

## CHAPTER 3 - APPENDIX

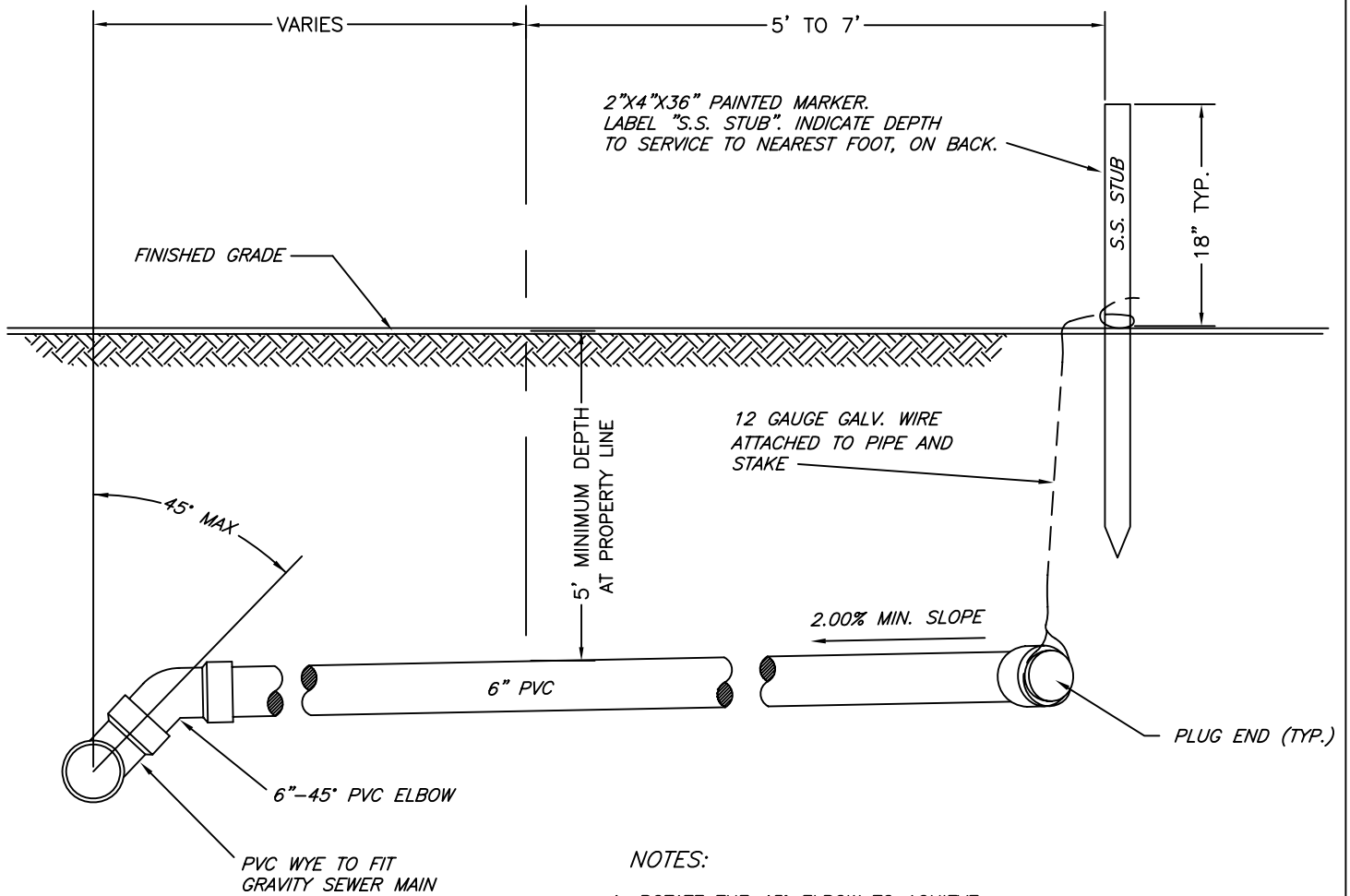
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Exhibit #	Standard Detail #	Title
1	SS- 1A	Single Sewer Service
2	SS - 1B	Dual Sewer Service
3	SS - 1C	Deep Trench Service Connection
4	SS - 2A	Trench Section Trenching Pavement Restoration
5	SS - 2B	Pipe Bedding
6	SS - 3	Standard Maintenance Hole/New Maintenance Hole on Existing Sewer
7	SS - 4	Sewer Cleanout Detail
8	SS - 5	24" Maintenance Hole Frame and Lid
9	SS - 6	Drop Connection for Sanitary Sewer
10	SS - 7	Pavement and Installation Underground Maintenance Hole
11	SS - 8	Typical Sewer Connection to Existing Sewer Mains
12	SS - 9	Pipe Anchor Detail For Slopes Greater Than 20%
13	SS - 10	Check Valve Assembly for Joint Use Side Sewer
14	SS - 11	Polypropylene Ladder and Maintenance Step
15		Cleaning and Testing (3 Pages)



# City of Port Townsend - Public Works Department

## Standard Detail



- NOTES:**
1. ROTATE THE 45° ELBOW TO ACHIEVE THE PROPER ANGLE TO REACH THE PROPERTY LINE WITH 5' OF COVER; THE MINIMUM ALLOWABLE SLOPE IS 2%.
  2. 3' MINIMUM TO ADJOINING LOT LINE
  3. SERVICE TO SINGLE RESIDENCE MAY BE REDUCED TO 4" BEYOND PLUG.

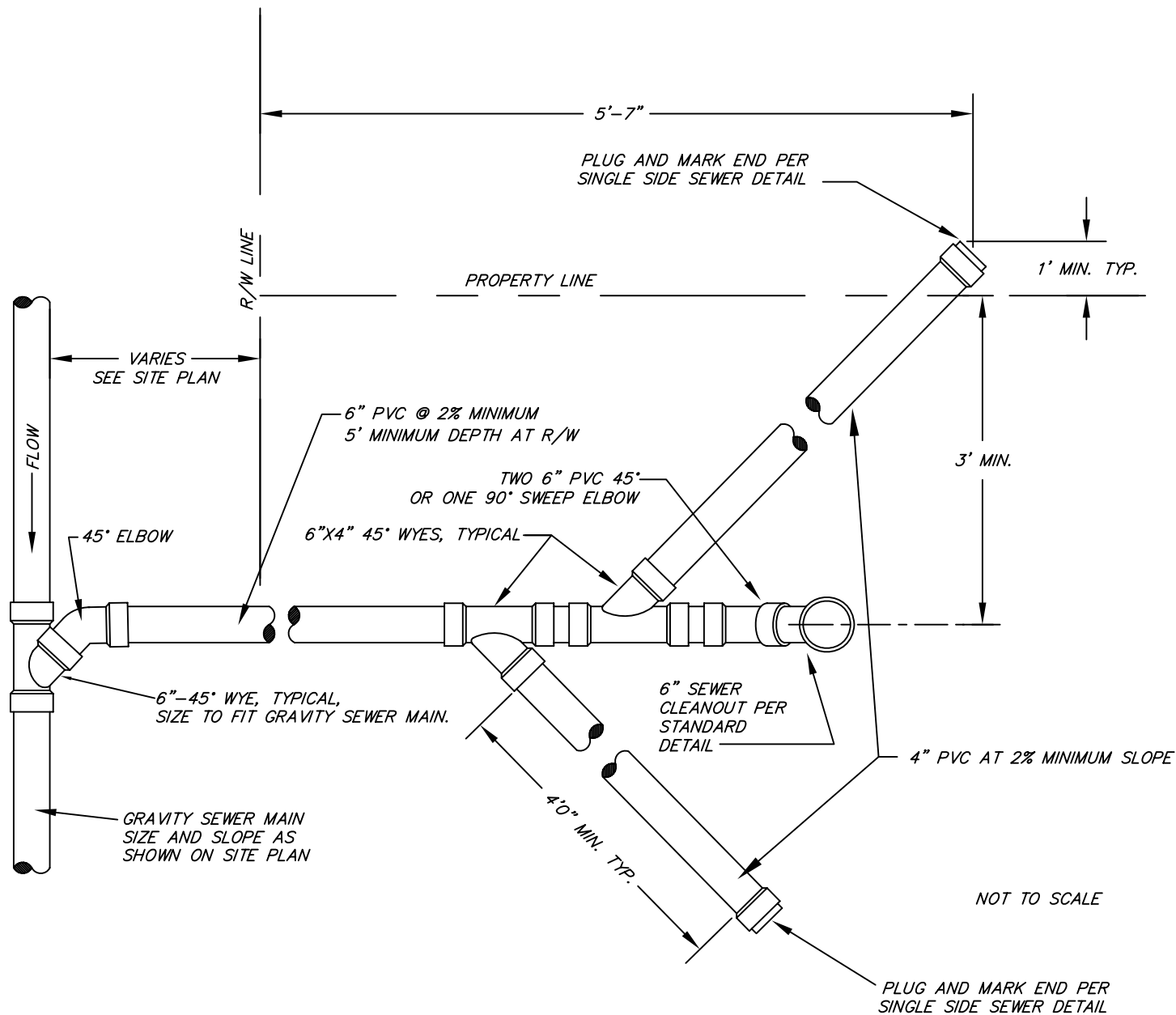
ALL WORK AND MATERIALS TO BE IN ACCORDANCE WITH CURRENT STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION, WASHINGTON STATE DEPARTMENT OF TRANSPORTATION, AMERICAN PUBLIC WORKS ASSOCIATION.

Date: April 1997	No.	Date	Revision	By	Apvd	<h3 style="margin: 0;">Single Sewer Service</h3> <p style="font-size: 24px; margin: 10px 0 0 0;">Detail:      SS-1A</p>
Approved By:						
File: E:\eng_std\standard\san_sew						



# City of Port Townsend - Public Works Department

## Standard Detail



ALL WORK AND MATERIALS TO BE IN ACCORDANCE WITH CURRENT STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION, WASHINGTON STATE DEPARTMENT OF TRANSPORTATION, AMERICAN PUBLIC WORKS ASSOCIATION.

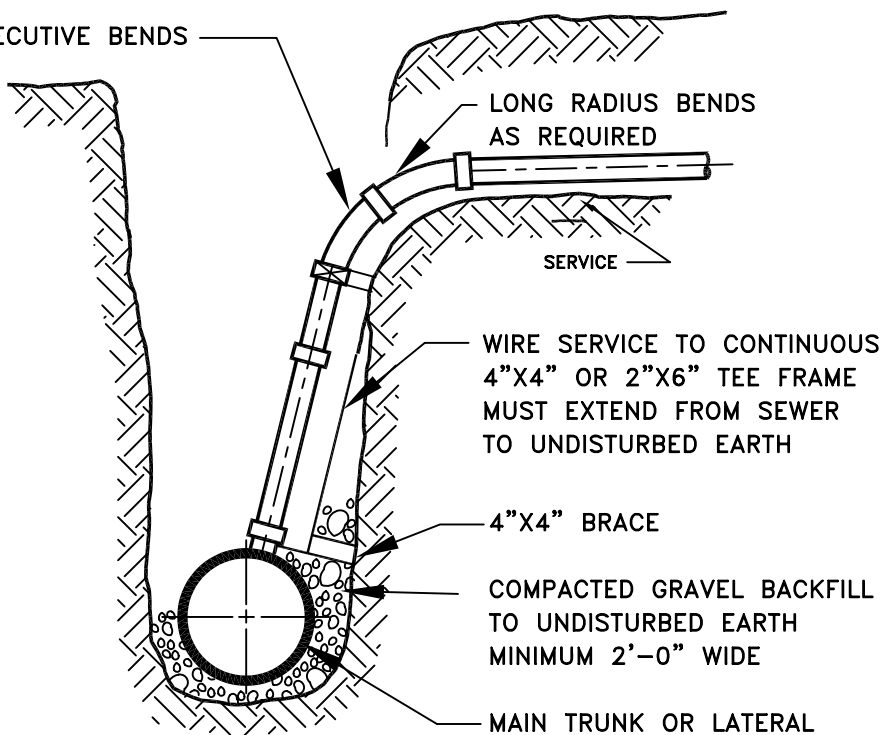
Date: April 1997	<b>No.</b>	<b>Date</b>	<b>Revision</b>	<b>By</b>	<b>Apvd</b>	<b>Dual Sewer Service</b>
Approved By:						
File: E:\eng_std\standard\san_sew						



# City of Port Townsend - Public Works Department

## Standard Detail

NO 90° OR CONSECUTIVE BENDS



INSPECTION REQUIRED UPON COMPLETION OF ROUGH GRADING AND DURING PLACEMENT OF STRUCTURAL SECTION.

CALL FOR FORM INSPECTION BY CITY PRIOR TO POURING CONCRETE AND PRIOR TO PAVING.

**NOTE:**

WOOD SUPPORT TO BE USED IN ALL CASES WHERE SERVICE CONNECTION CANNOT BE SUPPORTED FOR FULL LENGTH ON COMPACTED GRAVEL OR WHERE SEWER IS OVER 12'-0" DEEP TO FLOW LINE

ALL WORK AND MATERIALS TO BE IN ACCORDANCE WITH CURRENT STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION\*, WASHINGTON STATE DEPARTMENT OF TRANSPORTATION, AMERICAN PUBLIC WORKS ASSOCIATION.

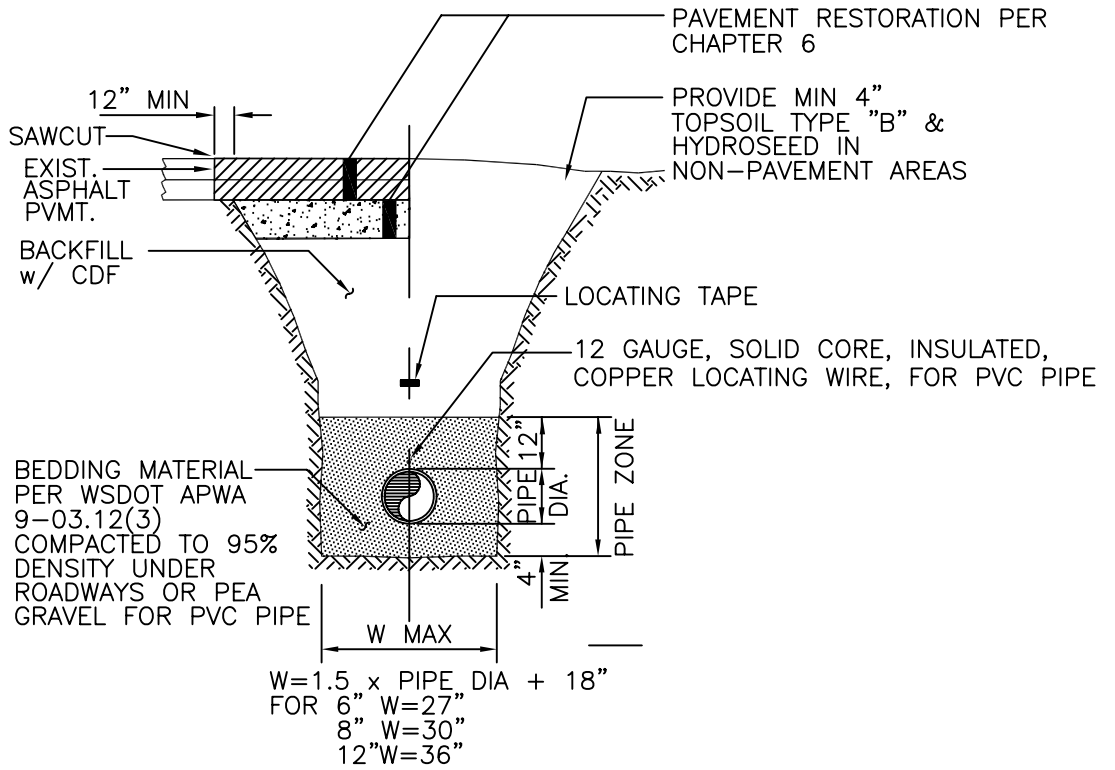
Date: April 1997	No.	Date	Revision	By	Apvd	<b>Deep Trench Service Connection</b>
Approved By:						
File: E:\eng_std\standard\san_sew						Detail:                   SS-1C



# City of Port Townsend - Public Works Department

## Standard Detail

### TRENCH SECTION



PEA GRAVEL SHALL BE FREE FROM ORGANIC MATTER MEET:  
 U.S. STD. SEIVE SIZE    %PASSING

3/4"	100
3/8"	95-100
#8	0-10
#200	0-3

Date: April 1997

Approved By:

File: E:\eng\_std\standard\san\_sew

No.	Date	Revision	By	Apvd

**Trench Section  
and Pavement Restoration**

Detail:                    **SS-2A**

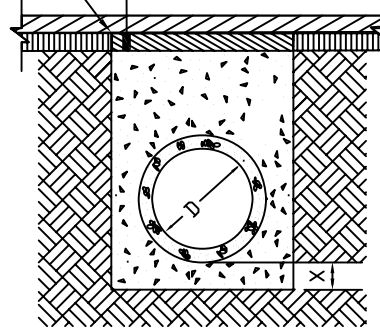


# City of Port Townsend - Public Works Department

## Standard Detail

SAWCUT EXIST. PAVEMENT  
TACK COAT EDGE  
MATCH EXIST.  
TYP. BOTH SIDES

PAVEMENT RESTORATION  
SEE CHAPTER 6.



### LEGEND

- C.D.F. (CONTROLLED DENSITY FILL) 1/4" MAX. SIZE AGGREGATE
- SLECTED NATIVE SOIL (S.N.S.)  
MAX 3/4" DIA. ROCK FOR PVC PIPE  
MAX 2" DIA. ROCK FOR CONC.  
DI OR CI PIPE

### NOTES :

C.D.F. SPEC. PER YARD

MATERIAL	POUNDS	ABS-VOLUME
CEMENT TYPE I	30	0.15
FLY ASH	300	2.19
SAND (SP.GR 2.68)	2550	15.25
WATER	300 (36 GAL)	4.81
AIR %	18.00	4.86

X = 2" FOR PIPE 6" & UNDER, 3" FOR PIPE 8" TO 18", 4" FOR PIPE 24" OR LARGER

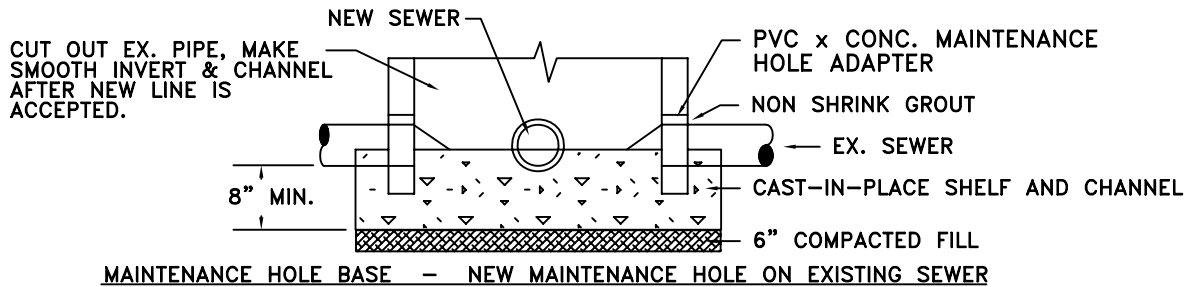
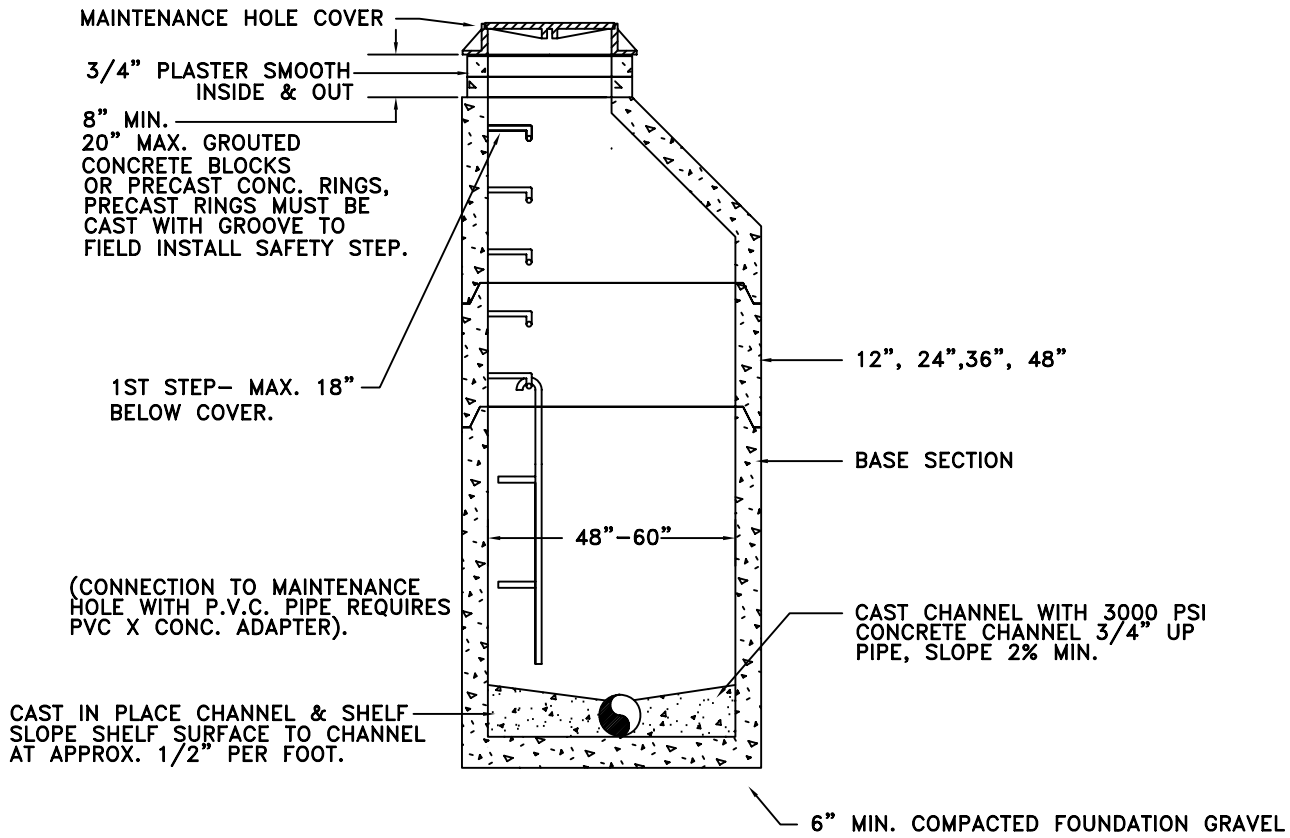
## C.D.F. PIPE BEDDING

Date: April 1997	<b>No.</b>	<b>Date</b>	<b>Revision</b>	<b>By</b>	<b>Apvd</b>	<b>Pipe Bedding</b>
Approved By:						
File: E:\eng_std\standard\san_sew						<b>Detail: SS-2B</b>



# City of Port Townsend - Public Works Department

## Standard Detail



**GENERAL NOTES (APPLY TO ALL MAINTENANCE HOLES)**

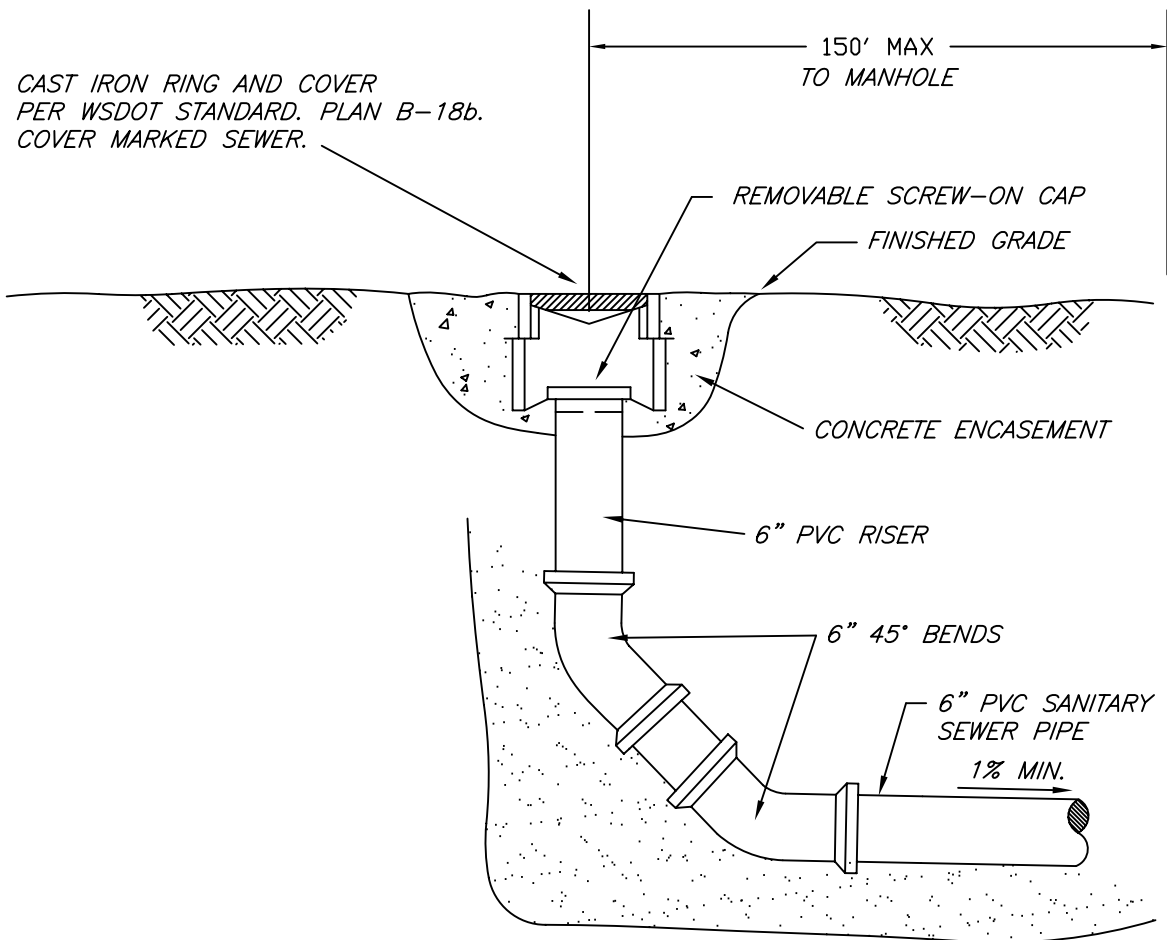
1. PRECAST SECTIONS SHALL BE REINFORCED PER ASTM SPECS FOR CORRESPONDING SEWER PIPE.
2. POLYPROPYLENE SAFETY STEPS WITH 12.0" SEPARATION BETWEEN RUNGS.
3. STEPS IN PRECAST BASE SECTION MAY BE CAST IN PLACE OR MOVABLE SAFETY LADDER GROUDED IN PLACE.
4. ALL HOLES FOR PIPE SHALL BE BLOCKED OUT AT THE TIME OF CASTING OF THE SECTION.
5. ALL RUBBER GASKETED MAINTENANCE HOLES SHALL BE FURNISHED WITH RUBBER GASKET JOINT CONFORMING TO ASTM C443.
6. MAINTENANCE HOLES OVER 10' HIGH SHALL BE FURNISHED WITH 5" MIN. WALL.
7. MINIMUM 3% SLOPE ACROSS MAINTENANCE HOLE CAHNNEL.
8. MAINTENANCE HOLES TO BE WATER TIGHT INCLUDING EXTENSIONS TO COVER CASTING

Date: April 1997	<b>No.</b>	<b>Date</b>	<b>Revision</b>	<b>By</b>	<b>Apvd</b>	<b>Standard Maintenance Hole/New Maint. Hole on Existing Sewer</b>  <b>Detail: SS-3</b>
Approved By:						
File: E:\eng_std\standard\san_sew						



# City of Port Townsend - Public Works Department

## Standard Detail



NOT TO SCALE

CALL FOR FORM INSPECTION BY CITY PRIOR TO POURING CONCRETE.

ALL WORK AND MATERIALS TO BE IN ACCORDANCE WITH CURRENT STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION, WASHINGTON STATE DEPARTMENT OF TRANSPORTATION, AMERICAN PUBLIC WORKS ASSOCIATION.

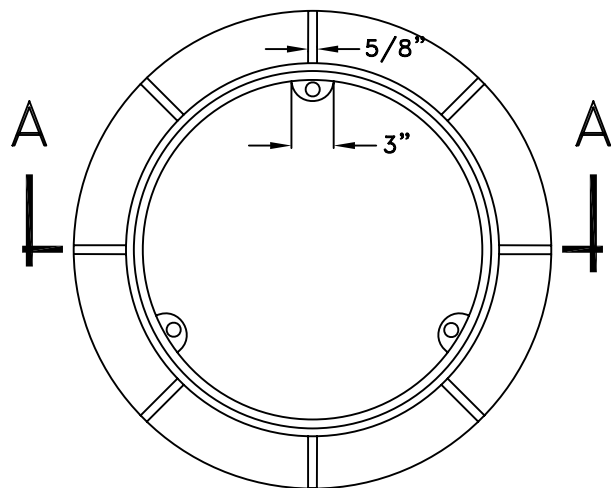
Date: April 1997	<b>No.</b>	<b>Date</b>	<b>Revision</b>	<b>By</b>	<b>Apvd</b>	<h3 style="margin: 0;">Sewer Cleanout Detail</h3>
Approved By:						
File: E:\eng_std\standard\san_sew						
						<b>Detail:                    SS-4</b>



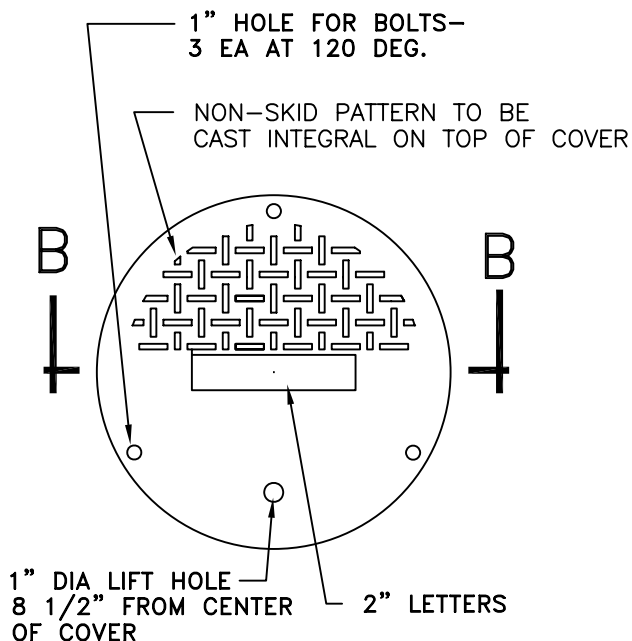


# City of Port Townsend - Public Works Department

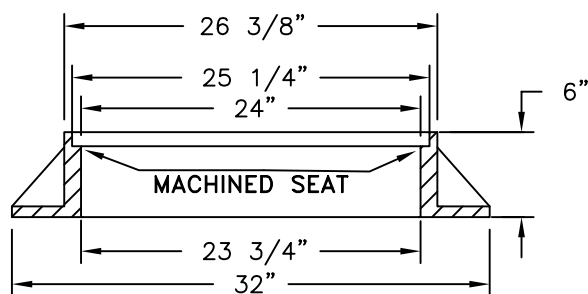
## Standard Detail



PLAN  
MH RING

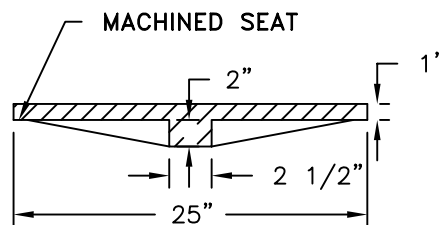


PLAN  
MH COVER



SECTION A-A

DUCTILE OR CAST IRON FRAME  
MINIMUM WEIGHT 210 LBS



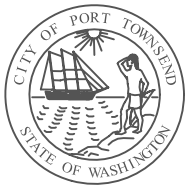
SECTION B-B

DUCTILE OR CAST IRON NON-LOCKING OR  
LOCKING COVER, MINIMUM WEIGHT 150 LBS

**NOTES:**

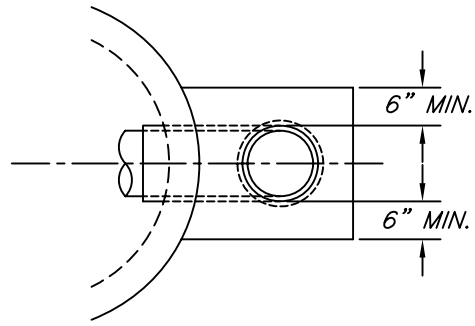
1. 3 LOCKING BOLT LUGS TO BE PROVIDED FOR EACH MAINTENANCE HOLE
2. COVER SHALL HAVE THE WORD "SEWER" IN 2" RAISED LETTERS.

Date: April 1997	No.	Date	Revision	By	Apvd	<h3 style="margin: 0;">24" Maintenance Hole Frame and Lid</h3> <p style="margin: 0;">Detail:                    SS-5</p>
Approved By:						
File: E:\eng_std\standard\san_sew						



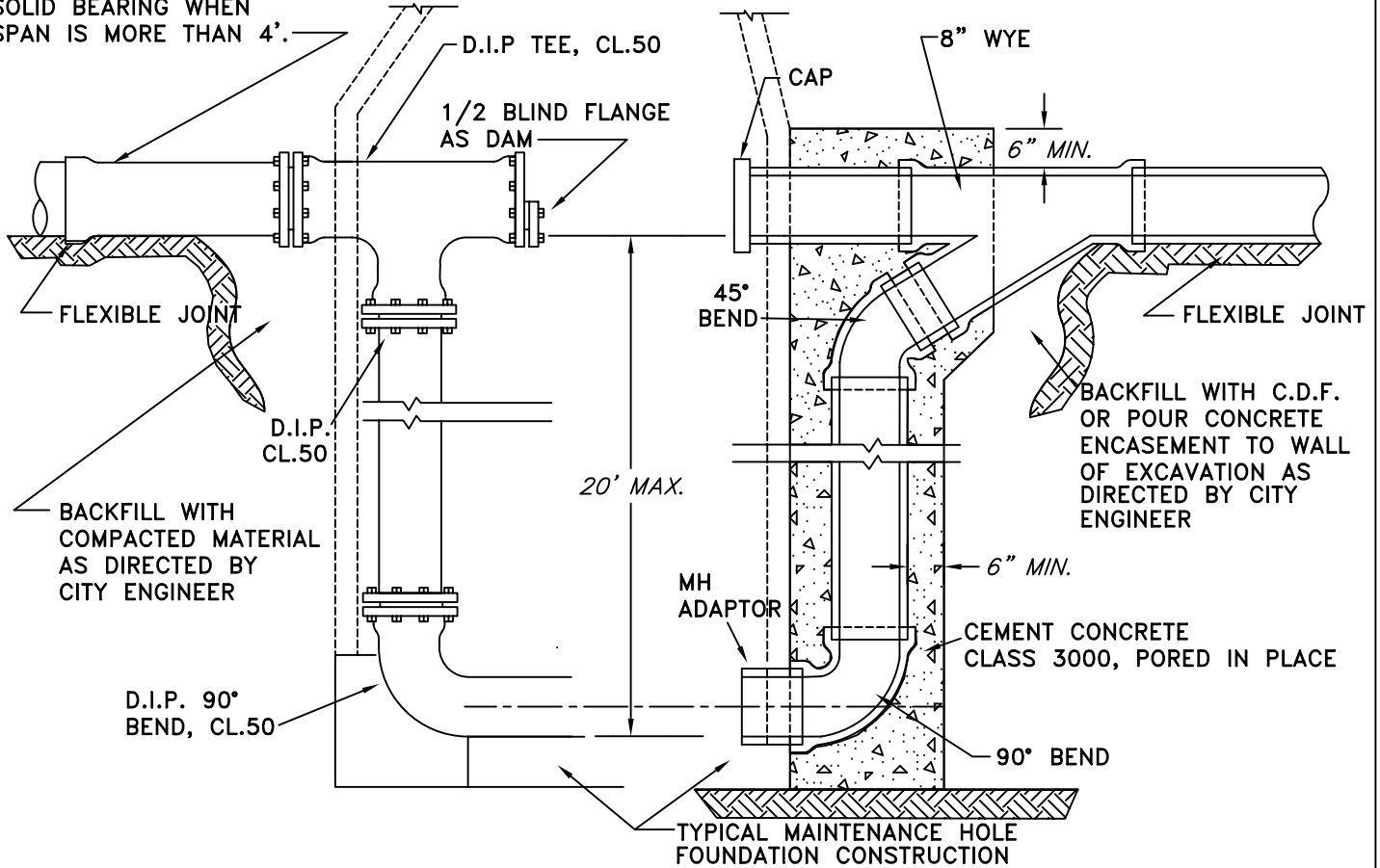
# City of Port Townsend - Public Works Department

## Standard Detail



ALL PIPE EXCEPT DUCTILE IRON PIPE SHALL BE CONCRETE ENCASED

ONE LENGTH OF D.I. PIPE (CLASS 50) TO SOLID BEARING WHEN SPAN IS MORE THAN 4'.



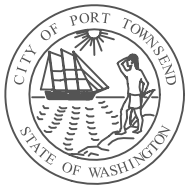
DUCTILE IRON INSIDE  
DROP CONNECTION

CONCRETE ENCASED PVC OUTSIDE  
DROP CONNECTION

NOTE: EXCAVATION TO BE CONDUCTED PER WISHA GUIDELINES

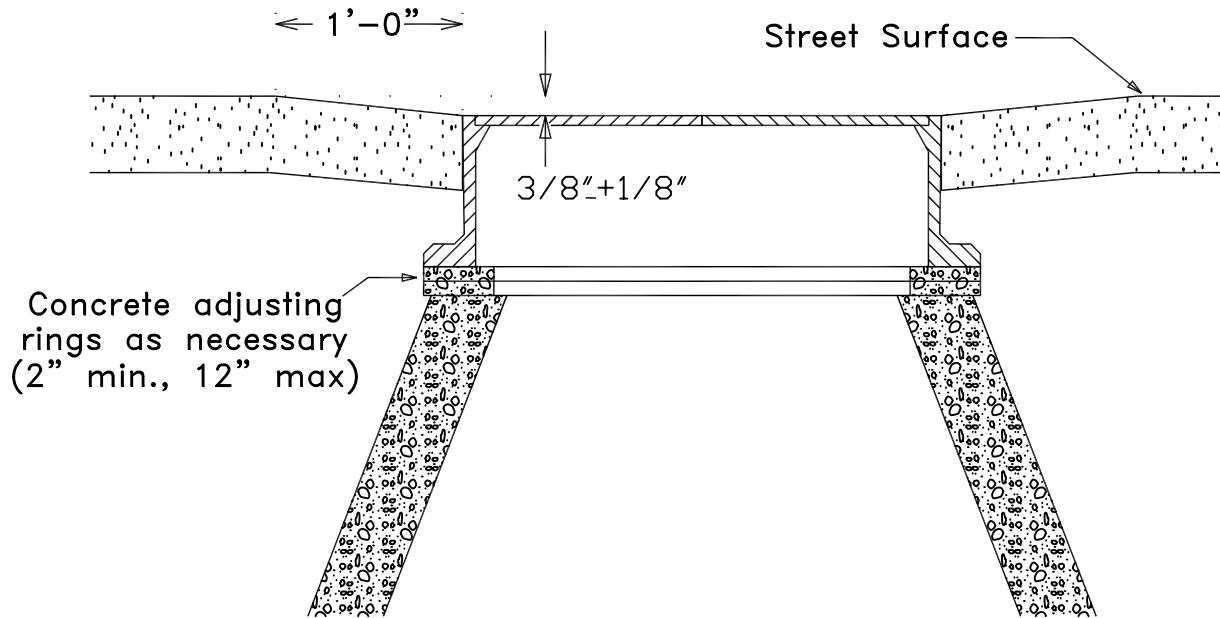
CALL FOR FORM INSPECTION BY CITY PRIOR TO POURING CONCRETE.

Date: April 1997	No.	Date	Revision	By	Apvd	<h3 style="margin: 0;">Drop Connection For Sanitary Sewer</h3> <p style="font-size: 1.5em; margin: 0;">Detail:            SS-6</p>
Approved By:						
File: E:\eng_std\standard\san_sew						



# City of Port Townsend - Public Works Department

## Standard Detail



### NOTES:

- 1.) Adjust manholes upward with adjusting rings under frame.
- 2.) Adjust maintenance holes downward by removing cone and barrel sections as necessary and replacing with sections of length required to match grade.
- 3.) Slope maint. hole frame as req'd to match slope of street.
- 4.) Final maint. hole adjustments shall be made before paving.

Date: April 1997

Approved By:

File: E:\eng\_std\standard\san\_sew

No.	Date	Revision	By	Apvd

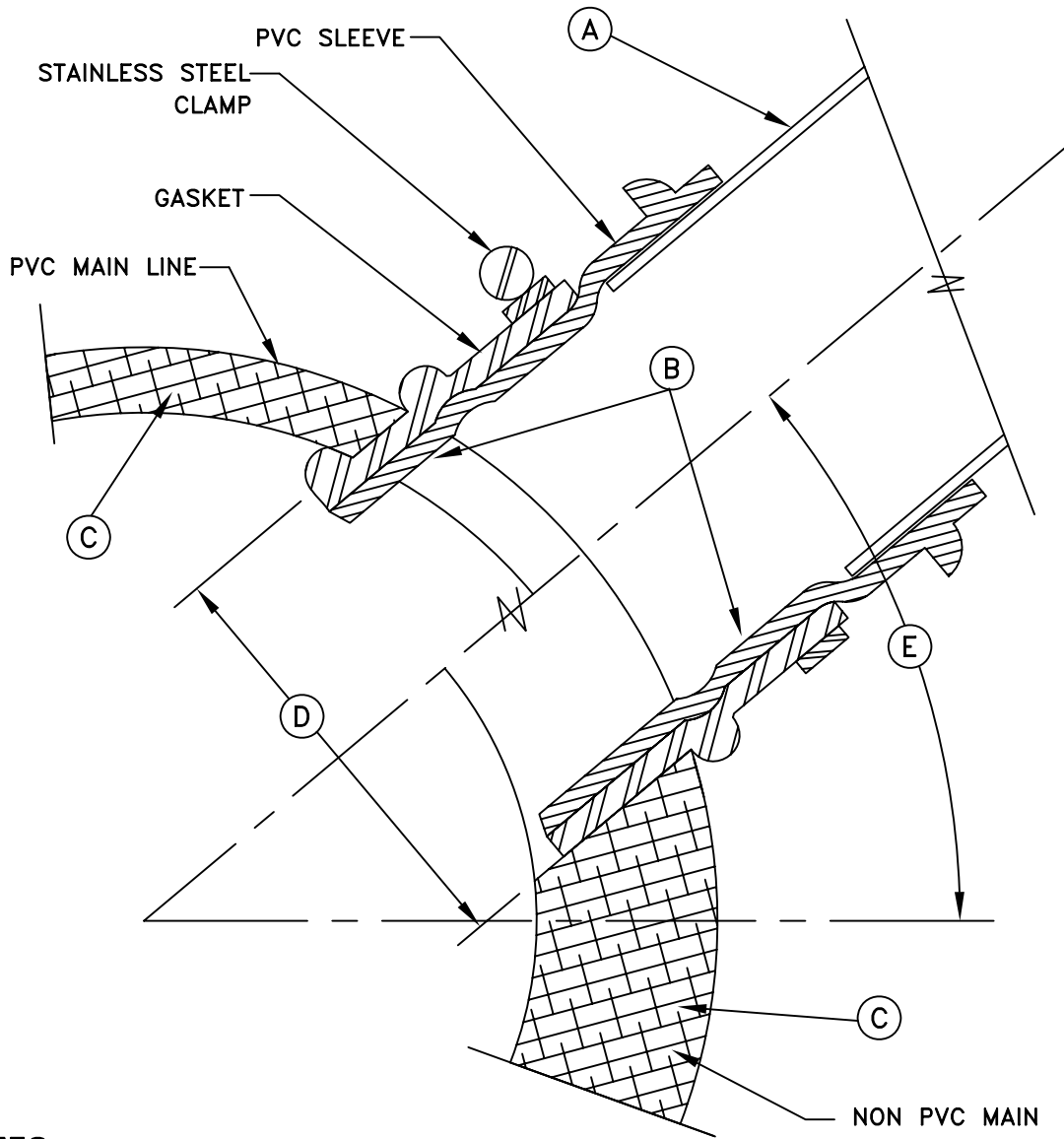
Pavement and Intallation  
Underground Maintenance Hole

Detail: SS-7



# City of Port Townsend - Public Works Department

## Standard Detail



### NOTES

- (A) PVC SIDE SEWER. FOR REMAINDER OF PVC SERVICE SEE DWG WW-1.
- (B) FOWLER MFG, CO. "INSERTA TEE" OR APPROVED EQUAL.
- (C) EXISTING SANITARY SEWER MAIN.
- (D) CORE DRILL EXISTING MAINLINE PIPE PER MFG'S SPECIFICATIONS.
- (E) 35° MIN, 45° MAX

Date: April 1997

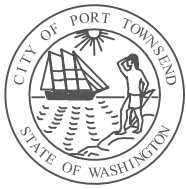
Approved By:

File: E:\eng\_std\standard\san\_sew

No.	Date	Revision	By	Apvd

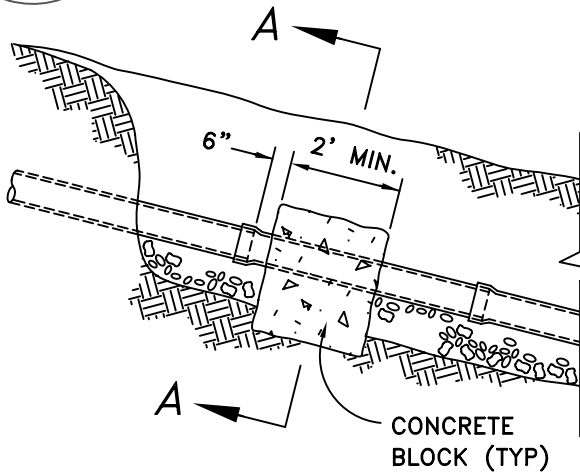
Typical Sewer Connection to  
Existing Sewer Mains

Detail: SS-8



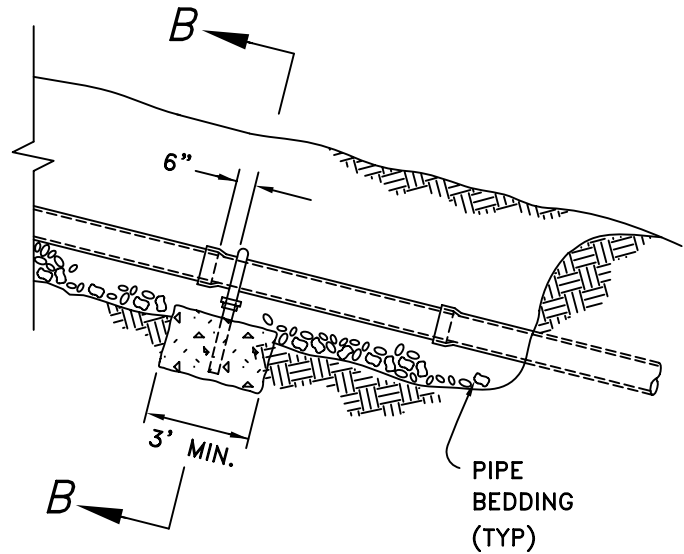
# City of Port Townsend - Public Works Department

## Standard Detail



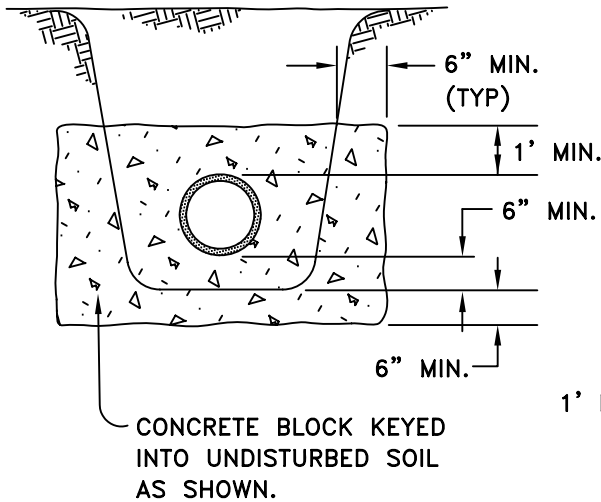
**CONCRETE BLOCK ANCHOR**

N.T.S.  
1 ANCHOR PER JOINT OF PIPE

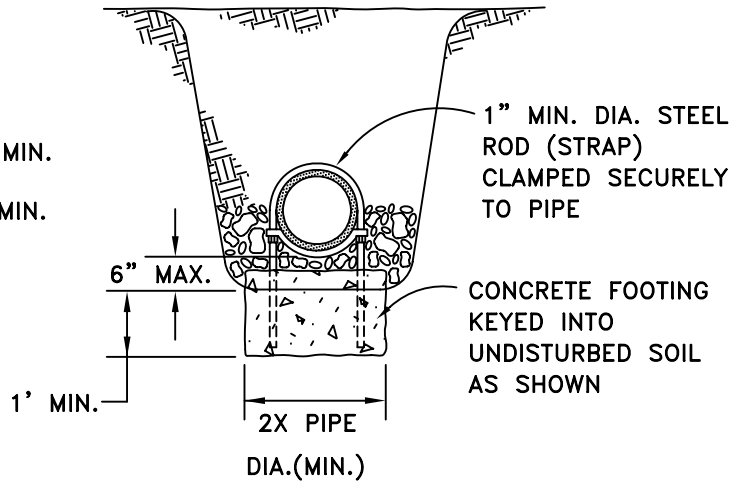


**STRAP - FOOTING ANCHOR**

N.T.S.  
1 ANCHOR PER JOINT OF PIPE



**SECTION A-A**  
N.T.S.



**SECTION B-B**  
N.T.S.

Date: April 1997

Approved By:

File: E:\eng\_std\standard\san\_sew

No.	Date	Revision	By	Apvd

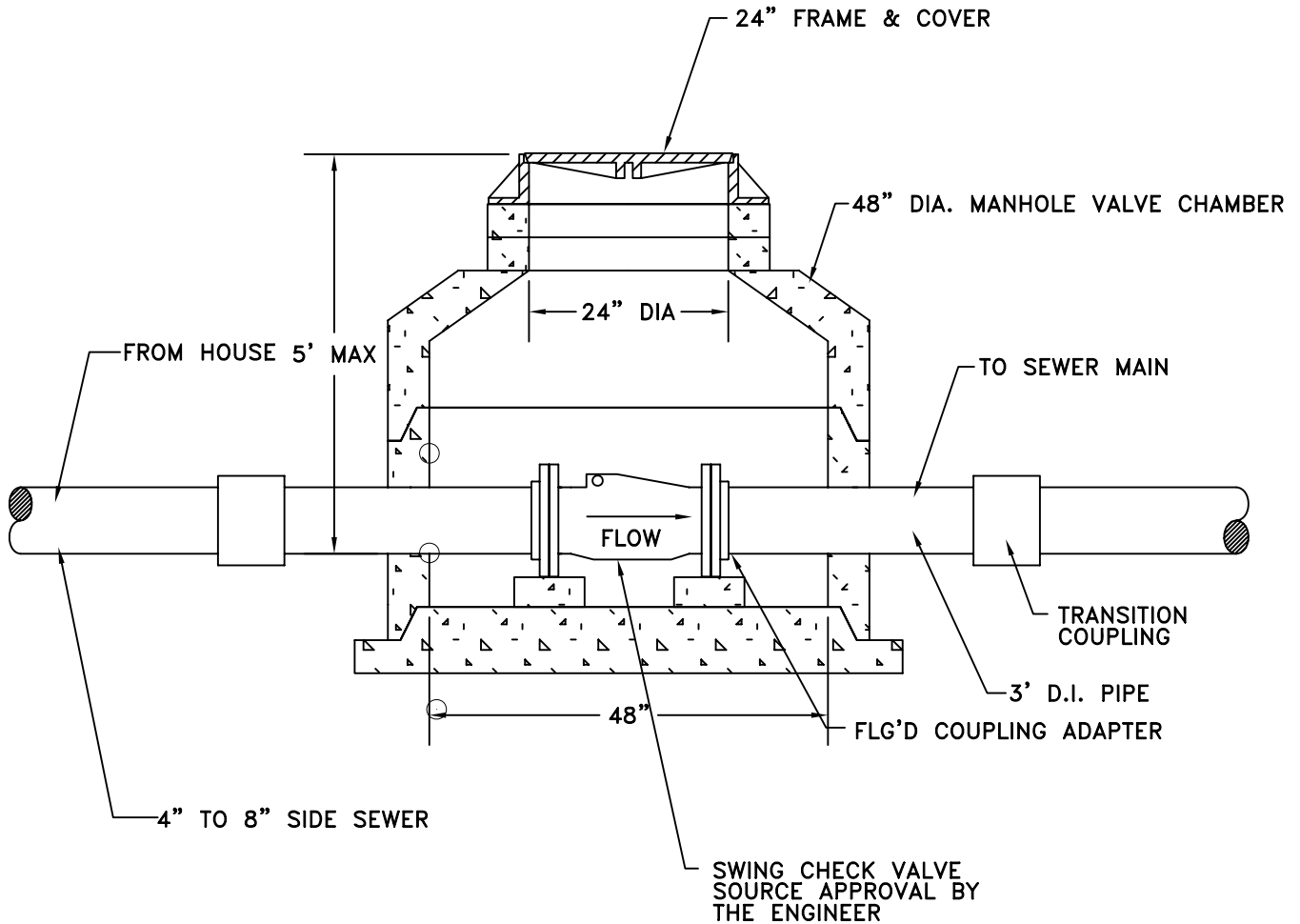
Pipe Anchor Detail  
For Slopes Greater Than 20%

Detail: SS-9



# City of Port Townsend - Public Works Department

## Standard Detail



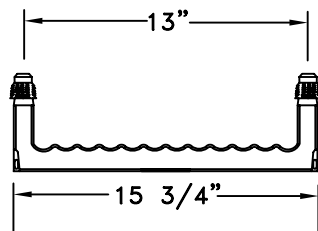
(4" to 8" Diameter)

Date: April 1997	No.	Date	Revision	By	Apvd	<h3 style="margin: 0;">Check Valve Assembly for Joint Use Side Sewer</h3> <p style="font-size: 1.2em; margin: 10px 0;">Detail:                    SS-10</p>
Approved By:						
File: E:\eng_std\standard\san_sew						

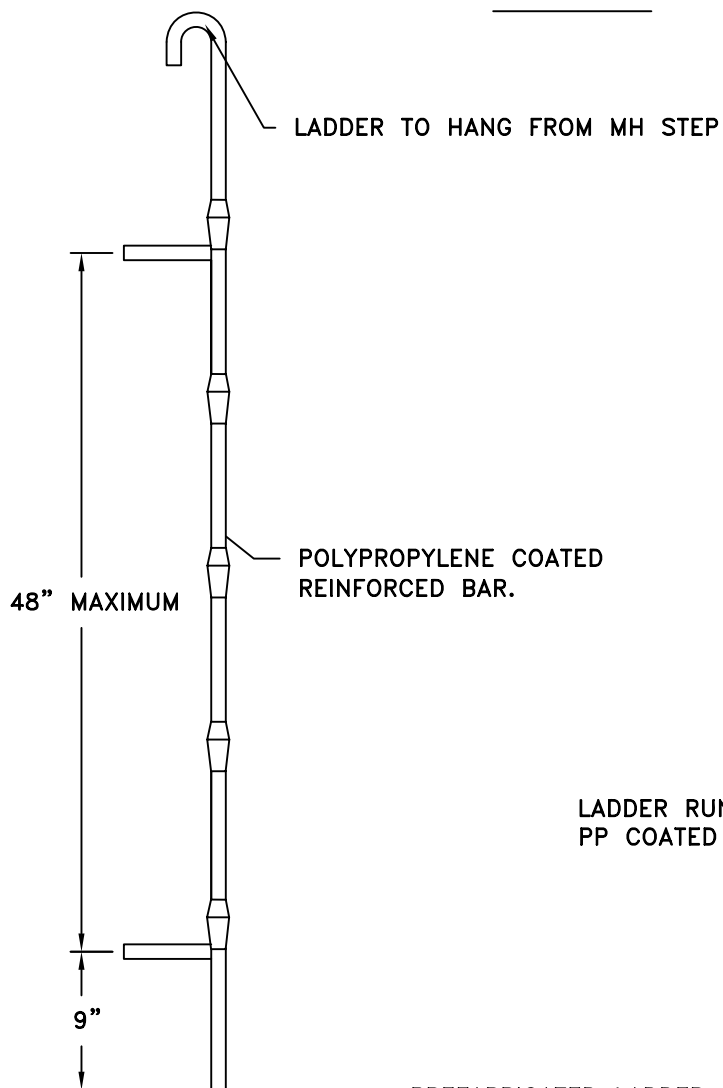


# City of Port Townsend - Public Works Department

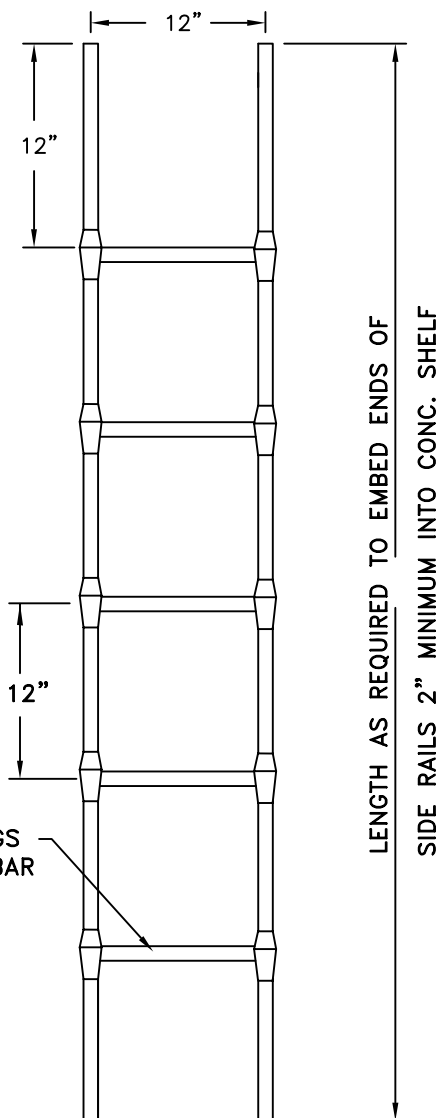
## Standard Detail



SAFETY STEP



PREFABRICATED LADDER



**NOTES:**

1. ALL STEP SHOULD MEET ASTM C-478 AND AASHTO M-199
2. POLYPROPYLENE SHALL CONFORM TO ASTM D-4101.
3. 1/2" GRADE 60 REINFORCING BAR SHALL CONFORM TO ASTM A-615.



RAIL 9/16" ROUND BAR



RUNG 1/2" GRADE 60

Date: April 1997	No.	Date	Revision	By	Apvd	<h3 style="margin: 0;">Polypropylene Ladder and Maintenance Step</h3> <p style="font-size: 1.5em; margin-top: 20px;">Detail:                    SS-11</p>
Approved By:						
File: E:\eng_std\standard\san_sew						

#### 7-17.3(4) CLEANING AND TESTING

##### 7-17.3(4)A GENERAL

Sewers and appurtenances shall be cleaned and tested after backfilling by either the exfiltration or low pressure air method at the option of the Contractor, except where the ground water table is such that the Engineer may require the infiltration test.

All work involved in cleaning and testing sewer lines between manholes or rodding inlets as required herein shall be completed within 15 working days after backfilling of sewer lines and structures. Any further delay will require the written consent of the Engineer. The Contractor shall furnish all labor, materials, tools, and equipment necessary to make the test, clean the lines, and perform all work incidental thereto. The Contractor shall perform the tests under the direction and in the presence of the Engineer. Precautions shall be taken to prevent joints from drawing during tests, and any damage resulting from these tests shall be repaired by the Contractor. The manner and time of testing shall be subject to approval by the Engineer.

All wyes, tees, and stubs shall be plugged with flexible jointed caps, or acceptable alternate, securely fastened to withstand the internal test pressure. 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.

If the Contractor elects to test large diameter pipe one joint at a time, leakage allowances shall be converted from GPM per 100 feet to GPM per joint by dividing by the number of joints occurring in 100 feet. If leakage exceeds the allowable amount, corrective measures shall be taken and the line then retested to the satisfaction of the Engineer.

Testing side sanitary sewers shall be for their entire length from the public sewer in the street to the connection with the building's plumbing. Their testing shall be as required by the local sanitary agency but in no case shall it be less thorough than that of filling the pipe with water before backfilling and visually inspecting the exterior for leakage. The decision of the Engineer as to acceptance of the side sanitary sewer shall be final.

If any sewer installation fails to meet the requirements of the test method used, the Contractor shall determine the source or sources of leakage and shall replace all defective pipe. The complete pipe installation shall meet the requirements of the test method used before being considered acceptable. Replacement of defective pipe shall not commence until the Contractor has received approval of his plan from the Engineer.

##### 7-17.3(4)B EXFILTRATION TEST

Prior to making exfiltration leakage tests, the Contractor may fill the pipe with clear water to permit normal absorption into the pipe walls provided, however, that after so filling the pipe he shall complete the leakage test within twenty-four hours after filling. When under test, the allowable leakage shall be limited according to the provisions that follow. Specified allowances assume pre-wetted pipe.

Leakage shall be no more than 0.28 gph per inch diameter per 100 feet of sewer, with a hydrostatic head of 6 feet above the crown at the upper end of the test section, or above the natural groundwater table at the time of test, whichever is higher. The length of pipe tested shall be limited so that the pressure at the lower end of the section tested does not exceed 16 feet of head above the invert, and in no case shall be greater than 700 feet or the distance between manholes when greater than 700 feet.

Where the test head is other than 6 feet, the measured leakage shall not exceed 0.28 gph per inch diameter per 100 feet times the ratio of the square root of the test head to the square root of 6.

$$\text{Leakage maximum} = 0.28 \times \frac{\sqrt{H} - 0.114 \sqrt{H}}{\sqrt{6}} \text{ gph/inch dia./100ft.}$$

When the test is to be made one joint at a time, the leakage per joint shall not exceed the computed allowable leakage per length of pipe.

##### 7-17.3(4)C INFILTRATION TEST

Infiltration test leakage shall not exceed 0.16 gph per inch diameter per 100 feet, when the natural groundwater head over the pipe is 2 feet or less above the crown of the pipe at the upper end of the test section. The length of pipe tested shall not exceed 700 feet or the distance between manholes when greater than 700 feet.

Where the natural groundwater head is more than 2 feet, the measured leakage shall not exceed 0.16 gph per inch diameter per 100 feet times the ratio of the square root of the natural groundwater head to the square root of 2.

$$\text{Leakage maximum} = 0.16 \times \frac{\sqrt{H} - 0.114 \sqrt{H}}{\sqrt{2}} \text{ gph/inch dia./100ft.}$$

When a suitable head of groundwater exists above the crown of the pipe and when the pipe is large enough to work inside, acceptance may be based on the repair of visible leakage by means satisfactory to the Engineer.

##### 7-17.3(4)D AIR PRESSURE TEST FOR SANITARY SEWERS CONSTRUCTED OF AIR PERMEABLE MATERIALS

(a) Pipelines may be tested with low pressure air by the pressure drop method, in lieu of water infiltration or exfiltration. The pressure drop shall be from 3-1/2 to 2-1/2 psig greater than the average back pressure of groundwater above the centerline of the pipe. At the Contractor's option, pipe may be tested without pre-wetting; however, the test allowances herein assume pre-wetted pipe.

(b) The allowable rate of air loss shall be .003 cfm per square foot of internal pipe surface, but the total air loss shall be not less than 2 cfm nor more than 3.50 cfm.

(c) The test equipment to be used shall be furnished by the Contractor and shall be inspected and approved by the Engineer prior to use. The Engineer may at any time require a calibration test of gauges or other instrumentation that is incorporated in the test equipment.

(d) Safety Provisions. Plugs used to close the sewer pipe for the air test must be securely braced to prevent the unintentional release of a plug which can become a high-velocity projectile. Gauges, air piping manifolds, and valves shall be located at the top of the ground. No one shall be permitted to enter a manhole where a plugged pipe is under pressure. (Four psig air pressure develops a force against the plug in a 12 inch diameter pipe of approximately 450 pounds.) Air testing apparatus shall be equipped with a pressure release device such as a rupture disk or a pressure relief valve designed to relieve pressure in the pipe under test at 6 psi.

(e) Pipe under 36 inches in diameter may be tested from manhole to manhole or such shorter lengths determined by the Contractor. Pipe 36 inches in diameter and over shall be tested one joint at a time. Each joint must show no appreciable loss of pressure when held for 30 seconds.

##### 7-17.3(4)E AIR PRESSURE TEST FOR SANITARY SEWERS CONSTRUCTED OF NON AIR PERMEABLE MATERIALS

###### 7-17.3(4)E1 GENERAL

When non air-permeable pipelines are subjected to the low pressure air test, all of the provisions of Section 7-17.3(4)D shall apply except that the pressure drop shall be from 3.5 to 3.0 psig greater than the average back pressure above the center of the pipe, and the minimum time shall be twice that computed as specified under Section 7-17.3(4)D.

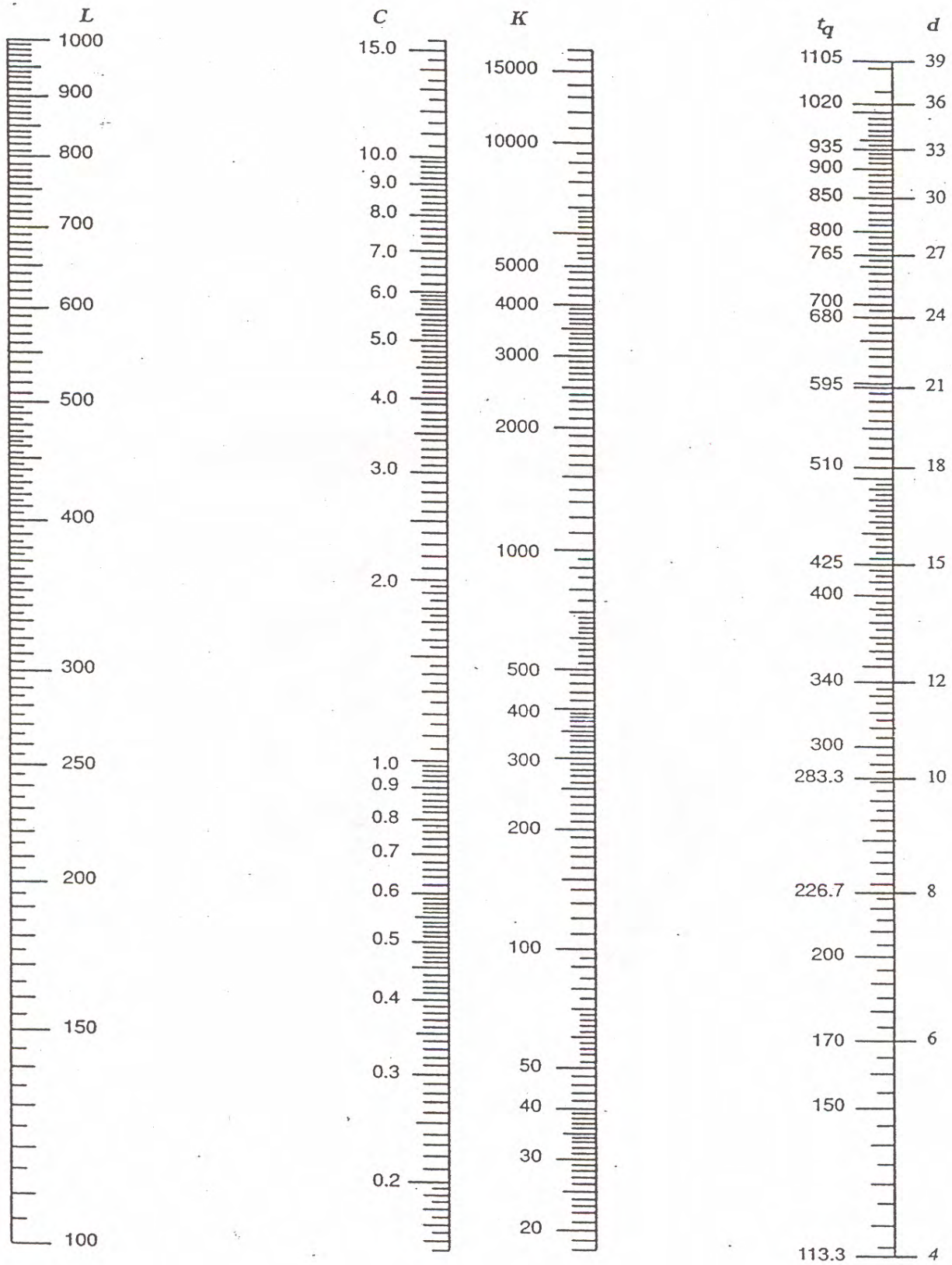


7-17.3(4)E2 RECOMMENDED PROCEDURE FOR CONDUCTING ACCEPTANCE TEST BY PRESSURE DROP METHOD

- (a) Plug all pipe outlets with suitable test plugs. Brace each plug securely.
- (b) All gauge pressures in the test should be increased by the amount of groundwater pressure at the center of the pipe.
- (c) Add air slowly to the portion of the pipe installation under test until the internal air pressure is raised to 4.0 psig.
- (d) After an internal pressure of 4.0 psig is obtained allow at least 2 minutes for air temperature to stabilize, adding only the amount of air required to maintain pressure.
- (e) After the 2 minute period, disconnect air supply.
- (f) When pressure decreased to 3.5 psig, start stop watch. Determine the time in seconds that is required for the internal air pressure to reach 2.5 psig. This time interval should then be compared with the time required by specification as computed below.
- (g) List size and length of all portions of pipe under test in table similar to the one that follows. The maximum reach to be tested in one operation shall be the reach between two consecutive manholes.
- (h) By the use of Nomograph, compute K and C. Use scales d and L, read K and C, and enter these values in the table.
- (i) Add all values of K and all values of C for pipe under test.
- (j) If the total of all C values is less than one, enter the total of all K values into the space for "Time Required by Specification."
- (k) If the total of all C values is greater than one, divide the total of all K values by the total of all C values to get  $t_q$ . To make this division with the nomograph, use scales C and D, and read  $t_q$ .

DIAMETER INCHES	LENGTH FEET	$K = .011 d^2 L$	$C = .0003882 dL$

TOTAL K \_\_\_\_\_ TOTAL C \_\_\_\_\_  
Time required by specification \_\_\_\_\_



NOMOGRAPH FOR THE SOLUTION OF  $K = .011d^2L$ ,  $C = .0003882dL$ ,  $t_q = K/C$