiration assembly.

2. The use of hydraulic fall (vertical siphon) within the terminal manhole.

3. High velocity discharge with smooth transition so as not to cause splashing of force main into the down stream gravity sewer.

These methods would all require an adequate source of fresh air at the vault or manhole. At a minimum, the manhole at the terminus and the first manhole downstream of the terminus shall be coated with Tnemic 120 vinyl ester, quantum polymorphic resin or approved equal which is resistant to sulfuric acid and hydrogen sulfide.

7.30 Manhole/Vault Access

All manholes and vaults are required to have a paved access a minimum width of 12 feet.

SANITARY TREATMENT EFFLUENT PUMP (STEP) STANDARDS - GENERAL SPECIFICATIONS

Only in areas where specifically identified and approved by the City of Tumwater through the City of Tumwater Comprehensive Sanitary Sewer Plan, and/or the Thurston County General Sewage Plan as appropriate, pressure sewer systems may be permanently installed to serve residential and light commercial locations where conventional gravity sewers are impractical, or for reasons of topography are not feasible or would be difficult to maintain because of limited accessibility. Extension of gravity sewer lines may be required if areas upstream of project have been designated for gravity sewer service.

7.31 Description and Scope

A pressure sewer system is a permanent facility consisting of a tank or tanks for settling and digesting wastewater solids, and a pressure piping system for conveying the supernatant liquid into the gravity sewer system. The pressure piping system may be "gravity" where topography allows, but normally will be pumped.

Where pumped, the system shall include a pump and pump control panel. The control panel is to be mounted within view of the tank, preferably on the building wall. House plumbing shall discharge sanitary wastewater only into the minimum 1000-gallon concrete single compartment septic tank containing the pump. Roof drains and other stormwater sources shall be strictly excluded.

House plumbing shall be designed and installed according to current city codes. The tank, one-inch service connection and related components shall be per these technical specifications and shall be warranted by manufacturer and contractor for a minimum of 12 months (24 months minimum for tank) after acceptance of installation by the City of Tumwater.

7.32 Ownership and Operation

Operation and maintenance of the service lateral, tank, pump, and pump controls shall be the responsibility of the City and will be owned by the City.

Power shall be provided by the customer. The customer shall be responsible for notifying the City when the control panel alarm buzzer is activated. All drains and plumbing between the tank and the building shall be the private responsibility of the customer. Each settling tank shall contain a minimum free-board reserve of 200 gallons, allowing City forces to respond to alarms during regular working hours. The customer shall be responsible for curtailing water usage until City forces respond to the customer's call and service the

tank or equipment on the next normal working day. The City will accept no responsibility for damages or pay any claims resulting from a plumbing backup, such as may occur if water usage is not curtailed during an alarm condition. Normal water use may be safely resumed only after the red alarm light on the control panel is off.

Tanks should be pumped out as required. Pumping and disposal of the pumped material shall be in accordance with County Health Department rules. Solids pumpout and disposal shall be the responsibility of the City.

7.33 Safety

The control panel will be sealed by the City to prevent exposure to electrical hazard. The riser lid shall not be covered.

The customer shall be cautioned that the tank is not designed to be driven over, and might collapse under the weight of a vehicle. Where final grading, landscaping, or other work could subject the tank top to excessive loading, the engineer shall be responsible for specifying a safe tank top strength. If a traffic bearing tank is required, it shall be the responsibility of the customer to submit a satisfactory design by a Registered Professional Engineer qualified in Structural Design for City review and approval.

The City will perform any tapping required of existing sewers for service connections. The customer should schedule for the tap when permit application is made.

7.34 Required Dedications

Easements shall be required for all publicly owned components on private property.

7.35 Design

Plumbing between building and tank shall be designed in accordance with the Uniform Plumbing Code, and approved by the Development Services Division.

7.36 Construction Checklist

The Construction Checklist for Pressure Sewer Systems shall be initialed by the appropriate inspector, and submitted with the asbuilt drawing required for final approval and acceptance by the City.

STEP STANDARDS - MECHANICAL AND ELECTRICAL SPECIFICATIONS

The following specifications describe the type and standard of quality acceptable and approved for pressure sewer on-site installation and components. Where the name of a specific manufacturer or model is listed, the intention is to indicate the minimum acceptable quality, and not to exclude other products which equal or surpass the reference item, provided that alternate parts are interchangeable with those specified.

It is necessary to obtain prior written approval for installation of alternate components prior to ordering materials. Alternate components installed without specific approval will be rejected. All judgments regarding the interchangeability and acceptability to the City of alternate materials and components shall be made solely on the authority of the City of Tumwater.

7.37 Pipe

All service connection pipe shall be one inch, minimum Schedule 40 PVC, solvent weld joint. Larger pipe shall be two inches, minimum PVC complying with S\ASTM D 1784 (PVC Resin Compound), ASTM 2241, SDR 21, 200 psi working pressure rated. All services shall be installed with solid No. 14 AWG insulated copper toning wire, on top of pipe, continuous. Marking tape shall be placed approximately nine inches above the pipe when the trench is backfilled.

Pipe shall be installed per City Standard Plans (flexible pipe bedding detail and trench backfilling and resurfacing). PVC pipe with solvent weld joints that may be subject to thermal contraction shall be snaked in trench.

7.38 Joints

Rubber ring gaskets shall comply with ASTM D-l869 and D-3l39 specifications and shall be supplied by the pipe or fitting manufacturer. Lubricant shall be water soluble, non-toxic, non-supportive of bacterial growth, and have no deteriorating effect on the PVC or gasket.

Solvent cements and primer for joining PVC pipe and fittings shall comply with ASTM D-2564 and be as recommended by the pipe and fitting manufacturers.

7.39 Fittings

Pipe fittings shall have minimum working-pressure ratings equal to the pipe with which they are connected. All fittings shall be PVC 1120, rubber joint complying with ASTM D-1784, D-2466, or D-2467, for pipe larger than one inch I.D. unless otherwise noted on engineering drawings.

7.40 Valves

All one-inch valves shall be PVC ball valves with pre-loaded EPDM stem seals, micro-finished PVC ball and self-adjusting polyethylene ball seat to compensate for wear and prevent over-tightening. It shall be designed for use with corrosive fluids, for low torque manual operation, and for a working pressure of 150 psi. The valve shall be Model No. LT-l000-S, as manufactured by KBI (King Brothers Industries), or equal.

Two-inch and larger valves shall be cast iron body, resilient seated, gate valves, Mueller or approved equal, epoxy coated or plastic lined, suitable for septic service. Mainline valves shall be located at every cross street (not to exceed 600 feet spacing on runs without intersecting street).

7.41 Check Valves

The check valves used on service lines shall be a tee or wye pattern swing check, PVC. It shall have a working pressure of 150 psi and shall require only 1/2 psi of back pressure for complete closure. It shall be as manufactured by KBI, Model No. KSC-1000-T, or approved equal.

7.42 Septic Tanks

Tanks shall be 1,000-gallon minimum concrete, pre-cast concrete or fiberglass, single chamber, and shall have been designed by a Registered Professional Engineer qualified in Structural Design. All tanks shall be constructed for acceptance of pump assemblies or effluent filters and have pre-cast groove to allow positive attachment of the riser. The manufacturer/designer shall provide the structural design and certification to the City for review. The design or analysis shall be in accordance with accepted engineering practice. Tanks shall be designed for the following loading conditions:

A. Top of tank 400 lbs. per square foot.

B. The tank shall be designed to support an additional minimum 2,500 lb. wheel load.

C. The tank shall be designed to withstand hydrostatic loading equal to the maximum depth of bury, in addition to the soil loading. Maximum depth of bury shall be measured from the ground elevation to the invert of the sewer line entering the tank.

Unusual installations, if required by local conditions, will require special design consideration, as will tanks located where a vehicle might be driven over them.

All tanks shall be guaranteed in writing by the tank manufacturer/contractor for a period of two years from the date of installation on the project. Manufacturer's signed guarantee shall accompany delivery of precast or fiberglass tanks. The tanks shall be installed when the house is being built. The landscaping over and in the immediate area of the tank shall be kept to a minimum to provide easy access to the lid.

7.43 Concrete Tanks

Walls, bottom and top of reinforced-concrete tanks shall be designed using one-way or two-way slab analysis. Stresses in each face of monolithically-constructed tanks may be determined by analyzing the tank cross-section as a continuous fixed frame. The tank, including walls, top slab, and bottom slab shall be poured monolithically; alternatively, waterstops may be provided at the top of the tank.

Reinforcing steel shall be ASTM A-615, Grade 60, fy = 60,000 psi. Details and placement shall be in accordance with ACI 315 and ACI 318.

Concrete material and placement shall meet the requirements of section 6-02 of the Standard Specifications (1988 Standard Specifications for Road, Bridge, and Municipal Construction prepared by Washington State Department of Transportation and the American Public Works Association) with the following modifications:

A. Classification of Structural Concrete - Class of concrete shall be AX (4,000 psi) fc' = 5,000 psi.

B. The concrete mix shall not be modified unless the mix design is reviewed and approved by the City.

C. Tanks shall be protected by applying a heavy cement-base waterproof coating, Thoroseal or approved equal, on both inside and outside surfaces.

D. Tanks shall be constructed and furnished with access openings of the size and configuration shown on the standard plans. Modification of completed or existing tanks will not be permitted, for structural, warranty, and liability reasons. Tanks shall be furnished without concrete access hole lids. In order to demonstrate water tightness, tanks shall be tested prior to acceptance. Each precast tank shall be tested at the factory, by filling with water to the base of the riser and letting stand. After 24 hours, the tank should be refilled to the soffit and the exfiltration rate shall be determined by measuring the water loss during the next two hours. The two-hour loss shall not exceed one gallon.

E. Form release used on tank molds shall be Nox-Crete or equal. Diesel or other petroleum products are not acceptable.

F. Precast tanks shall not be moved from the manufacturing site to the job site until the tank has cured for seven days or has reached two-thirds of the design strength.

G. After the tanks have been set in place and the riser installed, but prior to backfilling, each tank shall be tested by filling the tank to two inches above the base of the riser for a two-hour period. Water loss shall not exceed one gallon.

H. Tanks installed where groundwater levels are above tank bottom require precautions to prevent flotation. In general, tanks shall immediately be filled with water and shall never be pumped down more than three feet below top of tank. In high groundwater locations tanks should be anchored in place to prevent floating.

I. Tank excavation shall be backfilled with select material free of coarse gravel and larger (3/4-inch plus materials) and compacted to a dry density equal to or greater than that of the adjacent, undisturbed soil. Finish grading, cleanup, and restoration shall be completed prior to final acceptance by the City.

7.44 Fiberglass Tanks

The tank shall be constructed with a glass fiber and resin content specified by the manufacturer and with no exposed resin-coated glass fibers. The manufacturer must be approved by Orenco Systems, Inc., 2826 Colonial Road, Roseburg, OR 97470, and by the City of Tumwater, Washington. The manufacturer shall supply to the City, without charge, satisfactory evidence of testing by an approved laboratory showing compliance with IAPMO ICC 3-74, excepting as herein modified. Any metal part shall be 300 series stainless steel.

A. Inspections may be made by the inspector in the supplier's yard, within the plant, upon delivery and again after installation. The wall thickness shall average at least 1/4-inch. When less than 3/16-inch in thickness or if any delamination is suspected within any portion of the tank, the inspector may drill a 1/4 inch diameter hole through the tank wall for inspection purposes. If the required minimum 3/16-inch thickness is not found, repair, if feasible, shall be the responsibility of the contractor. If repair is judged not feasible, the tank shall be rejected. If the required minimum 3/16-inch thickness is found and no delamination is present, the repair shall be the responsibility of the City.

B. Holes specified for the tank shall be provided by the manufacturer. Resin shall be properly applied to all cut or ground edges so that no glass fibers are exposed and all voids are filled.

C. Ty-Seal neoprene gaskets for equal shall be used at the inlet to join the tank wall and the ABS inlet piping. ABS Schedule 40 pipe and fittings shall be used at the inlets.

D. Each tank shall be water tested on the project site after assembly and prior to backfill by the contractor and witnessed by the inspector. Every tank shall be assembled by the contractor and water raised to the brim of the manhole for a minimum of two hours. The tank shall show no leakage from section seams, pinholes, or other imperfection. Any leakage is cause for rejection.

E. When leakage occurs, if the tank is not rejected by the inspector, an additional water test for a minimum of two hours shall be made on the tank after repairs have been completed. The contractor shall be responsible for making all corrective measures in production or assembly necessary to insure a completely watertight tank.

F. After installation (including backfill) of tank (with riser) is completed, each tank shall be filled with water to two inches above the base of the riser for a two-hour period to confirm that there is no leakage. Every tank test shall be witnessed by the inspector.

INSTALLATION AND HANDLING PROCEDURES:

G. Fiberglass septic tanks shall be handled, stored and installed as recommended by the manufacturer.

H. Backfill shall include a minimum six-inch thick envelope of pea gravel completely around the tank.

I. A minimum of 1 1/4 cubic yards of concrete per 1,000 gallons of tank capacity shall be placed above the gravel envelope over the tank--located between the riser ports. A layer of six mil plastic shall be placed between the concrete and the gravel to prevent bonding. The concrete cap shall be rough formed into sections not to exceed 10 cubic feet and include enough reinforcing steel placed to provide handles for the removal of the individual sections.

7.45 Tank Risers

Inlet and outlet risers shall be fiberglass or ribbed PVC as manufactured by Orenco Systems, Inc., 2826 Colonial Road, Roseburg, OR 97470, or equal. Outlet risers shall be a minimum of 18 inches high or as otherwise shown on the engineering drawings, and have a minimum nominal diameter of 24 inches. Outlet risers shall be factory equipped with the following:

A. One l-inch or 1 l/4-inch diameter neoprene grommet for the pump discharge, installed no less than 8 inches or more than 15 inches from the top of the riser.

B. A PVC splice box, with 4 cord grips and 1 inch outlet fitting, Mode I No. SB4l, or equal, shall be mounted within 15 inches of the top of the riser.

A lid shall be furnished with each riser. It shall be bolted to the riser and shall be constructed of fiberglass with an aggregate finish.

Each riser shall be bonded to the top of the concrete tank with a two-part epoxy that shall be supplied with the riser by the manufacturer. The epoxy shall be applied in accordance with the manufacturers recommendations. A generous bead of epoxy shall be laid completely around the bottom of the riser prior to mounting the riser on the top of the tank. After the riser is in place, a generous fillet shall be run completely around the inside base. The epoxy shall be allowed to be based on manufacturer's recommendations, before backfill is placed over tanks. Care shall be exercised during the curing period to avoid dislodging the riser or disrupting the water-tight seal between the riser and tank.

Where riser depth exceeds 36 inches over the top of the tank, a 48-inch diameter manhole will be placed to allow servicing of the fiberglass riser and attachments.

7.46 Gravity Discharge Tank Equipment

Gravity discharge tanks shall be equipped with ORENCO SYSTEMS Model F-1248 Effluent Filter, or equal, installed in conformance with the standard plans and composed of the following components:

A. PVC vault, 12-inch diameter by 48-inch depth with eight 1-3/8 inch diameter inlet holes, polyethylene effluent screen, l-l/4-inch diameter PVC intrusion pipe with overflow screen on top.

B. 1 l/4-inch diameter PVC discharge fitting with seep ring.

C. 1 l/4-inch diameter PVC 90-degree elbow for mounting on the bottom of the vault.

D. 1 1/4-inch diameter flexible PVC hose, a minimum of 60 inches in length, with quick-disconnect fittings on vault end.

7.47 Effluent Pumping Tank Equipment

Pumps shall be listed for use in effluent. All pumping systems shall be ORENCO SYSTEMS Model) SI S 4000 Series High Head Pumping Assemblies, or equal, composed of:

A. Standard Vault: PVC Vault and Flow Inducer, Model No. SV 1548F1, or equal, with eight 1 3/8-inch diameter inlet holes.

B. Hose and Valve Assembly includes one-inch diameter flexible PVC hose with quick- disconnect fittings and PVC ball valve. Model No. HV 100 B, or equal.

C. Mercury Switch Float Assembly, Model MF-ABR, or equal, with three mercury floats mounted on a PVC stem which attaches to vault.

D. Pump: OSI High-Head, 1/3 hp or 1/2 hp, 110CV, signal phase Model 8 OSI 03 HH or 8 OSI 05 HH, or equal, with 8-foot cord and 1/8-inch bypass orifice for effluent application, or approved equivalent.

All pumping systems shall be installed in accordance with the manufacturer's recommendations.

7.48 Controls and Alarms

Positions on the PVC float assembly are to be set at the following levels: Alarm set at 9 inches below top, "on" at 3 1/2 inches below "on" and low water/redundant off set 3 1/2 inches below "off".

Control panels shall be ORENCO SYSTEMS Model A-l or equal, with the following features:

A. Audible alarm, panel mount with a minimum of 80 db sound pressure at 24 inches.

B. Oil-tight visual alarm with push-to-silence feature.

C. Automatic audio-alarm reset.

D. 15 amp motor rated toggle switch, single- pole, double-throw with three positions: manual (MAN), automatic (AUTO) and center (OFF).

E. NEMA 4X-rated fiberglass enclosure with gasketed, hinged cover, and locking latch. Seal will be installed by City at time of City's acceptance of the completed installation, and shall signify final acceptance.

F. Alarm circuit shall be wired separately from the pump, so that if the internal Pump overload switch is tripped, the alarm will still function.

G. 20-amp power isolation switch to de-energize entire control panel, to permit servicing panel without access to the customer's breaker switches. The pump control panel shall be mounted on the side of the house nearest the tank and pump, within sight of the pump and visible from the vehicular access point for the house.

H. Wiring from panel to splice box shall be conduit-encased with a 3/4" EY conduit seal at the riser, below the control panel, minimum 18 inches burial, color stranded wire of a size and type per code. There shall be a dedicated circuit breaker serving the pump control panel.

I. Hour meter and event counter base area must be included so the meter and counter may be moved from one installation to another.

7.49 Valve and Service Connection Boxes

A service valve box shall be placed over each ball and check valve in each service line. Check valve shall be located upstream of ball valve in each service valve box.

All service connect boxes shall be manufactured by Carson Industries, Inc., Model No. 1419, or equal, with hinged cover and 1419 E extension box as required, or approved equal. These boxes shall have a bolt-down cover.

7.50 Acceptance Testing

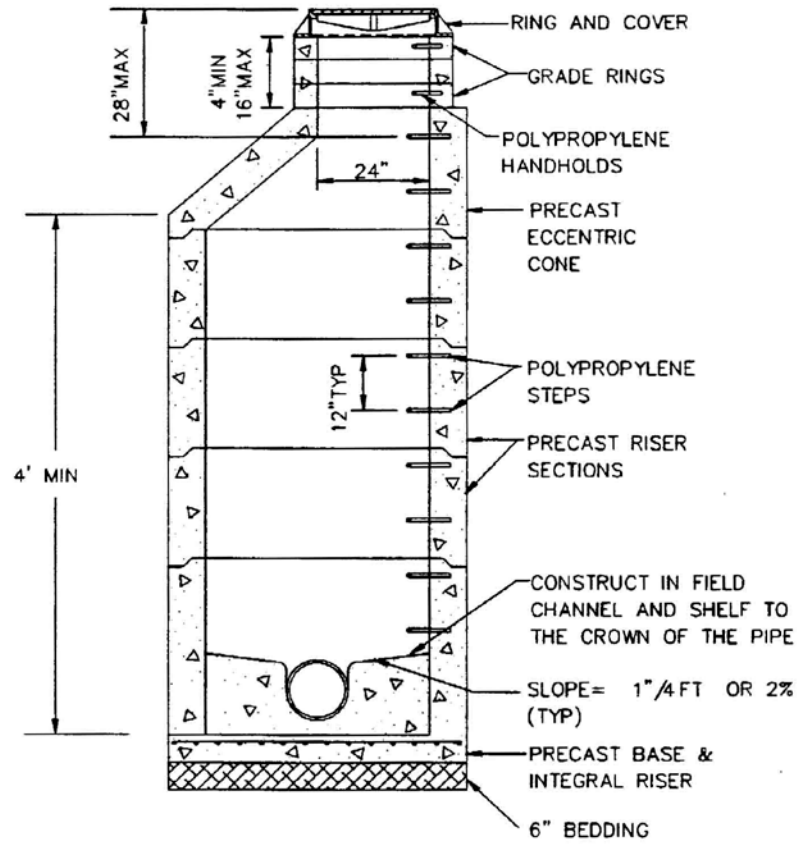
All pressure pipe shall be hydrostatically tested to 100 psi.

Service-line piping shall be tested prior to backfilling by pumping against the closed ball valve in the service box with a hand pump or other acceptable method. No leakage will be accepted. The pump shall be connected to the discharge line at the PVC union in the hose and valve assembly. The union in the service box shall be loosened to allow the trapped air to escape and then be re-tightened to begin the test.

Gravity service lines shall be tested for leakage by plugging the air vent in the riser, removing the effluent filter from the vault and placing it on the ground beside the riser, and disconnecting the fitting at the bottom of the vault. A proper fitting shall be attached to the flexible outlet hose to allow testing by pumping against the closed ball valve in the service box with a hand pump or other acceptable method. The union in the service box shall be loosened to allow the trapped air to escape and then be retightened to begin the test. No leakage will be accepted.

Water for acceptance testing of tanks and service lines shall be supplied by the customer or contractor.

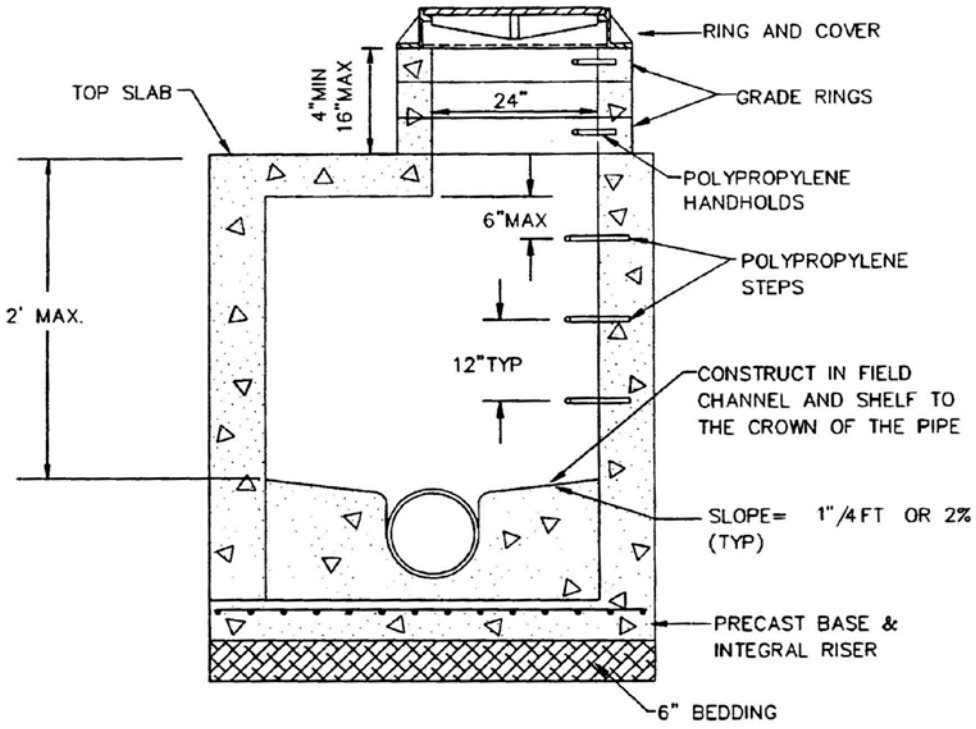
CHAPTER 7 - SANITARY SEWER
LIST OF DRAWINGS



NOTES:

1. PRECAST MANHOLES SHALL MEET THE REQUIREMENTS OF ASTM C478. JOINTS SHALL BE RUBBER GASKETED CONFORMING TO ASTM C443 AND SHALL BE GROUTED FROM THE INSIDE. LIFT HOLES SHALL BE GROUTED FROM THE OUTSIDE AND INSIDE OF THE MANHOLE.
2. STEPS IN MANHOLE SHALL HAVE 6" MINIMUM CLEARANCE. HANDHOLES IN ADJUSTMENT SECTION SHALL HAVE 3" MINIMUM CLEARANCE THE FIRST STEP OR HANDHOLD SHALL BE A MAXIMUM OF 12" FROM THE TOP OF THE COVER.
3. PRECAST BASES SHALL BE FURNISHED WITH CUTOUTS OR KNOCKOUTS. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MINIMUM.
4. CONNECTION TO MANHOLE SHALL BE MADE BY KOR-N-SEAL BOOT, SAND COLLAR OR A-LOCK.
5. SEE DETAIL 7-3 FOR MANHOLE COLLAR INSTALLATION.
6. A SEWER GUARD SHALL BE INSTALLED IN ANY MANHOLE SUBJECT TO FLOODING.

CITY OF TUMWATER	DRAWN BY: SRJ	STD. PLAN NO. SW-01
TYPE 1 MANHOLE	CHECKED BY: JRN	DATE: 05-30-95



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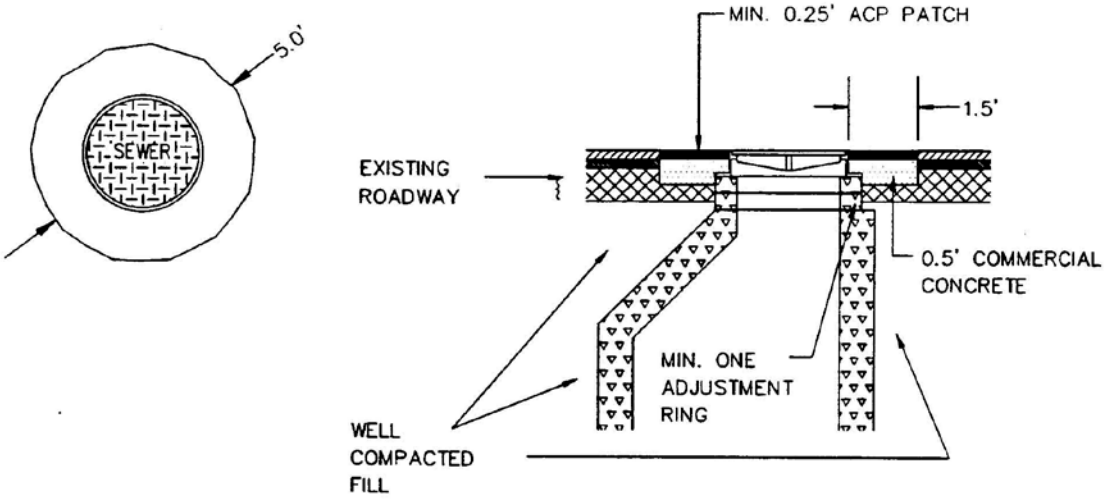
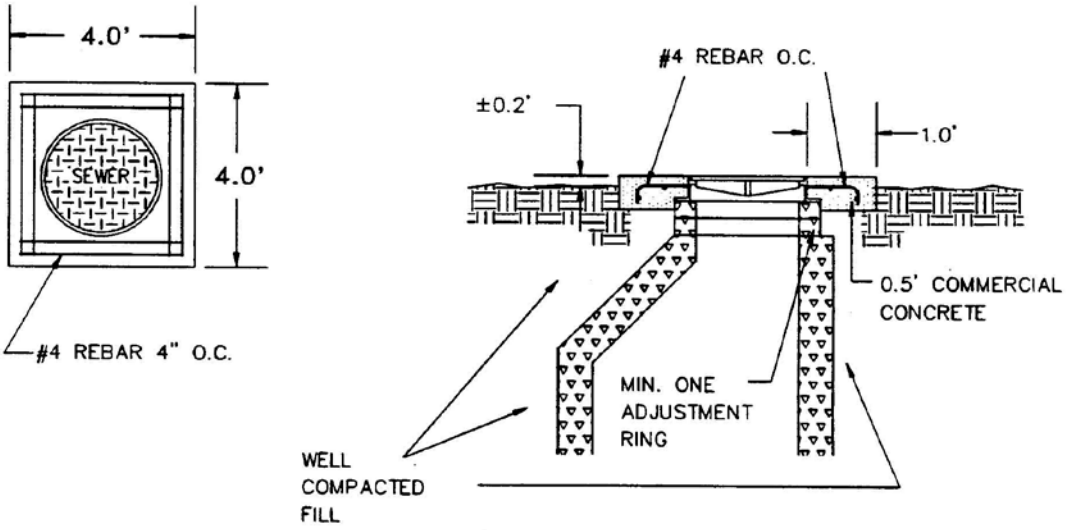
4. CONNECTION TO MANHOLE SHALL BE MADE BY KOR-N-SEAL BOOT, SAND COLLAR OR A-LOCK.
5. SEE DETAIL 7-3 FOR MANHOLE COLLAR INSTALLATION.
6. A SEWER GUARD SHALL BE INSTALLED IN ANY MANHOLE SUBJECT TO FLOODING.

CITY OF TUMWATER	DRAWN BY: SRJ	STD. PLAN NO. SW-02
SHALLOW MANHOLE	CHECKED BY: JRN	DATE: 05-30-95

MANHOLE IN ASPHALT



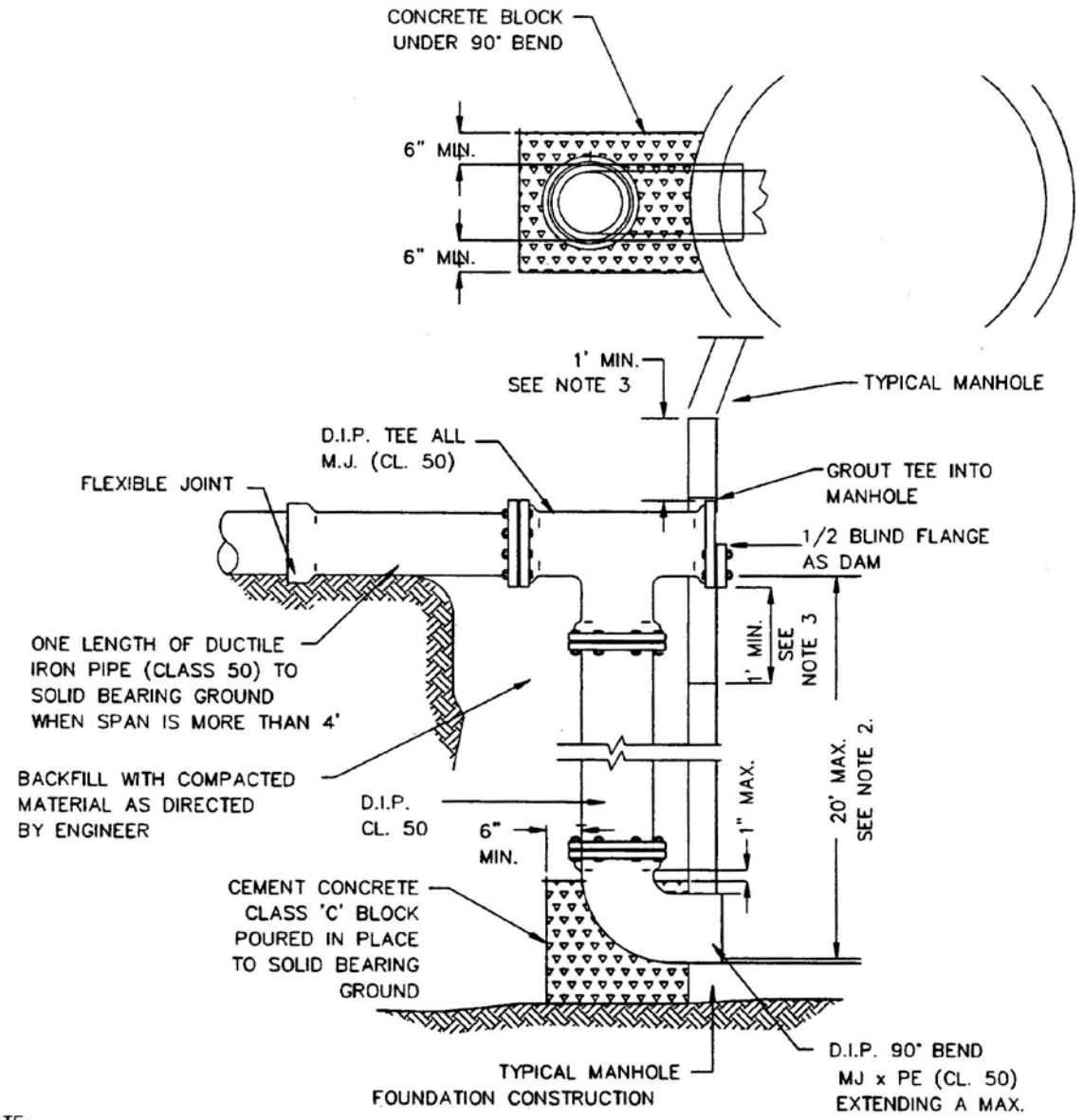
MANHOLE OUTSIDE ASPHALT



NOTE:

1. ON MANHOLE OUTSIDE ASPHALT ADD REINFORCING STEEL AS SHOWN ABOVE. DEFORMED BAR TO MEET ASTM A615 GRADE 60 FY=60,000 P.S.I.

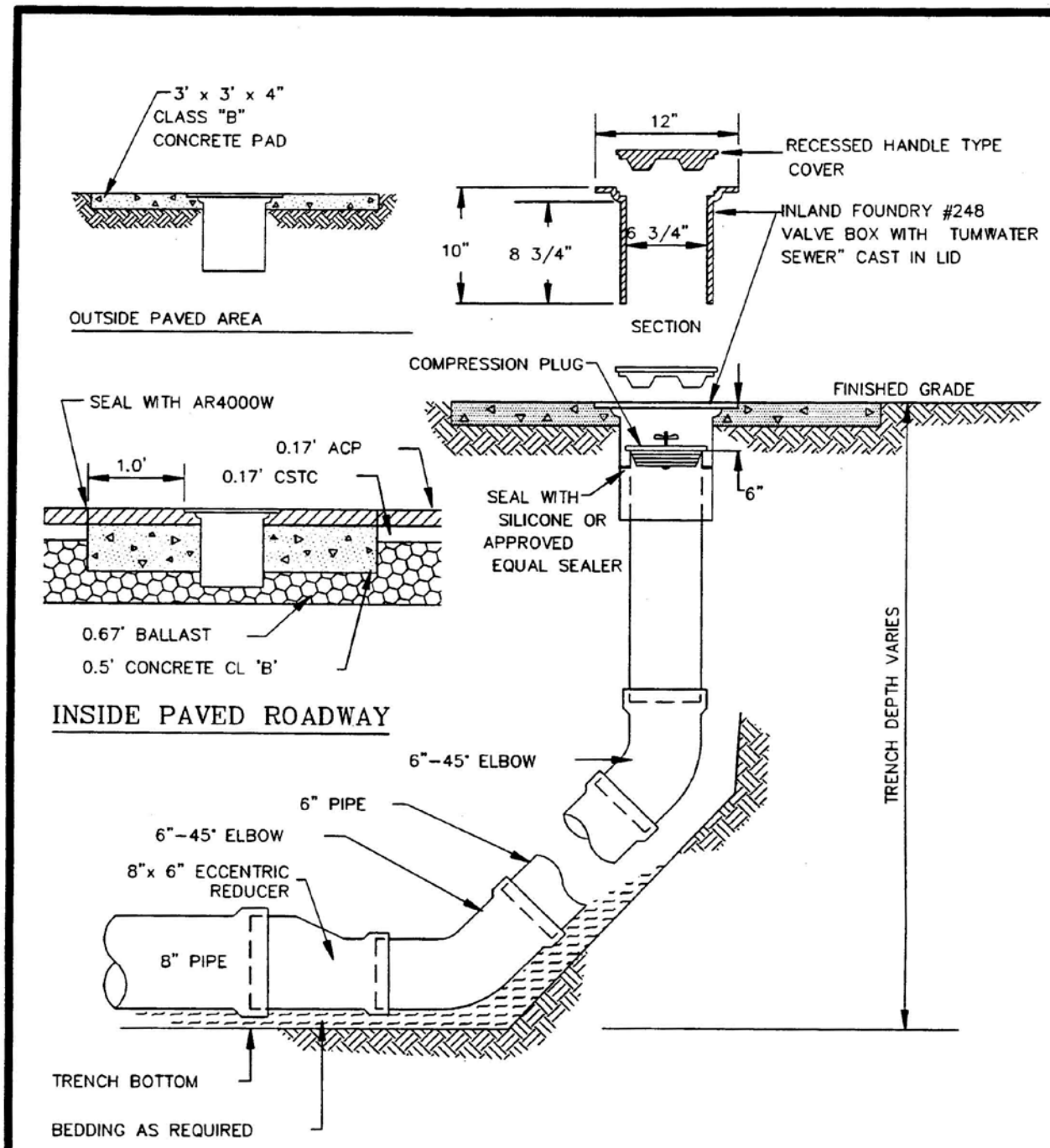
CITY OF TUMWATER	DRAWN BY: SRJ	STD. PLAN NO. SW-03
MANHOLE COLLAR	CHECKED BY: JRN	DATE: 05-30-95



NOTE:

1. THE INTERIOR OF ALL DUCTILE IRON SHALL BE COATED WITH EPOXY OR TNEMEC 66.
2. DEPTHS OVER 20' MAY BE ALLOWED IF MEGA-LUG JOINTS ARE USED.
3. MAINTAIN A MINIMUM OF 1' BETWEEN MANHOLE JOINTS AND TEE.

CITY OF TUMWATER	DRAWN BY: SRJ	STD. PLAN NO. SW-04
DROP CONNECTION	CHECKED BY: JRN	DATE: 05-30-95



NOTE:

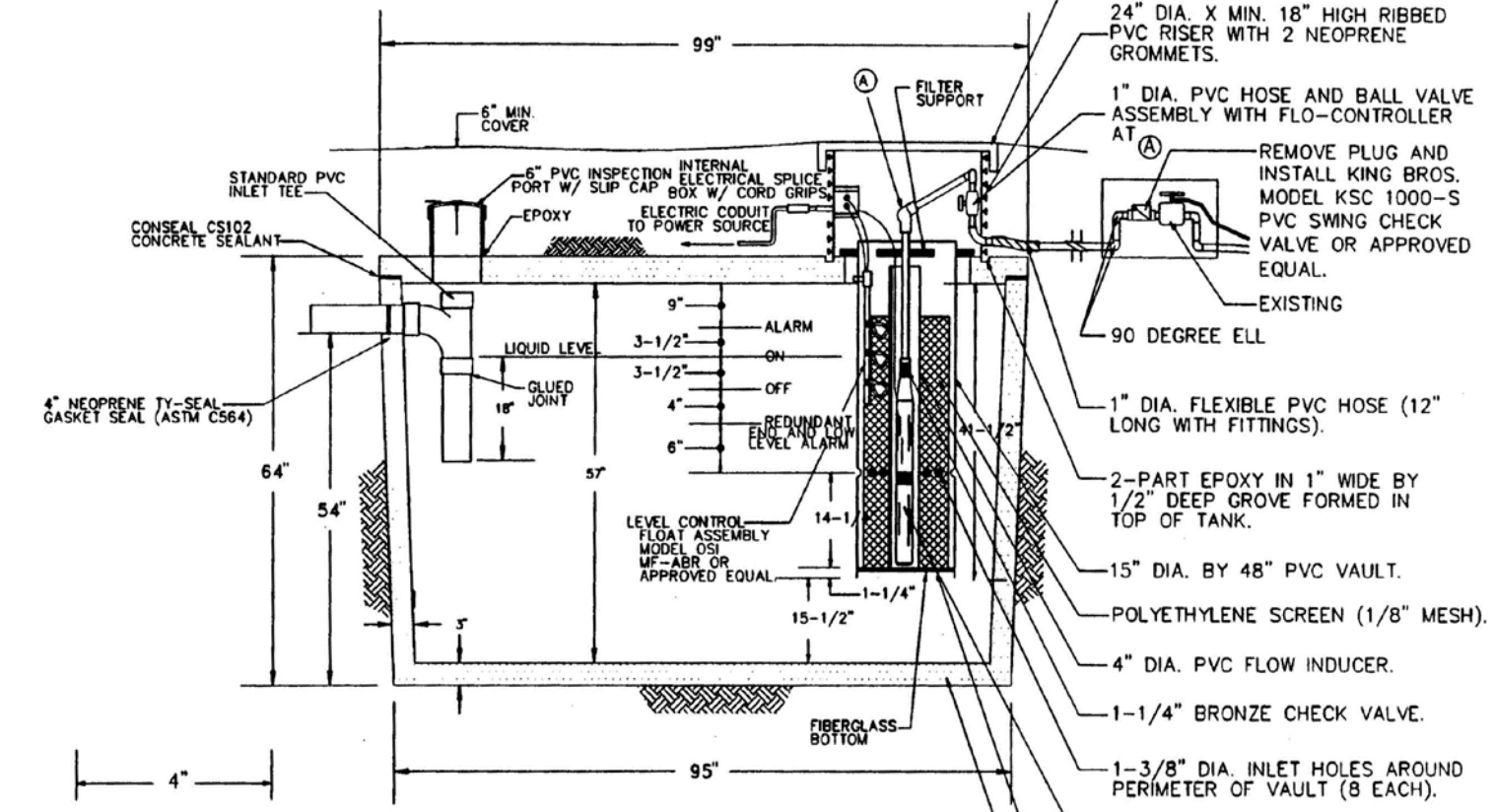
ALL SEWER PIPE SHALL BE ASTM 3034
SDR 35.

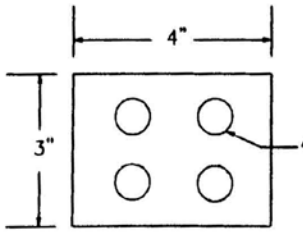
CITY OF TUMWATER	DRAWN BY: SRJ	STD. PLAN NO. SW-05
CLEANOUT	CHECKED BY: JRN	DATE: 05-30-95

CITY OF TUMWATER

1000 GALLON STEP TANK

DRAWN BY:	CHECKED BY:	STD. PLAN NO.
SRJ	JRN	SW-06
DATE: 05-30-95		





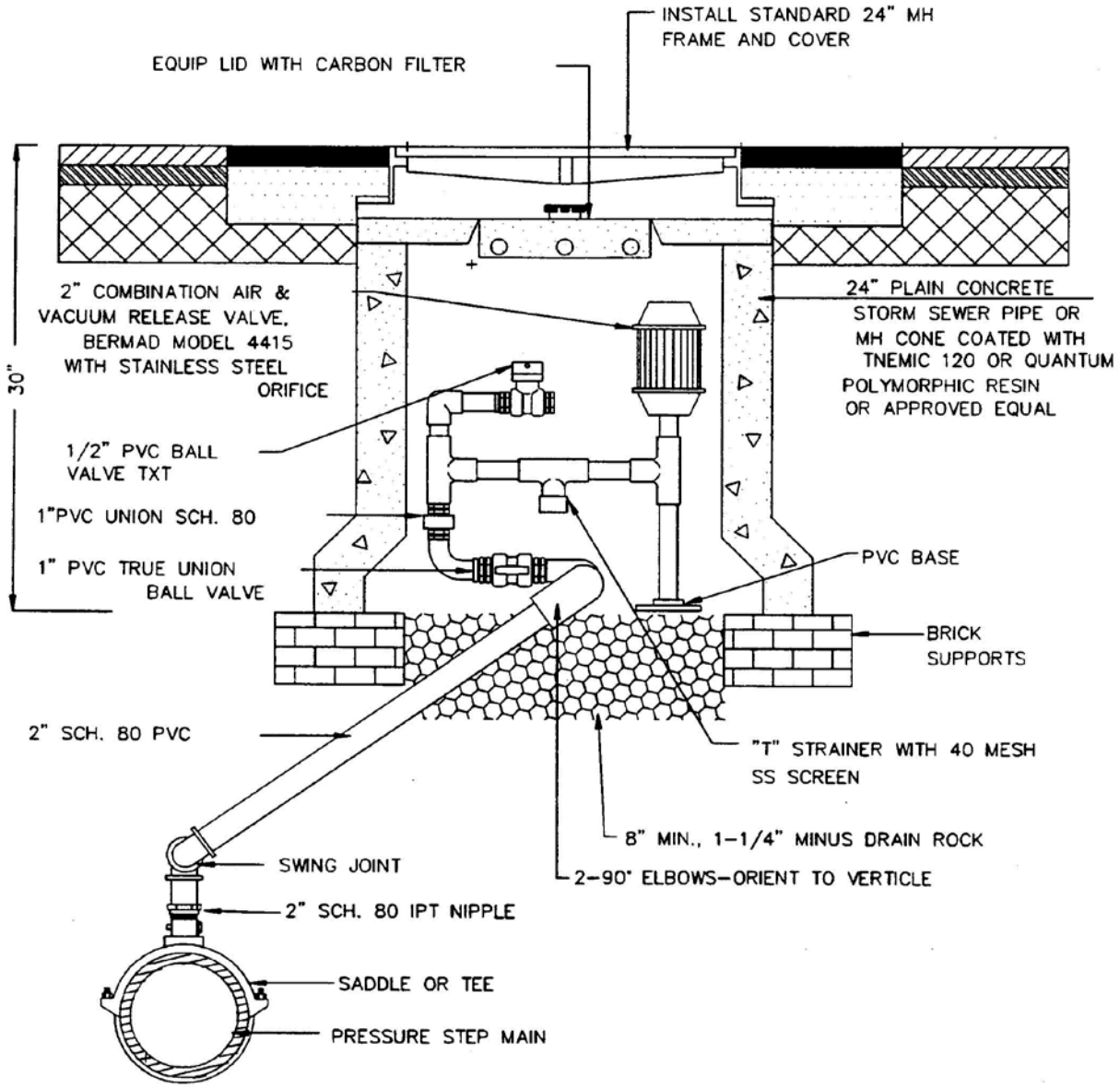
DETAIL A
N.T.S

S.T.E.P.S.

(STEP TANK EFFLUENT PUMP SYSTEM)
SIDE VIEW TYPICAL 1000 GALLON TANK

NOTE:

1. TANK SHALL BE BEDDED ON 6" SAND OR PEA GRAVEL.
2. BACKFILL AGAINST SIDE SHALL BE COMPACTED IN 2" LIFTS TO THE SAME OR GREATER COMPACTION THAN SURROUNDING AREA.



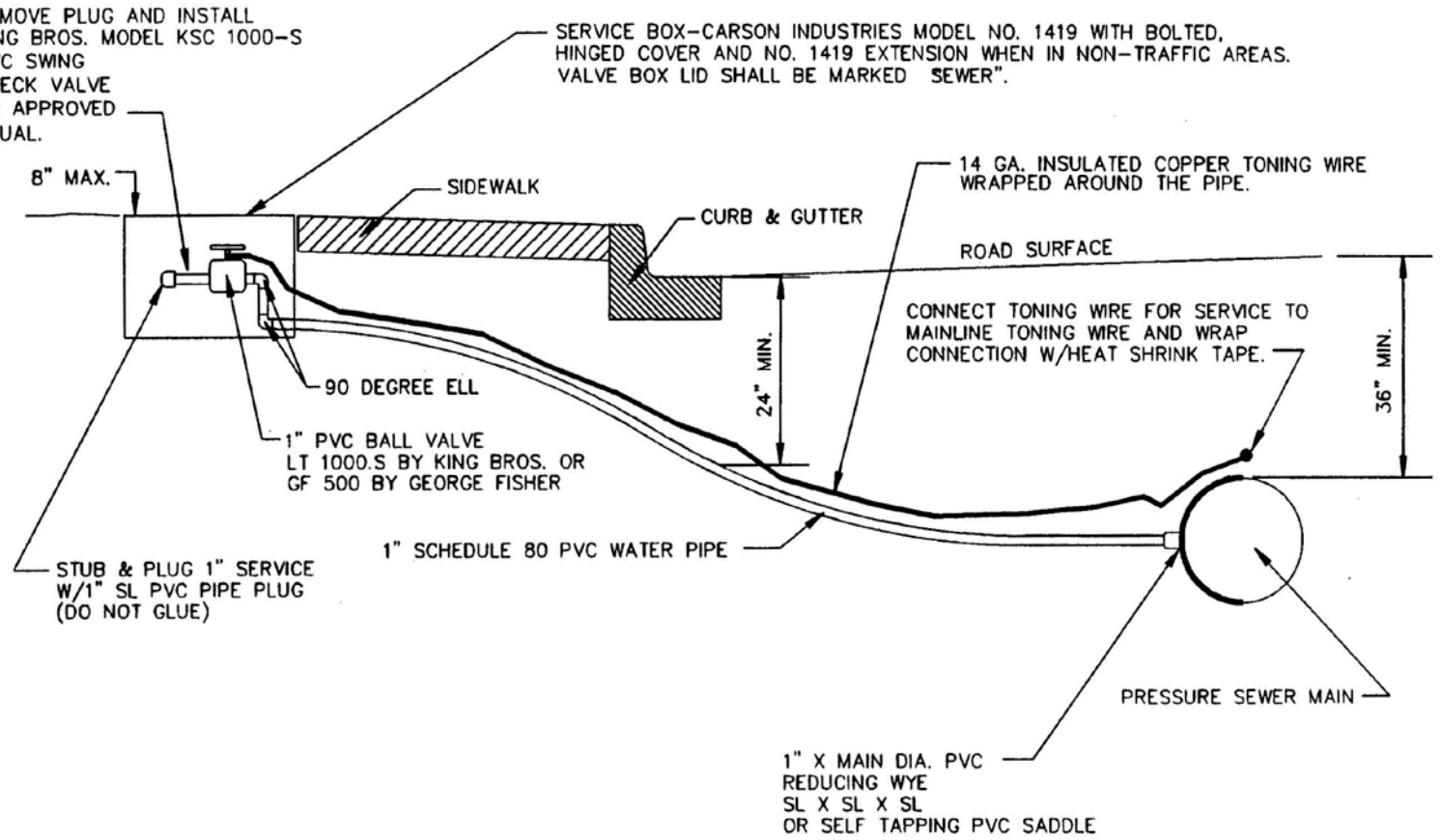
NOTE:

1. LOCATE AIR RELEASE ASSEMBLY IN SIDEWALK WHEN POSSIBLE.

CITY OF TUMWATER	DRAWN BY: SRJ	STD. PLAN NO. SW-07
AIR RELEASE ASSEMBLY	CHECKED BY: JRN	DATE: 05-30-95

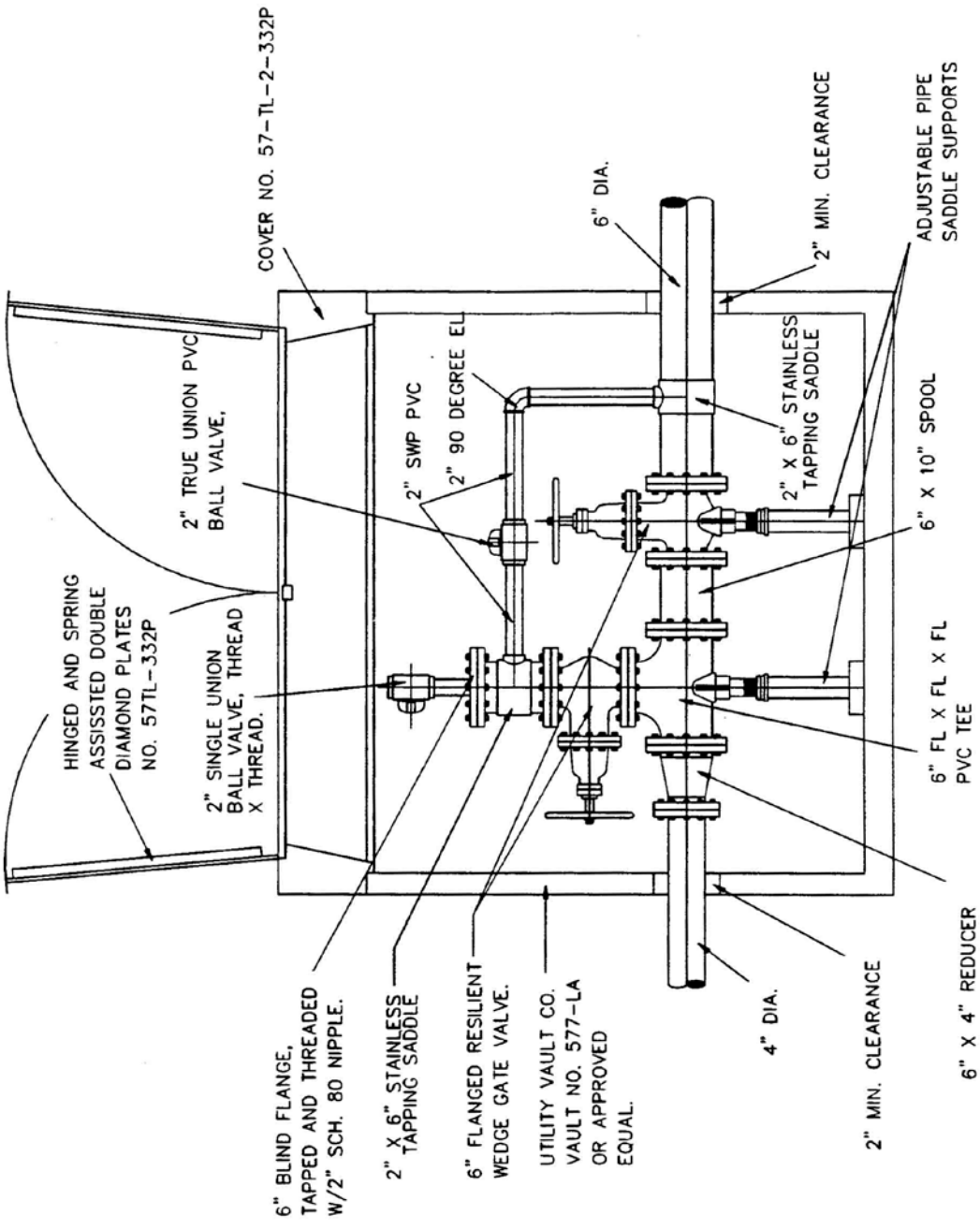
CITY OF TUMWATER

TYPICAL S.T.E.P. SYSTEM SERVICE CONNECTION

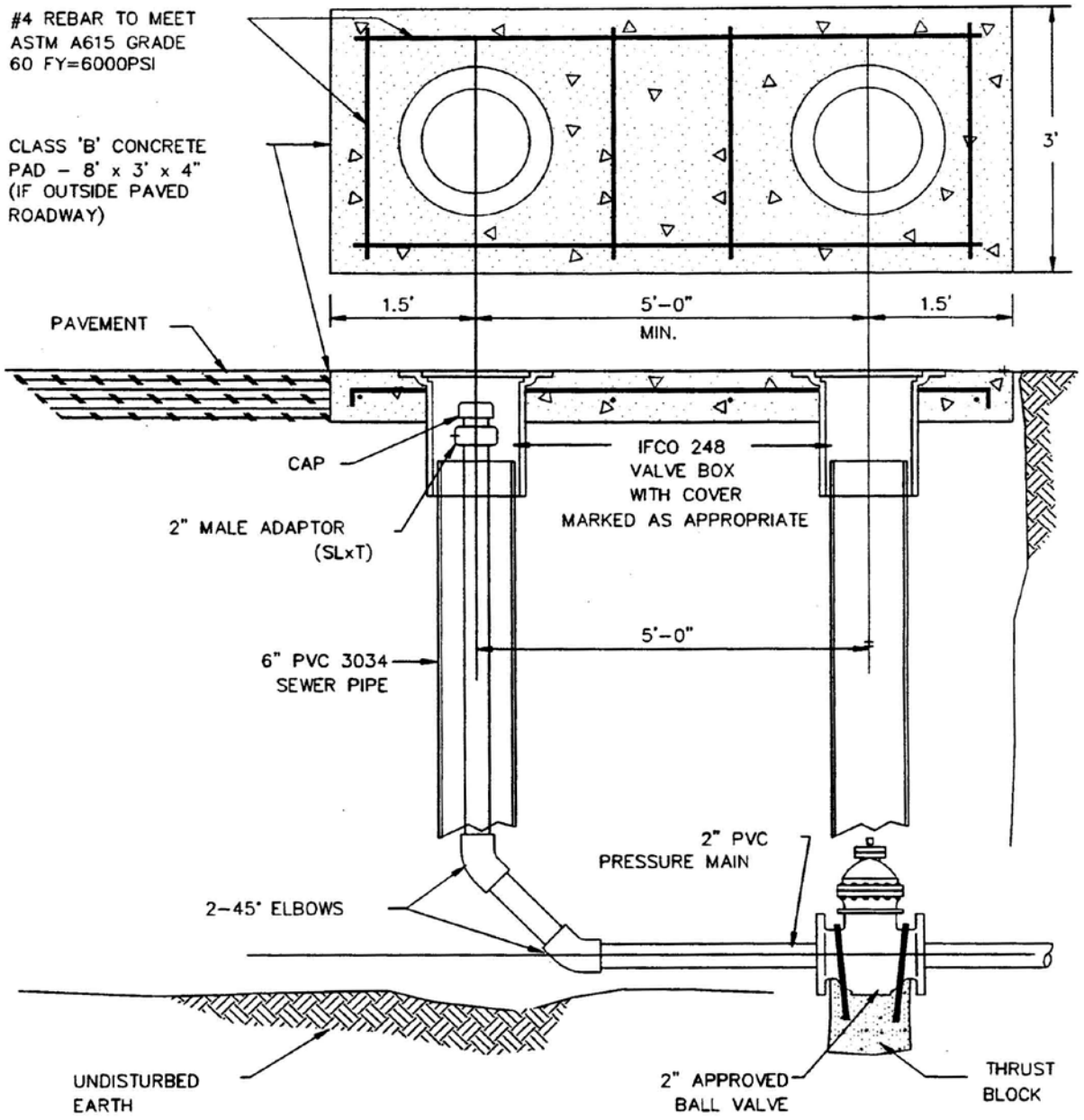


DRAWN BY:	CHECKED BY:	STD. PLAN NO.
SRJ	JRN	SW-08

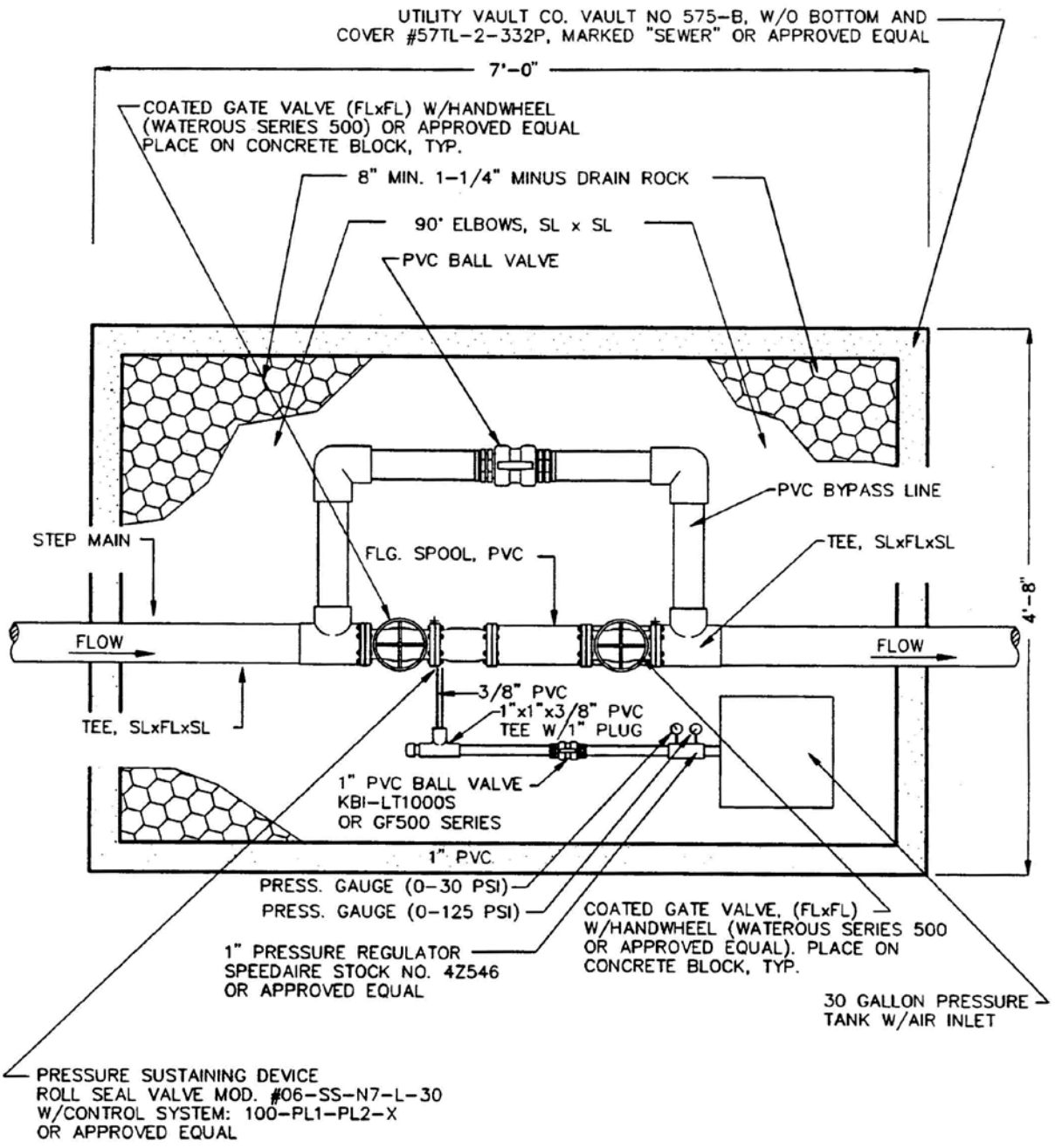
DATE: 05-30-95



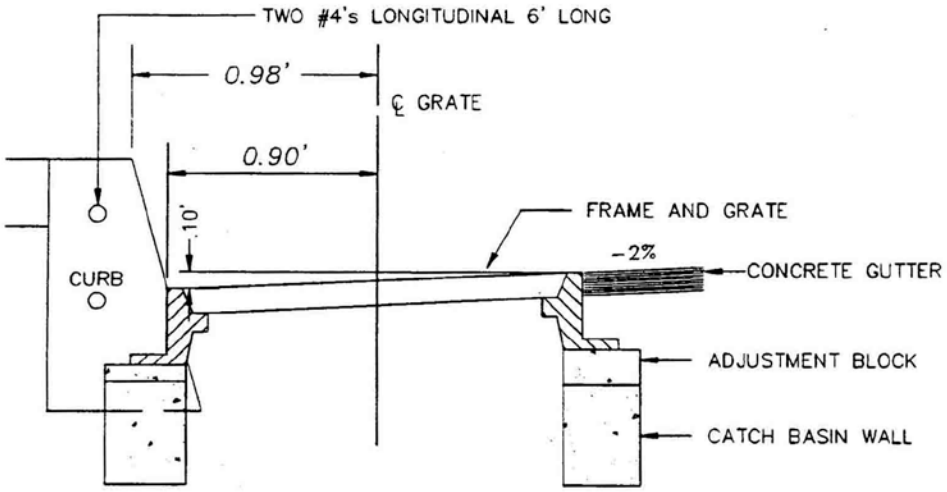
CITY OF TUMWATER	DRAWN BY: SRJ	STD. PLAN NO. SW-09
PIG PORT	CHECKED BY: JRN	DATE: 05-30-95
TYPE II		



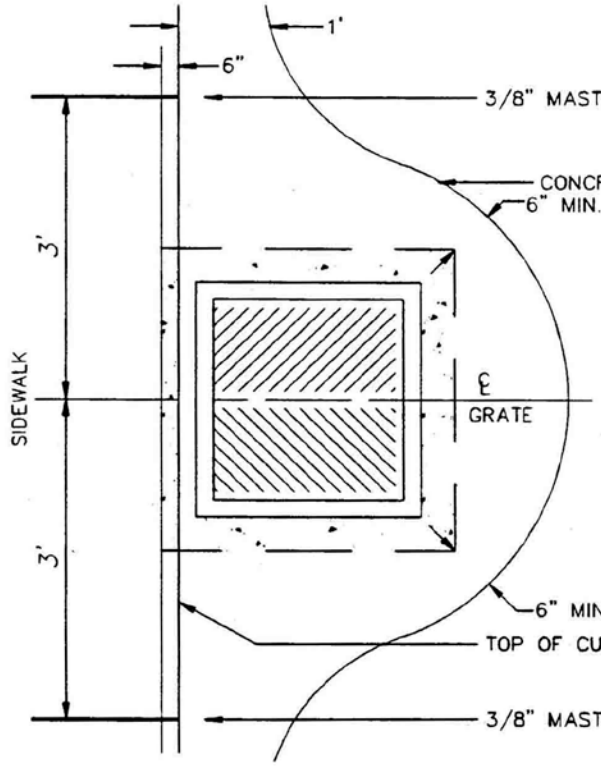
CITY OF TUMWATER TERMINUS PIG LAUNCH PORT	DRAWN BY: SRJ	STD. PLAN NO. SW–10
	CHECKED BY: JRN	DATE: 05–30–95



CITY OF TUMWATER	DRAWN BY: SRJ	STD. PLAN NO. SW-11
6" PRESSURE SUSTAINING DEVICE	CHECKED BY: JRN	DATE: 05-30-95



SIDE VIEW



NOTES:

SEE W.S.D.O.T. STANDARD PLANS B-1, B-2a, AND B-b FOR DETAILS.

PLAN VIEW

CITY OF TUMWATER	DRAWN BY:	STD. PLAN NO.
STANDARD CATCH BASIN FRAME & GRATE DETAIL	SRJ	ST-12
	CHECKED BY: JRN	DATE: 03-30-95

APPENDIX A

City of Tumwater Development Guide
Ordinance No. O95-023

ORDINANCE NO. O95-023

AN ORDINANCE relating to standards for development within the City of Tumwater and adopting an amended Tumwater Development Guide and repealing Ordinance 1328, adopting the original Development Guide in 1992, as more particularly set forth herein.

WHEREAS, the City of Tumwater adopted a Development Guide Manual in 1992 as a means of providing written development guidelines for projects so that both city staff and all property owners, developers and contractors could better plan and implement development projects; and

WHEREAS, in the intervening three year period it has become apparent that the best interests of the city would be served is such manual were updated to reflect changes in standards, conditions and procedures necessary to better serve the interests of the community; and

WHEREAS, the Public Works Committee of the City Council has conducted a series of meetings to determine what provisions should be brought forward to the full City Council for adoption; and

WHEREAS, said process included consideration of comments and proposals from a responders group representative of the local development community; and

WHEREAS, the Public Works Committee has recommended that the Tumwater Development Guide Manual in the form presented be adopted; and

WHEREAS, the Tumwater City Council held a duly advertised public hearing on September 5, 1995 to consider the comments and recommendations of the general public.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF TUMWATER, STATE OF WASHINGTON, DOES ORDAIN AS FOLLOWS:

Section 1. That certain manual entitled "CITY OF TUMWATER DEVELOPMENT GUIDE MANUAL", a copy of which is on file in the office of the City Clerk-Treasurer, is hereby adopted as the official development guide for use on all development projects within the City of Tumwater and on all development projects located within the City of Tumwater's service areas, annexation areas or planning areas to the extent that the city has the authority to require such standards.

Section 2. That Section 15.16.020, **Section 10.240(a) Fire Apparatus**

Access Roads; Dimensions, as adopted by Ordinance 1353, is hereby amended to provide as follows:

> "Section 10.204(a) Dimensions. Fire apparatus access roads shall have an unobstructed width of not less than ~~24~~ 20 feet and an unobstructed height of 13 feet 6 inches."

Section 3. **Repealer.** That Ordinance 1328, with the exception of Section 2 thereof which repealed Sections 12.12.030 and 12.12.040 of the Tumwater Municipal Code, is hereby repealed in its entirety.

Section 4. **Interpretation.** In the event of a conflict between any of the provisions of the herein adopted Development Guide Manual and other prior adopted development provisions, the standards, policies and conditions contained herein shall take precedence.

Section 5. A reasonable fee for printing costs of the Tumwater Development Guide Manual shall be charged for copies of said manual. Said fee will be set by resolution of the City Council.

Section 6. This ordinance shall become effective five days after passage, approval, and publication as provided by law.

ADOPTED this 19th day of December, 1995

CITY OF TUMWATER

Ralph C. Osgood, Mayor

ATTEST:

Gayla L. Gjertsen, Clerk/Treasurer

PUBLISHED: 12-22-95

APPROVED AS TO FORM:

Patrick Brock, City Attorney

APPENDIX B

City of Tumwater Fee Resolution