# WATER \& SEWER PIPE STANDARDS 

 OF ORRVILLE UTILITIES

AUTHORIZED BY ORDINANCE \# 29-81 REVISION AUTHORIZED BY RESOLUTION \# U-15-01 REVISION AUTHORIZED BY RESOLUTION \#U-20-10

Robert W. Maglio
Public Utilities Board President

## TABLE OF CONTENTS

WATER - GENERAL PIPE REGULATIONS ..... 1
SECTION I - Potable Water Service Pipe ..... 2
A. TYPE "K" SOFT COPPER TUBE (ASTM B88) ..... 2
B. POLYVINYL CHLORIDE (PVC) PIPE (ASTM D2241, NSF \# 14) SDR 21, 200 PSI ..... 2
C. PE 3408 CTS WATER SERVICE TUBING - BLACK WITH BLUE STRIPES (ASTM D 2737, NFS \#14) SDR 9, 200 PSI ..... 2
D. RIGID POLYVINYL - CHLORIDE (PVC) PIPE (ASTM D1785, NSF \# 14) ..... 3
E. POLYVINYL CHLORIDE (PVC) PRESSURE PIPE (AWWA C900, NSF \# 14) ..... 3
F. SOCKET TYPE POLYVINYL CHLORIDE (PVC) PIPE FITTINGS ..... 3
G. THREADED POLYVINYL CHLORIDE (PVC) PIPE FITTINGS ..... 3
H. SOLVENT CEMENTS FOR PVC PIPE FITTINGS - (ASTM D2564) ..... 4
I. JOINTS FOR PVC PRESSURE PIPES USING FLEXIBLE ELASTOMERIC SEALS - (ASTM D3139) ..... 4
J. GASKETS FOR JOINING PVC PIPE, ELASTOMERIC SEAL - (ASTM F477) ..... 4
K. TRACER WIRE - 12 AWG SOC 10 PE (COLOR-BLUE) or LARGER. ..... 4
SECTION II - Potable Water Main Pipe ..... 4
A. CLASS 52 CEMENT LINE DUCTILE CAST IRON PIPE WITH PUSH ON JOINT - (ANSI A21.51, AWWA C151) ..... 4
SECTION III - Water Line Components ..... 4
A. DUCTILE IRON PIPE ..... 4
B. JOINTS ..... 4
C. DUCTILE IRON FITTINGS ..... 4
D. NUTS AND BOLTS ..... 4
E. TAPPING VALVE ..... 5
F. TAPPING SLEEVE ..... 5
G. CORPORATION STOPS AND VALVES ( $3 / 4$ ", $1^{\prime \prime}$ ) ..... 5
H. CURB STOPS AND VALVES ..... 5
I. CURB VALVE BOX WITH ROD ..... 5
J. ROADWAY VALVE BOX ..... 5
K. GATE VALVE ..... 5
L. FIRE HYDRANTS ..... 5

1. Inlet Connection ..... 6
2. Hoses and Nozzles ..... 6
3. Mueller No. A-423 Centurion Fire Hydrant Main Valve and Seat Ring ..... 6
3a. Hydrant Barrel ..... 6
3b. Valve and Drain Stem ..... 6
4. Detailed Specifications ..... 7
M. APPROVAL ..... 7
SECTION IV - Remote Water Meter Installation ..... 22
A. GENERAL SPECIFICATIONS ..... 22
B. WATER METER INSTALLATION IN OUTSIDE PIT. ..... 22
SECTION V - Hydrostatic Water Line Testing ..... 26
A. PRESSURE TEST ..... 26
5. Test Pressure ..... 26
6. Restrictions ..... 26
7. Pressurization ..... 26
8. Air Removal ..... 26
B. LEAKAGE TEST ..... 27
9. Allowable Leakage at Various Pressures ..... 27
C. DISINFECTION ..... 28
SEWER - GENERAL PIPE REGULATIONS ..... 31

## Table of Contents

SECTION VI - Sanitary Sewer Pipe ..... 34
SECTION VII - Specifications for Manhole Frames, Lids and Adjusting Rings ..... 35
A. GENERAL SPECIFICATIONS ..... 35
B. SUPPLIERS OF MANHOLE FRAMES AND LIDS ..... 36
C. MANHOLE RISERS ..... 36
SECTION VIII - Specification for Sanitary Sewer Drop Manholes ..... 36
SECTION IX - Service Connections ..... 38
A. PLANNED SERVICE CONNECTIONS ..... 38
B. UNPLANNED SERVICE CONNECTIONS ..... 38
C. CONNECTIONS ..... 38
D. INSERTA-TEE INSTALLATION PROCEDURE ..... 38
SECTION X -Specification for Polyvinyl Chloride (PVC) Sewer Pipe and Fittings for Sanitary Sewer Installations ..... 40
A. POLYVINYL CHLORIDE (PVC) PIPE ..... 40

1. Home Mark ..... 40
2. Fittings ..... 40
3. Lubricant ..... 40
4. Certificate ..... 40
5. Manufacturer's Installation Instructions ..... 40
6. Straightness ..... 40
7. Prior Inspection ..... 40
8. Exposure to Sunlight ..... 40
B. PIPE JOINTS ..... 41
9. Joint Testing ..... 41
10. Test Specimens ..... 41
SECTION XI - Isolation of Sanitary Sewer Extensions ..... 41
SECTION XII - Sanitary Sewer Pipe Installation ..... 43
A. SAFETY. ..... 43
B. HANDLING ..... 43
C. PROTECTION OF TREES ..... 43
D. DE-WATERING ..... 43
E. CONSTRUCTION EQUIPMENT ..... 43
F. EXCAVATION AND CONSTRUCTION MATERIALS ..... 43
G. TRENCH SUPPORTS ..... 43
H. NOISE DUST AND ODOR CONTROL ..... 44
I. ALIGNMENT AND GRADE ..... 44
11. Batter Boards ..... 44
12. Laser Beam ..... 44
J. PIPE JOINT INSTALLATION ..... 44
K. FIELD CUTTING ..... 45
L. TRENCH EXCAVATION AND BOTTOM PREPARATION ..... 45
13. Trench Bottom ..... 45
14. Trench Width ..... 45
2a. Earth excavation ..... 45
2b. Rock excavation ..... 46
15. Foundation ..... 46
M. PIPE BEDDING AND INSTALLATION ..... 46
16. Pipe Bedding ..... 46
17. Haunching ..... 46
18. Pipe Laying ..... 46

## TABLE OF CONTENTS

N. TRENCH BACKFILL ..... 46

1. Initial Backfill ..... 46
2. Initial Backfill Material ..... 47
3. Final Backfill ..... 47
4. Backfilling Under pavements Driveways, etc ..... 47
5. Casings ..... 47
6. Bulkheads ..... 49
7. Surface Conditions ..... 49
O. CONSTRUCTION AREA ..... 49
SECTION XIII - Inspection and Testing ..... 49
A. CLEANING ..... 49
B. LEAKAGE TEST PROCEDURE ..... 49
8. Infiltration Test ..... 49
9. Exfiltration Test ..... 49
10. Sanitary Force Mains ..... 50
11. Water ..... 50
C. LEAKAGE ALLOWANCE ..... 50
12. Gravity Sewers ..... 50
13. Force Mains ..... 50
D. DEFLECTION TEST ..... 50
DIRECTORY of ORRVILLE UTILITIES CONTACTS ..... 51

## WATER - GENERAL PIPE REGULATIONS

1. All water lines shall be installed with a minimum of four (4) feet of cover.
2. Sizing of water mains to accommodate future growth shall be determined by Orrville Utilities.
3. All costs for water improvements, including necessary over-sizing, shall be borne by the developer.
4. All water mains shall be extended to the farthest property line of the developer to accommodate future growth. Water mains shall be looped/connected with other existing mains when possible to maintain water quality. All water mains that are not looped/connected with other existing mains shall end with an "in line valve", a fire hydrant and watch valve, and have at least two (2) full lengths of pipe of proper diameter beyond the valve. The end of the line shall be plugged and blocked and marked. Said main extensions shall be at the expense of the developer.
5. All water installations shall be bedded in, and backfilled to 12 inches above the pipe with \#8 limestone. All trenches under paved areas shall be backfilled and properly compacted to finished grade with \#411 limestone.
6. All water pipes, fittings, hydrants, manholes, manhole castings and lids, meter pits and other appurtenances and incidentals shall conform to specifications and standards as specified in the "WATER \& SEWER PIPE STANDARDS" for the Orrville Utilities.
7. All water service taps shall be a minimum of one (1) inch diameter.
8. Flared or compression fittings are required on all copper service connections to be maintained by the City.
9. All water service lines from the main to the curb valve shall be Type " $K$ " soft copper tube or Class 52 cement lined ductile iron pipe as specified herein.
10. All water service lines from the curb valve to the building may be Type $K$ soft copper tube, Class 52 cement lined ductile iron pipe or approved plastic pipe as specified in Table 2. All water mains to be maintained by the City shall be Class 52 cement lined ductile iron pipe and fittings shall be a minimum of eight (8) inches in diameter.
11. All PVC water pipes and fittings must be accompanied by a manufacturer certificate that the pipe and fittings were manufactured and tested in accordance with the appropriate ASTM or AWWA specification. Said certificate shall be submitted to the Orrville Utilities prior to the installation of the pipe.
12. All fire hydrants to be maintained by the City shall be Mueller \# A-423 and meet the specifications contained herein. Hydrants shall be installed at a maximum spacing of 500 feet in residential areas and 300 feet in all other areas, except that a hydrant shall be installed at the end of all lines. All hydrants shall be equipped with a watch valve.

## SECTION I - Potable Water Service Pipe

A. TYPE "K" SOFT COPPER TUBE (ASTM B88)

| Nominal Size (inches) | Minimum Wall Thickness | Safe Working Pressure | O.D. |
| :---: | :---: | :---: | :---: |
| $3 / 4$ " | . 065 | 680 | . 875 |
| $1 "$ | . 065 | 680 | 1.125 |
| $11 / 4 \prime$ | . 065 | 550 | 1.375 |
| $11 / 2^{\prime \prime}$ | . 072 | 520 | 1.625 |
| 2 " | . 083 | 450 | 2.125 |
| $21 / 2^{\prime \prime}$ | . 095 | 420 | 2.625 |
| 3 " | . 109 | 410 | 3.125 |
| $31 / 2^{\prime \prime}$ | . 120 | 380 | 3.625 |
| $4 \prime$ | . 134 | 370 | 4.125 |
| 5" | . 160 | 360 | 5.125 |

Table 1 - Type "K" Soft Copper Tube Specs
B. POLYVINYL CHLORIDE (PVC) PIPE (ASTM D2241, NSF \# 14) SDR 21, 200 PSI

Minimum Wall Thickness

| $3 / 4^{\prime \prime}-.069$ | $2^{\prime \prime}-.113$ |
| :---: | :---: | :---: |
| $1^{\prime \prime}-.063$ | $2 \frac{1}{2 \prime}-.137$ |
| $1 \frac{11 / 4}{}-.079$ | $3^{\prime \prime}-.167$ |
| $11 / 2^{\prime \prime}-.090$ | $31 / 2 \prime-.190$ |

Table 2 - PVC Pipe - Minimum Wall Thickness
C. PE 3408 CTS WATER SERVICE TUBING - BLACK WITH BLUE STRIPES (ASTM D 2737, NFS \#14) SDR 9, 200 PSI

|  | Size | O.D. | Minimum <br> Wall | Weight <br> Per 100' |
| :---: | :---: | :---: | :---: | :---: |
| 200 PSI <br> DR-9 | $3 / 4^{\prime \prime}$ | .875 | .0097 | 10.3 |
|  | $1 \prime$ | 1.125 | .125 | 16.8 |
|  | $11 / 4^{\prime \prime}$ | 1.375 | .153 | 24.9 |
|  | $11 / 2^{\prime \prime}$ | 1.625 | .181 | 34.9 |
|  | $2 \prime$ | 2.125 | .236 | 59.7 |

Table 2a-CTS Water Service Tubing - Black w/blue stripes

PRESSURE RATINGS: All pressure ratings are a maximum PSI @ $73.4^{\circ} \mathrm{F}$. If temperatures exceed $80^{\circ} \mathrm{F}$, contact Charter Plastics for a working pressure derating.

INSTALLATION : All Charter PE 3408 CTS Tubing can be direct buried, plowed or pulled. This pipe is not designed for in-house or hot water applications. Buried pipe must be supported by embedment material like sand or gravel. Refer to ASTM D2774 as well as all local, state or federal guidelines.

JOINING: Charter Plastics CTS Tubing is made to ASTM D2737 and AWWA C901 Standards. It can be joined with heat fusion, or mechanical fittings designed for CTS Tubing.

TESTING: All pipe should be hydrostatically tested after installation. Do not exceed $150 \%$ of the pipes working pressure Pneumatic testing is prohibited.
D. RIGID POLYVINYL - CHLORIDE (PVC) PIPE (ASTM D1785, NSF \# 14)

| Minimum Wall Thickness - SCHEDULE 40 |  |  | Minimum Wall Thickness - SCHEDULE 80 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1" - . 133 | $21 / 2^{\prime \prime}$ | . 203 | 1" - . 179 | $21 / 2^{\prime \prime}$ | . 276 |
| $11 / 4 \prime$ - . 140 | $3^{\prime \prime}$ |  | 1" - . 191 | 3 " | . 300 |
| $11 / 2 \prime$ - . 145 | $31 / 2^{\prime \prime}$ | . 226 | $11 / 2 \prime$ - . 200 | $31 / 2 \prime$ - | . 318 |
| 2"-. 154 |  |  | 2"-. 218 |  |  |

Table 3 - Rigid PVC Minimum Wall Thickness
E. POLYVINYL CHLORIDE (PVC) PRESSURE PIPE (AWWA C900, NSF \# 14)

| PC 150, 150 PSI |  |
| :---: | :---: |
| Minimum Wall Thickness | PC 200, 200 PSI |
| $4^{\prime \prime}-.267$ | $4^{\prime \prime}-.343$ |
| $6^{\prime \prime}-.383$ | $6^{\prime \prime}-.493$ |
| $8^{\prime \prime}-.503$ | $8^{\prime \prime}-.646$ |
| $10^{\prime \prime}-.617$ | $10^{\prime \prime}-.793$ |
| $12^{\prime \prime}-.733$ | $12^{\prime \prime}-.943$ |

Table 4 PVC Pressure Pipe , Minimum Wall Thickness

## F. SOCKET TYPE POLYVINYL CHLORIDE (PVC) PIPE FITTINGS <br> Schedule 40 (ASTM D2466) <br> Schedule 80 <br> $\qquad$ ( ASTM D2467) <br> G. THREADED POLYVINYL CHLORIDE (PVC) PIPE FITTINGS <br> Schedule 80 (ASTM D2464)

H. SOLVENT CEMENTS FOR PVC PIPE FITTINGS - (ASTM D2564)
I. JOINTS FOR PVC PRESSURE PIPES USING FLEXIBLE ELASTOMERIC SEALS - (ASTM D3139)
J. GASKETS FOR JOINING PVC PIPE, ELASTOMERIC SEAL - (ASTM F477)
K. TRACER WIRE - 12 AWG SOC 10 PE (COLOR-BLUE) or LARGER.

## SECTION II - Potable Water Main Pipe

A. CLASS 52 CEMENT LINE DUCTILE CAST IRON PIPE WITH PUSH ON JOINT - (ANSI A21.51, AWWA C151)

Minimum Wall Thickness

| $6^{\prime \prime}-0.31$ | $20^{\prime \prime}-0.42$ |
| :---: | :---: |
| $8^{\prime \prime}-0.33$ | $24^{\prime \prime}-0.44$ |
| $10^{\prime \prime}-0.35$ | $30^{\prime \prime}-0.47$ |
| $12^{\prime \prime}-0.37$ | $36^{\prime \prime}-0.53$ |
| $14^{\prime \prime}-0.39$ | $42^{\prime \prime}-0.59$ |
| $16^{\prime \prime}-0.40$ | $44^{\prime \prime}-0.65$ |
| $18^{\prime \prime}-0.41$ |  |

Table 5 - Class 52 Cement Line Cast Iron Pipe w/Push On Joint, Minimum Wall Thickness

## SECTION III - Water Line Components

## A. DUCTILE IRON PIPE

All ductile iron pipes shall meet the physical property recommendations of ASTM A536, "Ductile Iron Castings" with bell and spigot push on joints, complete with gaskets, and lubricants. Unless otherwise approved, the minimum thickness for the barrel of the pipe shall be thickness Class 52 for all trench installations and thickness Class 56 for railroad bore and jack installations. Pipe shall be cement lined inside with a bituminous coating in accordance with ANSI/AWWA A21.4/C104 and the outside shall be coated with a bituminous coating. The pipe shall be manufactured in strict accordance with ANSI/AWWA A21.51/C151. (Drawing PST 101)
B. JOINTS

Push-on and mechanical joints, including accessories shall conform to ANSI/AWWA A21.11/C111 "Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings". Bolts shall be stainless steel Type 316. Flanged joints shall not be used in underground installations without prior approval. (Drawing PST 101)
C. DUCTILE IRON FITTINGS

Ductile iron standard and special fittings shall conform to ANSI/AWWA A21.53/C153, "Ductile Iron Compact Fittings, 3 inches through 24 inches and 54 inches through 64 inches. "Fittings for 3 inch through 24 inch shall be suitable for 350 psi of pressure. The fittings shall be coated outside with a bituminous coating in accordance with ANSI/AWWA A21.53/C153 and lined inside with cement mortar and sealed coated in accordance with ANSI/AWWA A21.4/C104. (Drawing PST 501A)
D. NUTS AND BOLTS

All nuts and bolts added are required to be Stainless Steel Type \# 316.

## E. TAPPING VALVE

Tapping valves shall be MUELLER T-2360-16, BRONZE, conforming to AWWA C509 Standard Tapping valve shall be of a cast ductile iron body and have an inlet flange on one end for bolting to the tapping sleeve and a mechanical joint type end connection. Tapping valve shall have a full sized resilient wedge, open left (counter clockwise), non-rising stem (NRS) and designed for a working pressure of 150 P.S.I.

## F. TAPPING SLEEVE

Tapping sleeves shall be MUELLER H-615 (4" to 12" sizes 200PSI/14"-24" sizes-150PSI), ductile cast iron, AWWA approved, "mechanical joint ends ANSI/AWWA C111 or and stainless steel tapping sleeve (PST 601) to assure uniform gasket pressure and permit centering of the sleeve on the pipe. Flange dimensions and drilling comply with ANSI B16.1 and MSS SP-60. (Drawing s PST 601 \& PST 602)
G. CORPORATION STOPS AND VALVES (3/4 ", $1^{\prime \prime}$ )

Corporation stops and valves shall be Mueller H-15008, Ground Key Corporation Stop, 3/4" to 1" with a conductive compression connection for CTS OD tubing pt Mueller H-15013 ORI-CORP Corporation Valve, $1^{1 / 2 \prime \prime}$ to $2^{\prime \prime}$ with a conductive compression outlet connection for CTS OD tubing or Mueller H15000 Ground Key Corporation Stop with a copper flare straight outlet connection. (Drawings PST 701 \& PST801)

## H. CURB STOPS AND VALVES

Curb stops and valves shall be Mueller $\mathrm{H}-15209$ with a conductive compression outlet connection for CTS OD tubing-all valves shall be left opening (counter- clockwise)-both ends Quarter turn check or Mueller H-15204 copper flare nut-both ends Quarter turn check (Drawings PST 701 \& PST801)
I. CURB VALVE BOX WITH ROD

Curb valve boxes shall be Mueller H -10314 extension type with arch pattern base and shall be adjustable in height from 42 inches to 60 inches. Curb boxes shall have one piece lids with two holes for $1^{\prime \prime}$ services or two piece lids with brass pentagon plug for 2" services and shall have the word "WATER" cast neatly on the lid (Drawings PST 1101 and PST 1201)
J. ROADWAY VALVE BOX

Valve boxes shall be genuine buffalo style cast iron, size No. 22 (Series 6850), adjustable screw type with $51 / 2$ " shaft and of such length to extend from valve to finished grade, five foot bury. Valve box covers shall be marked "WATER". (Drawing PST 1301)

## K. GATE VALVE

Gate valves shall be either double disc Mueller A-2380-20 or resilient seat wedge Mueller A2360-20 complying with AWWA C509. All gate valves shall have a non-rising stem (NRS) with rubber " 0 " ring packing seals and shall be furnished with mechanical joints unless otherwise specified. All resilient seated gate valves shall be designed for 400 P.S.I. test pressure and a maximum working pressure of 200 psi with no leakage, unless otherwise noted. All valves shall be installed in a vertical position and open by turning to the left (counterclockwise). Stainless steel Type 316 bolts and nuts shall be used. (PST 1501-PST 2001).
L. FIRE HYDRANTS

Fire hydrants shall be first line hydrants and shall conform as a minimum to the American Water Works Association standard C502, latest revision thereof. Hydrants shall be Mueller Super Centurion No. A423. Hydrants shall be compression main valve type of the center stem construction, closing with the line pressure and shall be designed for a working pressure of 150 PSI in ordinary water works service. Fire Hydrants shall meet the following specifications (Drawings \#PST 2010 and PST 2201):

## 1. Inlet Connection

The inlet shall be a 6 inch bell end connection suitable for a mechanical or push-on joint of Class 52 ductile iron spigot end pipe.
2. Hoses and Nozzles

Each hydrants shall have two $21 / 2$ inch hose nozzles and one $41 / 2$ inch bronze pumper nozzle. Hydrants shall be furnished with a five foot bury line and shall be self-draining. The hydrants shall open by turning left (counterclockwise). The equipment shall be new and all applicable warranties shall be submitted to the City upon delivery.
3. Mueller No. A-423 Centurion Fire Hydrant Main Valve and Seat Ring All hydrants shall have a main valve opening of at least $5 \frac{1}{4}$ inches in diameter. The valve gasket shall be of synthetic rubber at least 1 inch thick. The design of the main valve assembly shall be such that, the main valve and seat ring may be removed from above ground by a wrench through the upper barrel without excavation. The bronze seat ring shall thread directly into a bronze drain ring forming an all bronze waterway. All bronze internal parts shall be ASTM B-62 grade. All pressure seals shall be accomplished by the use of " $O$ " ring seals.

3a. Hydrant Barrel
The lower barrel shall be a one piece casting with integrally cast lower and upper flanges.

The design of the hydrant shoe shall be such that it may be removed from the lower barrel without disturbing the main valve seal. The lower barrel shall also be removable from the shoe without disturbing the main valve seal. The shoe shall be contoured smoothly to assure maximum flow. The interior of the shoe shall be coated with a two-part, non-toxic, thermo-setting epoxy. The coating shall be formulated from materials deemed acceptable per Food and Drug Administration Document Title 21, Section 121.2514, resins and polymeric coatings. The inlet connection of the hydrant shoe shall be six (6) inch mechanical joint.

A two-part safety flange shall accomplish the connection of the upper barrel to the lower barrel. The upper barrel shall be capable of rotating a full $360^{\circ}$ without full disassembly at the ground line.

## 3b. Valve and Drain Stem

The main valve stem shall be a two piece design joined at the safety flange area by a steel torque-diverting coupling. The coupling shall be affixed to the main valve stem by means of stainless steel clevis pins and stainless steel cotter pins. The main valve stem in the lower barrel shall be coated with a two-part, nontoxic epoxy. The coating shall be formulated from materials deemed acceptable per Food and Drug Administration Document Title 21, Section 121.2514, resins and polymeric coatings. The hydrants shall have double drain valves to facilitate complete drainage of the barrel.

The bonnet section shall be constructed of a one-piece casting and shall have a seal oil reservoir as an integral part. The oil reservoir will be such that it has two " $O$ " ring seals at the bottom, one serving as a pressure seal, the other as a dirt seal. There shall also be " $O$ " ring seals between the bronze hold down nut and the bonnet, between the hold down nut and the operating nut. The oil
reservoir will be such that the oil is recycled and all working parts in the bonnet section are lubricated each time the hydrants is fully opened and closed. The one piece operating nut will be such that there is an anti-friction washer above the thrust collar to reduce operating torque and decrease wear. Attached to the operating nut there shall be a ductile iron weather cap.
4. Detailed Specifications

One $21 / 2$ inch hose nozzle rated at 250 GPM
Two $21 / 2$ inch hose nozzle rated at 500 GPM
(0.25 P.S.I. Pressure Loss)
(1.00 P.S.I. Pressure Loss)

One $41 / 2$ inch steamer nozzle rate at 1,000 GPM (2.20 P.S.I. Pressure Loss)

Size of main valve opening
Size of inlet
Type of inlet
Hose nozzles
Steamer nozzles
Hose nozzle threads
Steamer nozzle threads
Size and shape of operating nut

Direction of opening
Depth of bury
$51 / 4$ inches
6 inches
Mechanical joint with accessories
$2-2 \frac{1}{2}$ inches
$1-4 \frac{1}{2}$ inches
National Standard 3.0686 O.D. \& $71 / 2$ T.P.I.
National Standard 5.7609 O.D. X 4 T.P.I.
$1 \frac{1}{2}$ inch pentagon

Left
5 feet
M. APPROVAL

All products shall be approved by the City of Orrville prior to installation.

## Mechanical Joint Fittings

Valve and Hydrant Connecting Pieces


Figure 1- Mechanical Joint Fittings \# PST 501A

Mueller Co. MECHANICAL JOINT TAPPING SLEEVE FOR CENTRIFUGAL C.I., D.I., \& PVC PIPE
Pen 0.de
a Catalog mumher-H-615 Mechanical Joint Tapping Sleeve

- Siees- $4^{\prime \prime}-24^{\prime \prime}$ main and outlet (see chart lelow for available size combinations)
I. Outter flainge dimensions and drilling comply with ANSI B16.1. class 125 and with MSS SP-60.
a Centified to ANSINSF 61.
a Ductile Iron body with $34^{\circ}$ NPT icest plug.
a $4^{*} * 24^{\prime \prime}$ sines -250 psig ( 1723 kPa ) maximum working pressure.


H-615

## Tapping Sleeve pipe information

| Nominal size of main | O.D. range of sleeve |  | Class and type of pipe | End Gasket part numbers |
| :---: | :---: | :---: | :---: | :---: |
|  | Inch | mm |  |  |
| 4 | $4.74 *-8.86^{*}$ | 1205-123.3 | Cast inno claskes $100,150,200$ and $A$ - all chases ductile itron - cast inon O.D. PVC plastor pipe classes 150 and 200 | 195122 |
|  | 4.87-5.32 | 1238-138.0 | Cast imon classes B, C, and D-A-C classer 100 and 150 | 195653 |
| $0^{\prime \prime}$ | 6.84-5.96 ${ }^{+}$ | 1738.176 .7 | Cast inon classes 100, 150, 290, and A-all clases dastile inve-tant ime OD. PVC plastic pipe clacses 150 and 260 | 156825 |
|  | $697-7.100^{\circ}$ | 177.1-187.9 | Cant inon clanes B, C. and D-A-C clanme 100 and 150 | 195654 |
| 5 | 8.49*-9.11 ${ }^{\text {- }}$ | $228+2313$ | Cast inom chasers 100. 150.200 A and FIB - all chases uluctile ifon - cast ifon O.D. PVC platie pipe classer 150 and 200 | 155836 |
|  | $4.12^{\circ}-4.62^{\prime}$ | 231.7-24+? | Cast imon clases B, C, and D-A-C classes 100 and 150 | 195665 |
| $10^{\circ}$ | $11.04^{\circ}-11.16{ }^{\circ}$ | 250.5-2534 | Cast irun clesses $150,200,250, \mathrm{~A}$ and B -all clanes ductile imes - cast iron OD. PVC planbe pipe (claseen 150 aml 200 | 194650 |
| 12 | $13.14{ }^{\circ}-13.26^{\prime \prime}$ | 3379-336.7 | Cast inoo classes $150,200,250, \mathrm{~A}$ and B - all clasen dactic inso - cast inon O.D. PVC platic pipe Classes 150 and 200 | 194638 |
| $14^{*}$ | 15.22\%-15.35 | 356.7.3898 | Cast imun clases 50, 100, 150,200, 250, A and 日 - all clasars dectile inn | 155127 |
| $16^{\circ}$ | 17313-17.45= | 4400-433.1 | Cast inn claswes S7, 100, 150, 200, 250, A ant B , all clases destile ition | 105128 |
| is ${ }^{-}$ | 19.42*-1955* | 493+-496.5 | Cat iono classes 50, 100, 150,200, 250. A and B - all clasees dictile ioon. | 195366 |
| $30^{\circ}$ | 2154'-21.65* | 546.7-549.8 | Cast inse classes 50, 100, 150, 200, 250, A anal B-all clasers desule ison | 195129 |
| $24^{*}$ | 25.72\% $25.55^{\prime \prime}$ | 6574-656.5 | Cast imentastes 50, 100, 150, 200, 250, A and B - all clasws dachile injo | 195130 |

## Sizes available

| Nominal size of main | Outlet size |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $4^{*}$ | $6^{\circ}$ | $8^{\prime \prime}$ | $10^{\prime \prime}$ | $12^{\prime \prime}$ | $14^{*}$ | $16^{-1}$ | $18^{*}$ | $20^{\prime \prime}$ | 24* |
| $5^{\prime \prime}$ | X | - | - | - | - | - | - | - | - | - |
| $6^{\prime \prime}$ | X | X | - | - | - | - | - | - | - | - |
| 5 | X | X | X | - | . | , | - | - | - | . |
| $10^{\circ}$ | X | X | X | X | - | - | . | - | - | - |
| $12^{7}$ | X | X | X | X | X | - | - | - | - | - |
| $14^{\circ}$ | - | x | X | X | X | X | - | - | - | - |
| $16^{\circ}$ | X | X | X | X | X | X | X | - | - | - |
| 18 | X | X | X | X | X | - | X | X | 5 | - |
| 20 | X | X | X | X | X | X | X | X | X | - |
| $24^{\circ}$ | X | X | X | X | X | X | X | X | X | X |

[^0]Figure 2- Joint Tapping Sleeve \# PST601
12.8 Mueller [o.

## STAINLESS STEEL TAPPING SLEEVE $4^{\prime \prime}-24^{\prime \prime}$


Tapping Sleeve pipe information

| Size of main | Size of outiet flange | Available sleeve O.D. ranges |  | Class and type of pipe |
| :---: | :---: | :---: | :---: | :---: |
|  |  | Inch | mm |  |
| $4^{*}$ | 3.4 | $\begin{aligned} & 4.50 \cdot 4,90 \\ & 4.80 .500 \end{aligned}$ | $114.30-124.46$ | Fron Pipe Siec PVC: COU0 Can Iroe OD PVC, Can Inoe $100-350$, A. B. C. D. Dacilic ime. AC. 100 |
| $\nabla^{\circ}$ | 4.6 | $\begin{aligned} & 6.50-6.99 \\ & 6,70-7.30 \\ & 7.10-7.50 \\ & 7,40-7.80 \end{aligned}$ | $\begin{aligned} & 167.39-177.55 \\ & 17506-185.42 \\ & 100.34-190.50 \\ & 167.96-109.12 \end{aligned}$ |  100-250, A. B. C. D. Decille inow: MC 100. 150 |
| $x^{\prime \prime}$ | $\frac{4^{n}, 6^{\prime}}{4^{\prime}, 6^{\prime}, x^{*}}$ | $\begin{aligned} & 7.90-8.10 \\ & \hline 5.62-9.06 \\ & 5.04-9.45 \\ & 9.20-9.60 \\ & 9.60-10.00 \end{aligned}$ | $\begin{aligned} & 200.66-210.52 \\ & 218.50-270.12 \\ & 229.62-240.09 \\ & 271.68-241.54 \\ & 243.84-254.00 \end{aligned}$ | frow Pige Siue PVC; CO00 Cast Inw OD PVC, Cast Inve 100-250. A. I. C. D. Dactike iron: AC 100. 150. 200 |
| 10 | $\begin{aligned} & 4^{+}, 6^{+}, 3^{+} \\ & 4^{*}, 6^{2}, 5^{+}, 10^{\circ} \end{aligned}$ | $\begin{aligned} & 490-10.30 \\ & 1675-11.11 \\ & 1105-11.45 \\ & 11.70-12.10 \\ & 12.00-12.40 \end{aligned}$ | $\begin{aligned} & 251.46-361.62 \\ & 272.54 \cdot 282.70 \\ & 280.67-290.83 \\ & 297.18-397.34 \\ & 304 . \mathrm{No} \cdot 314.46 \end{aligned}$ | Irow Mpe Sor PVC. CM00 Cai Iros OO PVC: Cas Itow 100-250. A. B, C, D. Dactile iron: AC' 100. 190, 200) |
| 12 | $4^{*}, 6^{\circ}, 5^{\prime}, 10^{\prime}, 12$ | $\begin{aligned} & 1250-12.40 \\ & 13.16-13.56 \\ & 1300-1400 \\ & 1410-14.58 \end{aligned}$ | $\begin{aligned} & 31750-327.66 \\ & 334.26-34.43 \\ & 145.44-375.46 \\ & 35 \times .14-370.33 \end{aligned}$ | (Y00 Cust Iren ODPPVC, Cas tnw 100-250, A. B, C_ D. Dectic imes, AC 100, 150. 290, C908 185 OD. FVC (14") |
| 14 | $4^{*}, 6^{\circ}, 5^{*}, 10^{+}, 12$ | $\begin{aligned} & 15.25-1565 \\ & 15.60-1600 \\ & 16.36-16.73 \\ & 15.45-15 / \mathrm{kx} \end{aligned}$ | $\begin{aligned} & 387.35-397.51 \\ & 306.24-406.40 \\ & 416.15-474.94 \\ & 415.59-426.75 \end{aligned}$ | Cous Cout fron OD PVC; Can hom 100-250, A. B, C, D; <br>  |
| 16 | $4^{*}, 6^{+}, 8^{\prime}, 10^{\circ}, 12$ | $17.40-17.80$ $17.54-17.34$ $17.85-18.25$ $18.15-18.55$ $18.60-19.00$ | $\begin{aligned} & 41.96-452.12 \\ & 13.26-344.45 \\ & 445.52-463.55 \\ & 461.01-471.17 \\ & 472.44-4 \times 2.641 \end{aligned}$ | Co0s Cint trie OO PVC, Cas tree 100-250, A. I, C. DE <br>  |
| 18 | $4^{*}, 6^{*}, x^{*}, 10^{\circ}, 12$ | $\begin{aligned} & 19.30-19.70 \\ & 19.70-20.10 \end{aligned}$ | $\begin{aligned} & 45022-50034 \\ & 50035-550.54 \end{aligned}$ | Cons Cus lioe GDPYC. Cast lowe 109-250. A. R. C. D Doutle imec Co05 B' O O. IVC GO") |
| $20^{\circ}$ | $4^{4}, 6^{\circ}, 3^{\prime \prime}, 10^{\circ}, 12$ | $\begin{aligned} & 21.40-21.80 \\ & 21.90-2230 \\ & 22.30-22.70 \end{aligned}$ | $\begin{aligned} & 543.56-553.72 \\ & 566.26-566.42 \\ & 566.42-576.68 \end{aligned}$ |  Ductile ion |
| 34 | $4 *, 9^{\circ}, 5^{\prime}, 10^{*}, 12$ | $\begin{aligned} & 23.30-23.70 \\ & 23.80 \cdot 24.10 \\ & 25.60 \cdot 26.00 \end{aligned}$ | 591天2 - 601.95 $004.52-612.14$ $6 \times 0.24$ - 660.40 | CO05 Cist inn OD PVC, Cast Inve 100-250, A, B, C. D. Dacule inn |

## MUELLER ${ }^{\circledR}$ MARK II ORISEAL CURB VALVES WITH MUELLER 110

| H-15209 | MUELLER MARK II ORISEAL |
| :--- | :--- |
| Curb Valve. MUELLER 110 <br> Conductive Compression <br> Connection for CTS O.D. |  |
| tubing-both ends Quarter turn check |  |

## 1/2" - 2" GROUND KEY DESIGN CORPORATION VALVES

Ground Key Corporation Valve
Inlet: AWWA taper
(MUELLER "CC') thread

## 1/2" - 1" GROUND KEY DESIGN

 CORPORATION VALVES| P-15008 | Ground Key Corporation Valve Inlet: AWWA taper (MUELLER "CC") thread Outlet: MUELLER ${ }^{*}$ Pack Joint Connection for CTS O.D.* tubing |  |
| :---: | :---: | :---: |
| $3 / 4$ | $344^{*} \times 1{ }^{\circ}$ | 1. |

## 1-1/2" \& 2" MUELLER ${ }^{\text {® }}$ ORI-CORP CORPORATION VALVES

| $1-1 / 2^{\prime}$ | MUELLER ORI-CORP Corpo- <br> ration Valve <br> Inlet: AWWA taper <br> (MUELLER "CC") thread <br> Outlet: MUEL,LER Pack Joint <br> Connection for CTS O.D, |
| :--- | :--- |
| ing tub- |  |

Figure 4 - Curb and Corporation Valves . PST \# 701

# MUELLER ${ }^{\circledR}$ MARK II ORISEAL ${ }^{\circledR}$ CURB <br> VALVES WITH COPPER FLARE CONNECTION 

| H-15204 |  | MUELLER MARK II ORISEAL Curb Valve Copper flare nut - both ends Quarter turn check |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| 54. | 1 | (1) $\mathrm{l} / \mathrm{F}$ | $1 \mathrm{~T}^{1 / 22^{2}}$ | F |



Figure 5 - Curb Valves w/Copper Flare Connection, PST \# 801

## CURB BOXES - IMPROVED EXTENSION TYPE WITH ARCH PATTERN BASE



Improved extension type curb box with arch pattern base - for $1 / \mathbf{2}^{\prime \prime}$ through $\mathbf{2}^{\prime \prime}$ curb valves
The arch extends around the curb valve and has a large foot surface to transmit loads into the ground beneath the curb valve, rather than to the curb valve itself. The box is cast iron and is furnished with a cast iron lid and brass pentagon plug. The upper part of the box is spring loaded and telescopes into the base to allow for grade adjustment within the range given in the dimensions charts. Stationary rods, shut-off rods and pentagon keys are optional and are ordered separately.


Foot piece (valve not included)

## Optional foot pieces

Optional foot pieces provide a firm base for the curb valve and helps to prevent the curb valve from moving when the valve is operated. This is especially important when a plastic service line is used.

Box Selection

| Curb <br> Valve \& Size | Box |  | Optional <br> Foot <br> Piece |
| :---: | :---: | :---: | :---: |
|  | Catalog Number | Inside Diameter |  |
| $300{ }^{\text {- }}$ Ball |  |  |  |
| $34{ }^{+}$ | 11-10885 | 1-1/4* | H-10396 |
|  | H-10316 | 2 | H-10391 |
| 1 | H-10385 | 1-1/4* | H-10397 |
|  | H-10316 | 2 | H-10401** |
| $1-1 / 2^{2}$ | H-10386 | 1-14* | H-10400 |
|  | H-10336 | $2^{*}$ | - |
| 2 | H-10336 | 2* | - |
| MARKII ${ }^{\text {b }}$ |  |  |  |
| $34^{-}$ | H-1035 | 1-1/4* | H-10396 |
|  | H-10316 | $2^{*}$ | H-10991 |
| ${ }^{*}$ | H-10385 | 1-1/4* | H-10397 |
|  | H-10316 | $2^{*}$ | H-10401** |
| 1-1/4* | H-10336 | 2 | - |
| 1-12* | H-10886 | 1.14* | H-10460 |
|  | H-10336 | $2^{*}$ | - |
| $2^{-}$ | H-10336 | $2^{*}$ | - |
| ORISEALIII ${ }^{3}$ |  |  |  |
| 34* | H-10385 | 1.1/4 | H-10396 |
|  | H-10316 | $2{ }^{*}$ | H10391 |
| ${ }^{*}$ | H-10385 | 1-14* | H-10997 |
|  | 11-10316 | $2^{*}$ | H.10401** |
| ORISEAL* (GreenKey) |  |  |  |
| $34^{*}$ | H-10385 | 1-1/4* | H-10396 |
| $1^{*}$ | H-10385 | 1-1/4* | H-10397 |
| 1-12* | H-10386 | 1-1/4" | H-10400 |
| 2 | 11-10386 | 1.1/4* | H-10400 |

[^1]Dimensions and Optional Stationary Rod

H-10306 and H-10308 Curb Boxes

| Curb box catalog number | Box length extended |  | Box length fully retracted |  | Weight |  | Optional stationary rod |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Inch | mm | Inch | mm | Ibs. | kg. | Part No. | L'gth inch |
| H-10306 | 34 | 640 | 18.00 | 457.0 | 12.0 | 5.4 | 85774 | 12.75 |
|  | 30 | 762 | 18.00 | 4578 | 14.0 | 6, 4 | 54546 | 15.0 |
|  | 46 | 914 | 24.00 | 6100 | 150 | 6.5 | 54275 | 210 |
|  | 42 | 1067 | 30.00 | 7620 | 15.0 | 73 | 54233 | 27.0 |
| $\begin{aligned} & 1-1 / 4^{\prime \prime} \\ & \text { tuppor } \\ & \text { section } \end{aligned}$ | 48 | 1219 | 36.00 | 914.8) | 17.0 | 7.7 | 84245 | 33, |
|  | 54 | 1572 | 4200 | 1067.0 | 580 | 1.2 | 54207 | 39.0 |
|  | 60 | 1524 | 41.00 | 1219.0 | 19.1 | 8.6 | 5415.4 | 450 |
|  | 66 | 1676 | 54.00 | 1372.0 | 20.0 | 9.5 | 4-2861 | 51.0 |
|  | T2 | 1539 | 00.00 | 1524.0 | 22.0 | 10.0 | 54341 | 57.0 |
|  | 78 | 1951 | 66.00 | 1676,0 | 23.0 | 10.4 | 84207 | 63.0 |
|  | 84 | 2134 | 72.00 | 1129.9 | 24.0 | 10.9 | 84152 | 69.0 |
|  | 90 | 2256 | 78.000 | 1941.31 | 25.0 | 11.3 | 8E703 | 75.0 |
|  | 06 | 2438 | 84.00 | 2143.0 | 26.0 | 118 | S6271 | 11.0 |
| H-10308 | 24 | 670 | 20.44 | 519.2 | 13.0 | 5.9 |  |  |
|  | 30 | 762 | 20.4 | 5192 | 15.0 | 6.8 | 8.842 | 150 |
|  | 36 | 914 | 21.00 | Eilla | 16.0 | 7.3 | 13256 | 21.15 |
|  | 42 | 1067 | 30.00 | 7620 | 17.0 | 7.7 | 84326 | 27.0 |
| 1-1/2* <br> upper section | 48 | 1219 | 36,00 | 9145 | 18.0 | $\mathbf{8 . 2}$ | 83305 | 33, 3 |
|  | 54 | 1372 | 42.00 | 1067.0 | 20.0 | 9.1 | 84338 | 39.0 |
|  | 60 | 1524 | 4K.00 | 1219.0 | 21.0 | 9.5 | 84353 | 45.0 |
|  | 66 | 1575 | 55.00 | 1572.0 | 22.0 | 100 | 8K702 | 51.0 |
|  | 72 | 1829 | 60.00 | 1524.0 | 23.0 | 10.4 | S4255 | 57.0 |
|  | 78 | 1951 | 66.00 | 1676.0 | 250 | 11.3 | 88290 | 63.0 |
|  | 84 | 2134 | 72.00 | 1529.9 | 26.0 | 11.8 | 50604 | 09.19 |
|  | 90 | $27 \mathrm{N6}$ | 7xico | 1085 | 27.0 | 122 | 84832 | 7500 |
|  | 96 | $24 \times 8$ | 84.00 | 2143,0 | 28.0 | 12.7 | 88139 | 810 |

## Extra lids and plug

Lids are cast iron with an integrally cast brass bushing which allows for easy removal of pentagon plug.


Lid with Plug


Plug only


One piece lid

| Curb <br> Box <br> Catalog <br> number | One <br> piece <br> lid part <br> number | Lid with <br> brass <br> pentagon <br> plug - part <br> number | Lid with <br> brass <br> bushing <br> and cast <br> iron plug | Plug only part <br> $n n n m b e r ~$ |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
|  | Cast Iron | Brass |  |  |  |
| H-10306 | - | 89369 | 89375 | 58039 | 63670 |
| H-10308 | - | 581642 | 89980 | 58116 | 63683 |
| H-10310 | 89982 | 681714 | 89981 | 59478 | 63684 |
| H-10314 | - | - | - | - | - |
| H-10334 |  | 89376 | 89376 | - | 36571 |


squaritcly.



Figure 8 - Screw Type Valve Box Detail, PST 1301


Dimensions

| Dimension* | Nominal size |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $2^{\prime \prime}$ | $3^{\prime \prime}$ | $4^{\text {a }}$ | $6^{\prime \prime}$ | $8^{\text {¹ }}$ | $10^{* \prime}$ | $12^{*}$ |
| A | 9.85 | 1235 | 14.19 | 18.00 | 21.50 | 2550 | 28.62 |
| FF | 8.50 | 4.00 | 10.00 | 1150 | 12.50 | 14.75 | 14. KK |
| L. | 2.50 | 2.50 | 2.50 | 250 | 2.50 | 2.50 | 2.50 |
| N | 452 | 7.50 | 9.12 | 11.12 | 13.37 | 1562 | 17.85 |
| O (number and size of holes) | 4-88 | $4-188$ | 4-88 | 6-. 88 | 6-88 | 8-88 | 5-88 |
| DD | 3 3 0 | 4.00 | 5.00 | 6.90 | 780 | 9.75 | 9.88 |
| Q (hore) | 230 | 3.30 | 4.30 | 6.30 | 830 | 10.30 | 12.30 |
| OOfbolt sicke diameter) | 5.00 | 6.19 | 750 | 9.50 | 11.75 | 14.00 | 16.25 |
| Tums to open | 8 | 11 | 14 | 205 | $2 \mathrm{~h}, 5$ | 33 | 38.5 |
| Weighe* | 40 | 83 | 129 | 180 | 250 | 405 | 540 |

*All dimensions arc in inches. All weights inclak ascessories are in pounds and are approxinate.

## MUELLER $^{\circledR} 2360$ SERIES $^{\text {TM }}$ RESILIENT WEDGE GATE VALVE

## MUELLER ${ }^{\text {² }} 2300$ Series Resilient Wedge Gate Valves

Mueller ${ }^{*}$ Resilient Wedge Gate Valves have features to make them easier to operate and to preserve the scaling capability and interior coating integrity for many years of reliable service. In addition to popular end connection options, Mueller brand RW valves can be ordered with Mueller's exclusive Aqua-Grip ${ }^{\text {™ }}$ System that incorporates an O-ring sealed compression connection and integral pipe restraint in one "ready to use" easy and quick 10 install package.

## Mueller $\mathbf{2}^{\prime \prime}-\mathbf{1 2}^{\prime \prime} \mathbf{2 3 6 0}$ Series Resilient Wedge Gate Valve Features

d TRIPLEO-RING SEALS PLLS DIRT SEAL - two atowe thrum collar and cese below, ntais latricant is this cribical ascu. Top two are replaceahle with valve fully open and under wownere. Fourth seal at top serves as datt mallt.
a TWO ANTL-FRKCTOON WASHERS WIIT LIBRICATION - mule of polymer, one above and one below the thrust collat, redece operating kixpue to open or clase value.

- STEM - foryed munganese broax bar stock is upect, then machioed to fiom a threst collar for superice stivegth in dias crisical arca.
a WEDGE - chat iron, fully encipue lated in moldad nibber - no exposed irmo.
(a EXTENDED WHDGE GUIDES - moldid ar part of wodjes, nide insid body chanacls fo maintain wedye alignment throuphout is traviL.
a CHIDE CAP BEARINCS - made of polymer and mapped over nutber conernd walet guides, proyide bearits surfacos that prowed both wedpe and imterior booly couting form war and nid in easy cperation - evon the largest valuc intallad bxizotally. Rulices. track or scrapers auc now noeded.

a SMOOTH OVHRSTZD HLOW WAY - full, round, uschstructed flow way aconmmodates full sime cymers, poovides superior flow characiensticr and reduces pumpisy conter,**

〕 MULIEE* PRO-GARD" FUSION EPOXY COATING - 10 mile* thick protects all inide and ouside iron ingfaces, and complies with AWW A C550 and certified in ANYU/NSF 61.
a 250 PSMG MAXIMUM WORKING Presstire - Hydrostatically wited at 500 page. Surpuesen ANSV/AWWA Standan CS09 by 254 . ULFM: 200 psigy MWP ***
a AMERICAN MADEQLALTTY - faclory in Chatlanooga. TN with ISO 90012000 sertificatione. and UL. 262 . FM II2V11s0. Cerified to ANsUNSF 61. Manufactured and lested it compliance with ANSI/AWWA Standard CS09. UL Listed and FM Aprowed.
a BI-DHRECTIONAL HLOW
( R AT BOTIOMSTREACES - Itands uqxight for canicr handling and storage
] IO-YEAR IIMITED WARRANTY - anmared relabibly (see reparate Marlier Wartanty documest for larm).

Mueller $14^{\prime \prime}-48^{\prime \prime} 2361$ Series Resilient Wedge Gate Valve Features
In addition to all the features of the smaller 2360 series valves, large size Mueller 2361 series RW valves offer these features:

1 STIM - Manganese frome cantag with integral thrust collar.
a. WEDGE - Ductile iton, fully cocipualated is molded rubber:
a BODY AND BONNET - Ductile iron.
*Nominat
**16' wive tignires 1/2" undersimed cuner
***2ty pit thaM moting avalable as as aption
tDis real on 4"12' valves.


- COMPLIANCF - In addation to thoer above ANSVAWWA Sundard C515.
a MAXIMUM WORKING PRESSURE - $14^{\prime \prime}-18^{\prime \prime}$ AWWA
valves rated at 250 peill-sested at 500 prig. L1.4M valves 200 prig MWP ( $14^{\circ} \cdot 16^{\circ} 250$ prig (WP) =**

Figure 10 - Mueller 260 Series Resilient Wedge Gate Valve, PST \# 1701


Dimensions

| Dimension* | Nominal size |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | $4^{\prime \prime}$ | 6" | $8^{\prime \prime}$ | $10^{\text {² }}$ | $12^{*}$ |
| A | 14.19 | 18.00 | 21.50 | 25,50 | 28.62 |
| L | 2.50 | 2.50 | 250 | 250 | 250 |
| N | 9.12 | 11.12 | 13.17 | 15.62 | 17.88 |
| $\bigcirc$ (mumber and sine of holles for MU) | 4. 38 | 6-. 28 | 6. B $_{88}$ | 8-, Sk | 8-, 88 |
| Q (bote) | 4.30 | 630 | 830 | 10.30 | 12.30 |
| OOf ibolt circle diameter for MD$)$ | 7.50 | 9.50 | 11.75 | 14.00 | 16.25 |
| R | 9.00 | 11.00 | 13.50 | 16.00 | 19.00 |
| UW Boit ciecle shameter for 17) | 7.50 | 950 | 11.75 | 14.25 | 17.00 |
| F | 9.50 | 11.80 | 12.00 | $17 . \mathrm{kx}$ | 14.44 |
| B (number and site of holes for HL) | 8-75 | 8-85 | $8-38$ | 12-1.00 | $12-1.00$ |
| Tume so open | 14 | 30.5 | 36.5 | 33 | 315 |
| Weighr ${ }^{\text {P }}$ | 115 | 168 | 275 | 400 | 570 |

[^2]
## 2"-12" A-2360 RESILIENT WEDGE GATE VALVES - M.J. x M.J.

A-2360-20 Mechanical joint ends (with accessories unassembled)
A-2360-23 Mechanical joint ends (less accessories)
A-2360-25 Mechanical joint ends (with transition gaskets accespories unassembled)
a Sizes-2", 3", $4^{*}, 6^{*}, 8^{+}, 10^{\circ}, 12^{\prime \prime}$

1. Meets or execeds all applicable requirements of ANSV/AWWA C509 Standard. IL. Linted, FM Approved, and certified to ANSI/NSF 61.

- Standard mechanical joint ends comply with ANSV/AWWA C1II
a. Iron body with nominal 10 mils MUELIER ${ }^{3}$ Pro-Gard" Fusion Epoxy Coated interior and exterior surfaces
- Epoxy coating mects or excects all applicable requirements of ANSU/AWWA C550 Standard and is certified to ANSI/NSF 61
a. Iron wedge, symmetrical \& fully encapealated with molded rubber, no exposed iton
- Non-tising stem (NRS)
a. Triple $O$-ring seal stufting hox $(2$ upper \& I lower $O$-riags), with forth $O$-ring serving as din scalt $\dagger$
- $2^{*}$ square wreach nut (optional handwheel available)-open left or open right
a. 250 psig ( 1723 kPa ) maximum working pressure,

500 psig ( 3447 kPa ) static lest pressure
(a) 3~12" sizes - UL Listed, FM Approved: $200 \mathrm{prig}(1379 \mathrm{kPa})$
$\dagger$ Dirt seal on $4^{-}-12^{-}$valver

## Options <br> See page 10.40 for more information on Resilient Wedge Gate Valve options <br> I. Potition indicators D Stainless sted farteners: Type 316 <br> a ASTM B98-C66100/H02 stem D Handwheel

Resilient wedge gate valve parts

| Catalog Part No. | Description | Material | Material Standard |
| :---: | :---: | :---: | :---: |
| G-16 | Bonnel Bolts \& Nuts | Stainlexs Steel | Type 304 |
| G.41 | Stufting Bex Bolts \& Nuts | Stainless Steel | Type 304 |
| G-49 | Stem O-rings (3) | Rubber |  |
| C- 200 | Wrench Nut Cap Screw | Stainleas Steel | Type 304 |
| G. 201 | Stuffing Box Seal | Rubber |  |
| G. 202 | Wrench Nut | Cast Iron | ASTM A126Cl. B |
| C. 203 | Stem | Bronie | ASTM BI38 |
| Ci. 204 | Hand Wheel | Castron | ASTM A126C7.B |
| G-205 | Stem Nut | Broine | ASTM B62 |
| C. 206 | Guide Cap Bearings | Celcan |  |
| G. 207 | Stuffing Box with dint sealtt | Cast Iron, Rubber | ASTM A126Cl.B |
| C. 208 | Anti-fiction Washer (2) | Celcon |  |
| G-209 | Wedec. <br> Rubber Encapsulation | Cast lron* <br> Rubber | ASTM A126C7. B |
| G-210 ${ }^{+4}$ | Bomad | Cat Iron * | ASTM A126Cl. 8 |
| G-211** | Bobuct O-rine | Nitrite |  |
| Q.212** | Body | Cast Imon* | ASTM A126ClB |

+ Fully encapsulated in molded rubber with bo iron exposed
*Previous to 1999 bese parth os $4^{\prime \prime-12^{\prime \prime}}$ valver wat dealgned with a gasker isstrad of an O-ring and with
 whon orderise a replacemem gesket or O -ring

†tDirf seal an $4^{\prime \prime}+12^{*}$ valves
* Hody and hannet of $12^{\prime \prime}$ valves ane ductile iros stanfard wall thickness in compliance with CSO9,

Figure 12 - A-2360, 2"-12" Resilient Wedge Gate Valves - M.J. X M.J., PST \# 2001

## MUELLER SUPER CENTURION $250^{*} 3$-Way Fire Hydrant Features

(] ANTI-FRICTION WASHER
helpw assure cany turning operation for the life of the hydrant.
[ OLLEILLER PLUG
permits quick cbeck of oil
level. Lots you aidd oil
withoat femoving bonnet.
[] OLL RESERVOIR O-RING SEALS seal oil in, water out.
] STAINLESSTEEL
SAFETY STEM COUPLING; puth free if bydrunt is lit by a vehicle preventing danage to the stemi and mais valve. Coupling will not break into pieces that could drop inte lower barrel and affect valw operation. Top of lewer stem is below the top of the lower barzel so that a tive cannot depress the stem ansl open the main valve. Repair is easy and economical.
[J SAFETY FLANGE - broaks cleanly to help prevent burrel damages. yet is strong enough to withstand normal handling. Allows coonomical repair, adding of extension section, rotation or changing of upper barrel without digeing or water shut-off.

- BRONZE UPPER VALVE PLATE oonical denign for smooth flow.
a DRAIN VALVE EACINGS
specially designed. looz-life facings provide effective scaling.
- DUCTILE IRON CAP NUT retains main valve. Seats apainst cap nut gasket to prevent cormsion of stem throads. Lacked in place by a stainless steel lock washer. Mueller HP Epoxy coated for durability.
(J) 250 PSIG - 3-way hydrant: 250 psig ( 1723 kPa ) maximum warking prossure, $500 \mathrm{psig}(3447 \mathrm{kPa})$
(] SHOE DESIGNED FOR MAXIMUM FLOW AND EASY CONNECTION
with ith smooth tramsitional contoun, extended neck and integral anti-rotation pods, allowing use of standand lee-bead bols. The inside of the sboe is covered with MUELLER H $\mathrm{T}^{*}$ Epoxy Coating. This thermosetting epoxy forms a tough corrosion-resistant barrier to cliemicals, physical impast and electrical cturrents.
- HOLD-DOWN NUT - with integral weather seal. Deagn discourages unauthorized re moval of the bolddown nut or bronze operating nuil. Resilient wiper seal between holddown nut and operating nut prevents water entry to profect operating nut from frevzing. Wiper seal material is resistant to ultra-wiolet ny detenoration. O-ring seal provides second level of protection.

- MEETS OR EXCEEDS
all applicable requirements of ANSI/AWWA C502 Standard and UL 246 and FM 1510 apecificatione.

」 O-RING SEALS AT BONNET, GROUND, AND SHOE FLANGES for better leak resistance, easier maintenabce.

- SEALED OLL RESERVOIR - Oring sealed to prevent Jeakage. Provides positive lubrication of stem threads and bearing surfaces each time the hydrant is operated. Filled at the factory

」 FULL FLOW OPENINGS
large radius hoie and pounper openings. prodace low friction loss

- FIELD REPLACEABLE HOSE AND PUMPER NOZZLES - O-ring sealed. Threaded in place und retained by stainless sheel locke. Nozales are sasily replaced.
] ELECTRO-GALVANIZED BOLTS AND NUTS - provide corrosion protection.
d NON-KINKING CHAINS
heavy-daty chains are securely attached to the hydrant. Special chain loop pernits free turning of the cap.
- BRONZE SEAT RING - threaded into drain ring and $O$-ring sealed. Seat ring ts easily removed or installed from above ground. Each time main valve is opened or closed, double drain valver foree-flush both drain valve openings to keep them open for effective barrel drainage. Bronze drisa valves are integral purts of main valve assembly.

Manufactured under one or more of the following: U.S. Patent No, 4,717,178; 4,842,246.

Figure 13 - Mueller Super Centurion Fire Hydrant, PST \# 2101

## Flav. 8-04 Shaded area indicates changes

- Super Centurion $250^{\circ}$ 3-way catalog uumbers (approved to UL. 246, FM 1510, ANSI/AWWA C502 Standards) -
A-421 4-1/2 main valve opening three way (two hose nozzles and one pumper nozzle)
A-423 5-1/4" main valve opening three way (two hose nozzles and one pumper nozzle)
Super Centurion 200"2-way catalog numbers
(approved to ANSI/AWWA C502 Standards) -
A-420 4-1/2" main valve opening two way (two hose noceales)
A-422 5-1/4 $4^{\prime \prime}$ main valve opening two way (two hose nozzles)
A-425 5-1/4" main valve opening two way (two pumper nozzles)
Super Centurion $200^{\text {n }}$ 1-way catalog number
(approved to ANSU/AWWA C502 Standards)-
A-4244-1/2 main valve opening one way (one pumper nozzle)
- 10 year limited warranty on material and workmanship
[1 Meets all applicable parts of ANSU/AWWA C502 Standard
- Post type dry barrel design
- Dry top design with O -ring sealed oil rescrvoir
- Traffic feature with stainicss stoel safely stem coupling
- Compression-type main valve closes with pressure for positive seal; it is made of rubber and is conveniently reversible providing a spare for long service life
- Operating nut available in wide variety of shapes and sizes-open left or right
- Field replaceable hose and pumper nozzles

1. Hose and pumper nozzles have large radius, full flow openings for low friction loss
D. Contoured shoe is designed for full flow

- Dual bronze drain valves provide effective barrel drainage
- 250 psig ( 1723 kPa ) maximum working pressure, 300 psig ( 3447 kPa ) static test pressure for 3 -way hydrants; 200 psig ( 1379 kPa ) maximum working pressure, 400 psig ( 2758 kPa ) static test pressure for 2-way and 1-way hydrants


## Dimensions





* 4" Vertical shoe avaitable for

A-420 and A-421 hydrants.

SEE PAGE 9.28 FOR ORDERING INSTRUCTIONS

Figure 14 - Mueller Super Centurion Fire Hydrant, PST \# 2201

## SECTION IV - Remote Water Meter Installation

This specification is the installation of residential $5 / 8$ inch $X 3 / 4$ inch remote water meters. All commercial and industrial meters must be approved on an individual basis as per the General Rules and Regulations of the Water Division. All meter installations shall be planned and constructed for remote reading devices. The owner or contractor is responsible for contacting the Orrville Utilities so that the remote wire installation can be made prior to enclosing walls, ceilings, etc.

## A. GENERAL SPECIFICATIONS

All meter installations shall be inspected and approved by the Orrville Utilities before permanent water service is established. If the meter installation does not meet Department of Public Utility Standards, the water will be shut off at the curb valve and water service shall not be established until the meter installation is revised and subsequently inspected and approved. A trip charge based on the current applicable rate is found in the General Rules and Regulations of the Meter Department, shall be charged for all inspection and turn on requests except for the initial request.

No water meter will be set until all appropriate lines have been inspected and approved by the Orrville Utilities inspector. This item refers to both water and sewer lines.

Meters shall not be installed in any inaccessible places such as, behind water heaters, furnaces, washers and dryers, in crawl spaces, bathrooms or bedrooms. In addition, meters shall not be installed in locations that might be exposed to extreme temperatures, either hot or cold, unless proper protection of the meter and lines is provided, and the installation is approved by the Department of Public Utilities.

Meter pits, if permitted, are required to have approval of the Director. If approved, meter pits shall meet the specifications of the utility and be furnished, owned and maintained by the consumer. Water meters shall be installed as follows:
*Reference next page for Meter Instruction Drawing (\# PST 2301)

## B. WATER METER INSTALLATION IN OUTSIDE PIT

1. Meter pit cannot be under trailer.
2. Meter pit must be accessible at all times.
3. Box must be kept in good repair at all times.
4. Meter pit may be made of treated wood or equivalent wood with minimum thickness of 1 inch and insulate with 2 inch thick Styrofoam or a manufactured Mueller/McCullough meter vault (for approved equal). Lid must be a removable cover with an opening size no smaller than 20 inches by 28 inches. (Drawing \# PST 2250)
5. Meter pits located in low or wet areas must be designed to prevent water from filling pit.
6. Pipe from pit should be at least 34 inches underground or if above ground must be insulated so as not to freeze. That part of the service line that will be outside shall have heat tape running from the "in" side of the meter to the trailer with a fiberglass wrap (with windbreaker wrap on outside) from inside the box to the point of attachment to trailer.
7. Pit must have enough heat either from soil or heat tape (with thermostat or limit so as not to damage meter) to keep from freezing in winter. All meters damaged by freezing will be repaired or replaced at customer's expense.
8. All water meters shall have a solid electrical bonding "jumper" placed around them, conforming to the National Electric Code (N.E.C.) and all other applicable standards and regulations, unless the structure is served by a non-metallic water line.
*for Meter Pit reference (Drawer \# PST 2401)

## FEATURES



1. Rigid PVC material
2. Round styles
3. Setter anchored in place for stability
4. Aluminum bottom optional

Two diameters - 24" for single 1-1/2" displacement meter (13" length) $-27^{\prime \prime}$ for single $2^{\prime \prime}$ displacement meter (17" length).


Figure 15 - Meter Pit Drawing, PST \# 2250


Figure 16 - Meter Instruction Drawing, PST \# 2301


NOTES: 1. METER PIT CANNOT BE UNDER TRAILER.
2. METER PIT MUST BE ACCESSIBLE AT ALL TIMES.
3. PIT MUST HAVE ENOUGH HEAT EITHER FROM SOIL OR HEAT TAPE (WITH THERM OSTAT OR LIMIT SO AS NOT TO DAMAGE METER) TO KEEP FROM FREEZING IN WINTER.
4. BOXMUST BE KEPT IN GOOD REPAIR AT ALL TIMES.
5. BOX SHOULD BE MADE OF TRE ATE D WOOD OR EQUIVALENT.
6. IN VERY WE SOIL OR LOW PLACES WHERE WATER IN PIT IS APROBLEM, ALL DUE CARE MUST BE TAKEN TO LIMIT WATER PROBLEM.
7. PIPE FROM PIT SHOULD BE AT LEAST $34^{*}$ UNDERGROUND OR IF ABOVE GROUND, MUST BE PROPERLY (I.E. WELL) INSULATED SO AS NOT TO FREEZE. THE SECTION OF THE SERVICE LINE THAT WILL BE OUTSIDE, SHOULD HAVE THE HEAT TAPE RUN FROM THE "IN" SIDE OF THE METER TO THE TRAILER WITH A FIBER GLASS WRAP (WITH WIND BRE AKER WRAP IN OUTSIDE) FROM INSIDE THE BOX TO THE POINT OF ATTACHMENT TO THE TRAILER.
8. ALL M ETERS DAM AGED BY FREEZING WILL BE REPAIRED OR RE PLACED AT CUSTOMER'S EXPE NSE.
9. INSULATION AROUND THE METER AND HEAT TAPE ARE PROPERTY OWNER'S RESPONSIBILITY. WATER DEPT. WILL NOT BE LIABLE FOR DAMAGE OF SUCH.

Figure 17 - Meter Pit Drawing with Detail, PST \# 2401

# SECTION V - Hydrostatic Water Line Testing 

Ref: AWWA C-600-82, AWWA C-601
The developer of his contractor shall perform hydrostatic water line testing in accordance with A.W.W.A. Standard C-600-82 specified herein. Air pressure testing may be used to isolate problems but is not acceptable for final approval of water lines by the Orrville Utilities. The developer or his contractor shall provide gauges for pressure tests. All water used for water line testing supplied from the City water supply is at the expense of the developer.

## A. PRESSURE TEST

1. Test Pressure

All newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure at the point of testing.
2. Restrictions

Test pressures shall:
2a. Not be less than 1.25 times the working pressure at the highest point along the test section.

2b. Not exceed pipe or thrust-restraint design pressures.
2c. Be of at least a 2-hour duration.
2d. Not vary by more than +-5 psi ( 0.35 Bar$)$ for the duration of the test.
2e. Not exceed twice the rated pressure of the valves or hydrants when the pressure boundary of the test section includes closed gate valves or hydrants. Note: Valves shall not be operated in either direction or differential pressure exceeding the rated pressure.

2f. Not exceed the rated pressure of the valves when the pressure boundary of the test section includes closed resilient-seated gate valves or butterfly valves.
3. Pressurization

Each valved section of pipe shall be filled slowly with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the owner. The test pressure shall be based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. It is good practice to allow the system to stabilize at the test pressure before conducting the leakage test.
4. Air Removal

Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the contractor shall install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged or left in place at the discretion of the City.

## B. LEAKAGE TEST

The leakage test shall be conducted concurrently with the pressure test.

1. Leakage Defined

Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within five (5) psi ( 0.35 Bar) of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water. Leakage shall not be measured by a drop in pressure in a test section over a period of time.
2. Allowable Leakage

No pipe installation will be accepted if the leakage is greater than that determined by the following formula:
$L=\underline{S D \vee P}$
133200
In which $L$ is the allowable leakage, in gallons per hour; $S$ is the length of pipe tested, in feet; $D$ is the nominal diameter of the pipe, in inches; and $P$ is the average test pressure during the leakage test, in pounds per square inch gauge. In metric units.
$L m=\underline{S D V}$
2816
In which Lm is the allowable leakage, in liters per hour; $S$ is the length of the pipe tested, in meters; $D$ is the nominal diameter of the pipe in inches; and Pis the test pressure in Bars. These formulas are based on an allowable leakage of 11.65 gpd , per mile, per inch nominal diameter at a pressure of 150 psi.
3. Allowable Leakage at Various Pressures

Allowable leakage at various pressures is shown in Table 6.
Allowable Leakage per $1000 \mathrm{ft}(305 \mathrm{~m})$ of Pipeline
Nominal Pipe Diameter - Inches

| Average Test <br> Pressure PSI <br> (Bar) | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $250(17)$ | .36 | .47 | .71 | .95 | 1.19 | 1.42 | 1.66 | 1.90 | 2.14 | 2.37 | 2.85 |
| $225(16)$ | .34 | .45 | .68 | .90 | 1.13 | 1.35 | 1.58 | 1.80 | 2.03 | 2.25 | 2.70 |
| $200(14)$ | .32 | .43 | .64 | .85 | 1.06 | 1.28 | 1.48 | 1.70 | 1.91 | 2.12 | 2.55 |
| $175(12)$ | .30 | .40 | .59 | .80 | .99 | 1.19 | 1.39 | 1.59 | 1.79 | 1.98 | 2.38 |
| $150(10)$ | .28 | .37 | .55 | .74 | .92 | 1.10 | 1.29 | 1.47 | 1.66 | 1.84 | 2.21 |
| $125(9)$ | .25 | .34 | .50 | .67 | .84 | 1.01 | 1.18 | 1.34 | 1.51 | 1.68 | 2.01 |
| $100(7)$ | .23 | .30 | .45 | .60 | .75 | .90 | 1.05 | 1.20 | 1.35 | 1.50 | 1.80 |

Table 6 - Nominal Pipe Diameter
*-If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.
\# - To obtain leakage in liters/hour, multiply the values in the table by 3.785.
4. When testing against closed metal-seated valves, an additional leakage per closed valve of $0.0078 \mathrm{gal} / \mathrm{h} / \mathrm{in}$. ( $0.0012 \mathrm{~L} / \mathrm{h} / \mathrm{mm}$ ) of nominal valve size shall be allowed.
5. When hydrants are in the test section, the test shall be made against the closed hydrant.
6. Acceptance of installation: Acceptance shall be determined on the basis of allowable leakage. If any pipe laid discloses leakage greater than that specified in Section II.B., the contractor shall, at this own expense, locate and make repairs as necessary until the leakage is within the specified allowance.
7. All visible leaks are to be repaired regardless of the amount of leakage.
C. DISINFECTION

1. Newly installed or repaired water main shall be disinfected in accordance with AWWA C651 Standards. The forms of chlorine that may be used are liquid chlorine, sodium hypochlorite and calcium hypochlorite granules or tablets using the continuous feed, slug or tablet method. The continuous feed method is the most suitable for general applications. Following chlorination, the main should be flushed as soon as possible since prolonged exposure to high concentrations of chlorine might damage the asphaltic seal coat.

BASIC DISINFECTION PROCEDURE
The basic disinfection procedure consists of:
a. Inspecting all materials to be used to ensure the integrity of the materials.
b. Preventing contaminating materials from entering the water main during storage, construction or repair and noting potential contamination at the construction site.
c. Removing by flushing or other means, those materials that may have entered the water main.
d. Chlorinating any residual contamination that may remain and flushing the chlorinated water from the main.
e. Protecting the existing distribution system from backflow caused by hydrostatic pressure test and disinfection procedures.
f. Documenting that an adequate level of chlorine contacted each pipe to provide disinfection.
g. Determining the bacteriological quality by laboratory test after disinfection.
h. Final connection of the approved new water main to the active distribution system.

Upon filling of the water mains, the potable water shall be chlorinated so that after a 24 hours holding period in the main there will be a free chlorine residual of not less than $10 \mathrm{mg} / \mathrm{l}$. After the holding period the heavily chlorinated water shall be flushed from the main until chlorine measurements show the concentration in the water leaving the main is below $2 \mathrm{mg} / \mathrm{l}$. After flushing and before the new water is connected to the distributions system, two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from a sampling tap. No hose or fire hydrant shall be used in the collection of samples.

All samples shall be tested for bacteriological quality in accordance with Standard Methods for Examination of Water and Wastewater; and shall show the absence of coliform organisms. If the initial disinfections fails to produce satisfactory bacteriological results, the new main may be reflushed and shall be resampled. If check samples also fail, the main shall be rechlorinated by the continuous feed or slug method until satisfactory results are obtained. (You may use the above method or other AWWA approved disinfection methods).

## SEWER

SECTION

## SEWER - GENERAL PIPE REGULATIONS

1. All sewer lines shall be installed with a minimum of four (4) feet of cover.
2. Sizing of sanitary sewer mains to accommodate future growth shall be determined by Orrville Utilities.
3. All costs for sewer system improvements, including necessary over-sizing, shall be borne by the developer.
4. All sewer mains shall be extended to the farthest property line of the developer to accommodate future growth. Said main extensions shall be at the expense of the developer.
5. All sewer installations shall be bedded in, and backfilled to 12 inches above the pipe with sand or pea gravel. All trenches under paved areas shall be backfilled and properly compacted to finished grade with sand or gravel.
6. All sewer pipes, fittings, manholes, manhole castings, and lids, meter pits and other appurtenances and incidentals shall conform to specifications and standards as specified in the "WATER \& SEWER PIPE STANDARDS" for the Orrville Utilities.
7. All sanitary sewer service laterals from the main to the building shall be PVC pipe conforming to ASTM D3034 material specification and ASTM D 3212 joint specification. Said sanitary sewer shall be a minimum of six (6) inches in diameter and installed with a minimum slope of one (1) percent. Where an existing four (4) inch " $\gamma$ " branch is found, and deemed serviceable by the City, the building sewer may be four (4) inches in diameter and installed with a minimum slope of two (2) percent.
8. All gravity sanitary sewer mains to be maintained by the City shall be a minimum of eight (8) inches in diameter and be PVC pipe conforming to ASTM D3034 material specification and ASTM D 3212 joint specification of ASTM F 1803 and F949.

PVC gravity sanitary sewer pipe and fittings confirming to ASTM D3034 shall be allowed for sanitary sewers when the depth of cover is greater than four (4) feet and no more than twenty (20) feet and when the internal pipe diameter is less than or equal to ten (10) inches.

PVC gravity sanitary sewer pipe and fittings conforming to ASTM F 1803 and F949 shall be allowed for sanitary sewers greater than ten (10) inches in internal diameter and greater than twenty feet (20) in depth.
9. Force main sanitary sewers shall be constructed of Class 52 cement lined ductile cast iron pipe or PVC pipe and fittings, which shall conform to ASTM D2241, SDR21, 200 psi.. They shall be a minimum of two (2) inches in diameter and have a minimum of four (4) feet of cover.
10. A manufacturer certificate that the pipe and fittings were manufactured and tested in accordance with the appropriate ASTM specification must accompany all PVC pipes and fittings. Said certificate shall be submitted to the Orrville Utilities prior to the installation of said pipe.
11. All sanitary sewer manholes installed in, or tributary to, the City of Orrville sanitary sewer system shall be precast concrete meeting ASTM C-478 material specification an dASTM C-443 joint specification.

They shall be installed at a maximum of 400 feet apart and at the end of all sewer mains and in changes in sewer line direction greater than 15 degrees.
12. All sanitary sewer manholes to be maintained by the City shall be covered with Neenah R-1787 or 1785 manhole frame and lid as per Section VI herein. (TABLE 11).
13. Grease traps must be installed according to Wayne County Health Department specifications when required. Detailed drawing of minimum design requirements attached. (Reference next page for drawing \# PST 2401A).


Figure 18-500 Gallon Grease Trap, PST \# 2401A (1 of 2)


Figure 19 - Grease Trap Interceptor, PST \# 2401 A (2 of 2)

## SECTION VI - Sanitary Sewer Pipe

## SANITARY SEWER PIPE (GRAVITY)

|  |  | MATERIAL | JOINT |
| :--- | :--- | :---: | :---: |
| A. | VITIRIFIED CLAY SEWER MAINS AND LATERALS | SPECIFICATION | SPECIFICATION |
| B. | TYPE PSM POLYVINYL CHLORIDE (PVC) | ASTM C- 700 | ASTM C -425 |
| C. | MAIN LATERAL SEWER PIPE $<18$ INCHES | ASTM D -3034 | ASTM D - 3212 |
| D. | PVC SANITARY SEWER \& FITTINGS $>18$ INCHES | ASTM F - 1803 |  |
|  |  | ASTM F -949 |  |

Table 7 - Sanitary Sewer Pipe (Gravity)

| Minimum Wall Thickness |  |
| ---: | :---: |
| $44^{\prime \prime}-.120$ |  |
| $6^{\prime \prime}-.180$ |  |
| $8^{\prime \prime}-.240$ |  |
| $10^{\prime \prime}-.300$ |  |
| $12^{\prime \prime}-.360$ |  |
| $15^{\prime \prime}-.437$ |  |

Table 8 - Minimum Wall Thickness - Sanitary Sewer Pipe

## SANITARY SEWER FORCE MAIN PIPE

| A. | POLYVINYL CHLORIDE (PVC) PIPE, SDR - 21 | ASTM D - 2241 |
| :--- | :--- | :--- |
| B. | POLYVINYL CHLORIDE PRESSURE PIPE | AWWA C -900 |
| C. | CLASS 52 DUCTILE CAST IRON PIPE | ANSI - A21.51 |

Table 9 - Sanitary Sewer Force Main Pipes

SANITARY SEWER MANHOLES, CASTINGS \& LIDS

|  |  | MATERIAL | JOINT |
| :--- | :--- | :---: | :---: |
|  |  | SPECIFICATION |  |$\quad$ SPECIFICATION

Table 10 - Sanitary Sewer Manholes, Castings \& Lids

## SECTION VII - Specifications for Manhole Frames, Lids and Adjusting Rings

This specification is for Ferrous Castings. Materials used in the manufacture of castings shall conform to ASTM, AASHTO, ASA, MIL, AMS or Federal Specifications for Gray Iron or other applicable standards. They shall be of uniform quality, free from blowholes, porosity, hard spots, shrinkage distortion or other defects. They shall be smooth and well cleaned by shotblasting. They shall be coated with asphalt paint, which shall result in a smooth coating, tough and tenacious when cold, not tacky and brittle.
A. GENERAL SPECIFICATIONS

All castings shall be manufactured true to pattern; component parts shall fit together in a satisfactory manner. Round frames and covers shall have machined bearing surfaces to prevent rocking and rattling under traffic. As a minimum, the castings shall conform to ASTM A 48, Class 30 with tensile strength 30,000 pounds per square inch.

The lids shall have cast in them for identification, the words SANITARY SEWER.


BOTTOM REINFORCING


IDENTIFICATION CODE
$\mathrm{A}=23.75^{\circ}$
$\mathrm{B}=1^{\prime \prime}$
$\mathrm{C}=23^{\circ}$
$\mathrm{D}=31.25^{\prime \prime}$ (min.)
$\mathrm{E}=\mathrm{TBD}$ BY GRADE
$\mathrm{F}=$ = SANITARY SEWER"
CAST INTO LID
$\mathrm{G}=\mathrm{KNOBS} 1.5^{\prime \prime}$ DIA. X $3 / 8^{\prime \prime} \mathrm{HIGH}$


Figure 20 - Sanitary Cast Iron Lids, PST \# 2501

## B. SUPPLIERS OF MANHOLE FRAMES AND LIDS

Suppliers include the following:

| NAMES OF SUPPLIER | NUMBER - | FRAME A ND LID |
| :--- | :--- | :--- |
| Nennah Foundry | R-1787 | $4 \frac{112 \prime}{2}$ rise |
| East Jordan Iron Works | R-1785 | $9^{\prime \prime}$ rise |
| Item 1 - Manhole Frame with Solid Lid, Total Weight 350 lbs. |  |  |

Table 11 - Suppliers of Manhole Frames and Lids

## C. MANHOLE RISERS

Manhole risers shall be one of the adjustable type or solid type and must be fitted properly to the existing casting and lid. Riser rings shall consist of domestic A-36 steel $3 / 41$ thickness steel inner and domestic A-36 steel $1 / 2$ " thickness outer ring. Certified welders shall perform all welds in accordance with AWS D1.5 Bridge Code. The riser ring shall be anchored to the manhole frame to prevent any movement from traffic loads with (3) $1 / 2^{\prime \prime} \# 5$ cone head set screws or bolts. The adjustment device shall be fabricated from stainless steel, shall be capable of adjustment $+/-3 / 8^{\prime \prime}$ from nominal. The manhole adjustment ring shall fit within the existing casting without interference and the manhole lid shall have bearing on all the surface of the inner ring to prevent rocking from occurring. The lid shall be removable without binding. The inner and outer ring shall be securely welded to prevent any differential movement between the inner and outer rings under traffic loads and shall be fabricated to $+/-1 / 16^{\prime \prime}$ concentricity. The outer riser shall have an inside diameter no greater than $3 / 16^{\prime \prime}$ larger than the outside diameter of the manhole lid and shall not be greater than $4^{\prime \prime}$ in height. All materials shall be bituminous asphalt coated. (See Next Page for Drawing \# PST 2601).

All grade adjustments using riser rings shall be approved by the City and fit properly. No more than 2 adjusting rings may be used per mahole frame.

## SECTION VIII - Specification for Sanitary Sewer Drop Manholes

This specification is for sanitary sewer drop manholes. Drop manholes may be installed in, or tributary to, the City of Orrville sanitary sewer system, only when approved by the Department of Public Utilities. They shall conform to design criteria contained therein.

Drop manholes shall not be utilized for immediate changes in sewer elevatiaon of less than two (2) feet. The drop pipe shall be, as a minimum, 8 " in diameter but it shall not be of lesser diameter than the influent line, which it serves.

For manholes constructed prior to January 1, 1981, which are served an effluent line with a diameter smaller than 8 ", the Orrville Utilities may consider influent lines and drop pipes of less than 8 " diameter but not less than the diameter of the effluent line.

Installation of drop manhole installations shall be in the presence of a qualified inspector designated by the Department of Public Utilities.

Drop manholes are used to provide for significant changes in grade or elevation resulting from the topography of the area. These structures should be used as infrequently as possible since they are a source of high
turbulence in sewage flow. Where hydrogen sulfide gas (H2S) is present in sewage, agitation turbulence developed by drop manhole can cause the H 2 S gas to be released, resulting in severe odor problems and corrosion of the manhole structure.

Two types of drop manholes are currently accepted.

1) Inside drop manholes (Drawing \# PST 2701, item A)
2) Outside drop manholes (Drawing \# PST 2701, item B)

The inside drop is the preferred method because of its economic and maintenance benefits. Reference Drawing \# PST 2701


1. DROP IS REOUIRED WHEN INVERT DIFFERENTALIS 24 OR GREATER

2 HEIGHT OF DROP PIPE IS TO BE SHOMN ON THE PLANS OR WLL BE DETERNINED AT THE TIME OF CONSTRUCTION.
3. WHERE CALLED FOR AND UNLESS OTHERWSE REQURED BT THE PLANS, THE OUTS DE DROP WIL BE CONTRUCTED WITH NEW MANHOLES

4 MATERALLS FOR THE TEE DROP PIPE, AND THE BENDSHALL BE OFONE TYPE AND BE OUE OF THE FOLOMNG INSDE DROP CASTIRON OR PVC, OUTSIDE
DROP CI SOIL VIT. SEVER, OR PVC.
5 OUTSIDE DROP PIPES REQUREA $5^{\prime}$ THICK MINNUMA CLASS 'C' CONCRETE ENCASEMEVT ON THREE SIDES OF PIPE AND TIED TO MANHOLE WALL WTH $5 / 8$ ' 'U'
RODS $\times 6^{\prime}$ LONG@1Z.
6. INSIDE DROP IIAY BE USED ON NEN CONSTRUCTION PROMDED THAT 60' BASE AND FISER SECTIONS ARE USED.

Figure 21 - Sanitary Sewer Drop Manholes, PST \# 2701

## SECTION IX - Service Connections

A. PLANNED SERVICE CONNECTIONS

All service connections, installed as a part of new sanitary sewer main installation, shall be by means of an approved tee, a minimum of six (6) inches in internal diameter. Said service connection shall be extended a minimum of three (3) feet into the property to be served, capped watertight, and the termination location indicated by a treated $2 \times 2$ marker extended a minimum of one foot above finished grade.
B. UNPLANNED SERVICE CONNECTIONS

All unplanned service connection methods must be approved by the Inspector and are at the expense of the Contractor. They shall be made in the field under observation of the Inspector. Service saddles may be installed, either gasketed and clamped or solvent cemented. When a field cut-in service connection is required, the following precautions should be observed.

1. Carefully cut the opening for the type of fitting to be used.
2. Prevent entrance of foreign material info cut-in pipe opening.
3. Use proper fitting and procedure for installing the field connection.
4. After curing for 24 hours, bed and backfill properly all pipe and fittings. (Note: Solvent welded fittings will gain $50 \%$ of full strength after 24 hours of curing time.)
5. Be sure and use ASTM D3034 saddles. Do not confuse with D3033.

## C. CONNECTIONS

Connections to pipe of different materials shall be made with approved adapters. For taps into all known approved solid wall, profile and closed profile pipe. INSERT TEE fittings, shall be used. Installation must be made according to INSERTA FITTINGS CO. installation procedures and using approved lubricants. (Reference next Drawing \# PST 2801).
D. INSERTA-TEE INSTALLATION PROCEDURE

Use Hole Saw Core Bits for PVC, Ribbed, and Polyethylene pipe. Use Diamond Core Bits for Concrete, Clay, D.I. and Fiberglass Pipe.

## TOOLS REQUIRED

1. Hand held drill with hole saws recommended for 4 " $, 6^{\prime \prime}, \& 8^{\prime \prime}$ INSERTA TEES. Tie down coring machine recommended for $10^{\prime \prime}$ X $12^{\prime \prime}$ INSERTA TEES and all diamond bits.
2. BITS

| INSERTA TEE size |  |
| :--- | :--- |
| $4^{\prime \prime}$ | $41 / 2^{\prime \prime}$ |
| $6^{\prime \prime}$ | $61 /$ l $^{\prime \prime}$ |
| $8^{\prime \prime}$ | $83 / 4^{\prime \prime}$ |
| $10^{\prime \prime}$ | $107 / 8^{\prime \prime}$ |
| $12^{\prime \prime}$ | $127 / 8^{\prime \prime}$ |
| $15^{\prime \prime}$ | $1513 / 16^{\prime \prime}$ |

3. 6 lb . Hammer and $2^{\prime \prime} \times 4^{\prime \prime}$ board.
4. Bottle of INSERTA TEE solution supplied with order.

## INSTALLATION PROCEDURE

1. Core the proper size hole. See bit diameters above.
2. Insert the rubber sleeve into the cored hole with the GOLD VERTICAL LINE ON THE RUBBER SLEEVE facing to the side of the mainline. The upper segment should be on top of the wall or rib and the lower segment (PVC, Ribbed, or Polyethylene pipe only) should be on the inside of the pipe.
3. Apply the INSERTA TEE solution supplied to the inside of the rubber sleeve and outside of the PVC hub adapter. CAUTION! DO NOT use on oil based lubricant.
4. Place the PVC hub adapter into the rubber sleeve. Make sure that the RED VERTICAL LINE ON THE PVC HUB addepter is in line with the gold vertical line on the rubber sleeve.
5. Place the $2^{\prime \prime} \mathrm{X} 4$ " board on top of the PVC hub adapter.
6. The RED HORIZONTAL LINE AT THE TOP OF THE HUB ADAPTER is a depth mark. This tells the installer just how far to drive the adapter into the rubber sleeve. Using the board and the hammer drive the PVC hub adapter into the rubber sleeve to where the HORIZONTAL RED LINE ON THE PVC HUB ADAPTER MEETS THE TOP OF THE RUBBER SLEEVE.
7. Install the stainless band around the top of the rubber sleeve and tighten down.
8. Install side service pipe in normal manner.


Figure 22 -Sewer Pipe Inserta-Tee, PST \# 2801

## SECTION X -Specification for Polyvinyl Chloride (PVC) Sewer Pipe and Fittings for Sanitary Sewer Installations

A. POLYVINYL CHLORIDE (PVC) PIPE

PVC sanitary sewer pipe and fittings conforming to ASTM D3034 shall be allowed for sanitary sewers when the depth of cover is greater than four (4) feet and no more than twenty (20) feet and when the internal pipe diameter is less than or equal to ten (10) inches.

PVC sanitary sewer pipe and fittings conforming to ASTM F 1803 and F 949 shall be allowed for sanitary sewers greater than ten (10) inches in internal diameter and greater than twenty feet (20) in depth.

1. Home Mark

All pipe spigots shall have a "home" mark to facilitate joint closure.
2. Fittings

PVC fittings shall be factory made and provided with joints of proper design to connect to the pipe or approved adapters shall be furnished to connect the pipe to the fittings. Approved adapters shall be provided for connection to pipes of different materials. All joints and fittings shall be formed to provide a leak-free and easily assembled system.
3. Lubricant

The proper lubricant recommended by the manufacturer shall be used. Lubricants that contain petroleum oils or vegetable oils may promote bacterial growth causing damager to the gaskets or pipe and are not approved.
4. Certificate

A manufacturer's certificate that the PVC material and pipe was manufactured and tested in accordance with the appropriate ASTM specification shall be provided to the inspector prior to installation of the pipe.
5. Manufacturer's Installation Instructions All PVC pipes delivered to the job site must be accompanied by the manufacturer's installation instructions and guidelines.
6. Straightness

Pipe intended to be straight shall have a maximum deviation from straightness of $1 / 16$ inch per lineal foot when measured in accordance with ASTM D2122.
7. Prior Inspection

No pipe and fittings may be installed unless approved by the Inspector immediately prior to installation and all rejected pieces must be completely removed from the work site. Pipe acceptable to the Inspector shall be substituted for rejected pieces at the developers or owners expense. No repairs of pipe or fittings will be allowed; undamaged lengths of straight pipe may be salvaged by neatly sawing off the damaged portion of the pipe and re-beveling as described in Section XI.
8. Exposure to Sunlight

The contractor shall take measures to protect the pipe from prolonged exposure to heat or direct sunlight (ultraviolet rays).
B. PIPE JOINTS

PVC sanitary sewer pipe joints shall be elastomerically gasketed conforming to ASTM D3212 push-on type.

## 1. Joint Testing

Testing of PVC sanitary sewer pipe joints, when so directed by the inspector, shall be performed in accordance with ASTM D3212 for gasketed joints, with modification as specified below. The Contractor shall provide all equipment necessary to conduct the pipe joint test.

## 2. Test Specimens

The inspector may initially and periodically select random sewer pipe for test purposes. The tests shall be performed on not less than two specimens and not less than one (1) percent of the total pipe length of each size and joint type required for the project.

## SECTION XI - Isolation of Sanitary Sewer Extensions

A watertight plug approved by the Orrville Utilities shall be installed by the Owner or his contractor at his point of connection to the existing sanitary sewer system. The plug shall be put in place as soon as the sewer extension work commences and shall remain in place until all improvements are approved by the Orrville Utilities and said development is formally accepted by the Council of the City of Orrville. Approval by the Orrville Utilities consists of the following various stages and/or items as follows:

- Plan submittal to City of Orrville for review and approval.
- Payment of all applicable deposits, fees, etc.
- Construction inspection and approval prior to backfilling trench.
- Sewer line cleaning, testing and approval.
- All manholes brought to finished grade and properly sealed and grouted.
- All sewer improvements have been constructed as per the requirements of the approved construction plans and specifications and have passed inspection and testing. Refer to Section XII, Inspection \& Testing.


Figure 23 - Sewer Line Plug Installation, PST \# 2901

## SECTION XII - Sanitary Sewer Pipe Installation

A. SAFETY

For the security and safety of persons in and adjacent to trenches or construction operations, the safety regulations of the appropriate federal, state and local agency(s) shall be adhered to.
B. HANDLING

Pipe, fittings, manhole sections, and accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall such materials be dropped. Pipe handled on skidways shall not be skidded or rolled against other pipe. Pipe and fittings shall be lowered gently into the trench. The inspector will reject any pipe or fittings dropped into the trench.
C. PROTECTION OF TREES

Special care shall be taken to avoid damager to trees and their root systems. Any damage incurred by trees, shrubs or lawns are the sole responsibility of the contractor.
D. DE-WATERING

Should water be encountered, the Contractor shall furnish and operate suitable pumping equipment of such capacity adequate to dewater the trench. The trench shall be sufficiently dewatered so that the laying and joining of the pipe is made in the dry. The Contractor shall convey all trench water to a natural drainage channel or storm sewer without causing any property damage in accordance with the Ohio Environmental Protection Agency's (OEPA) requirements contained in the National Pollutant Discharge Elimination System (NPDES) program. Trench water may not be conveyed to a sanitary sewer at any time and shall be conveyed without causing any property damage.
E. CONSTRUCTION EQUIPMENT

Where sewers are located in or adjacent to pavements, all digging, backfilling and materials handling equipment shall have rubber tires. Crawler equipment shall be permitted when there is no danger of damaging pavements or walkways. Any damages incurred to pavements, sidewalks, etc., is the sole responsibility of the contractor.

## F. EXCAVATION AND CONSTRUCTION MATERIALS

All excavated material and all construction materials used in prosecution of the work shall be deposited so as not to endanger the work or workers, create unnecessary annoyance to the public or interfere with natural drainage courses. During the progress of the work, all material piles shall be kept trimmed up and maintained in a neat, workmanlike manner.

## G. TRENCH SUPPORTS

Unsupported open cuts for sanitary sewers shall not be permitted where trenching may cause unnecessary damage to street or sidewalk pavement, trees, structures, poles, utilities, or other private or public property. During the progress of the work, whenever and wherever it is necessary, the Contractor shall, as his expenses, support the sides of the excavation by adequate and suitable sheeting, shoring, bracing or other approved means. Such trench support material and equipment shall remain in place until backfilling operations have progressed to the point where the supports may be withdrawn without endangering property. In lieu of removing all the sheeting, the Contractor may cut off the sheet two (2) feet above the top of the pipe and remove the upper portion. If all the sheeting is to be removed, it shall be removed without causing damage to the pipe.

## H. NOISE DUST AND ODOR CONTROL

The Contractor's construction activities shall be conducted so as to eliminate all unnecessary noise, dust and odors.
I. ALIGNMENT AND GRADE

Proper alignment and grade is the responsibility of the Contractor and he shall control his line and grade by use of:

1. Batter Boards

If batter boards are utilized, line and grade stakes shall be placed at regular intervals, not to exceed 25 feet, at some convenient offset from the centerline of the pipe. Batter boards shall be carefully placed immediately following the excavating equipment and a continuous check on trench depth shall be maintained. Suitable equipment, supplied by the contractor, for measuring from a line drawn taut over the batter boards shall be utilized. Such line shall be carefully located on the batter boards on the centerline of the pipe. In no event will pipe be laid unless a minimum of three batter boards are in place and checked.
2. Laser Beam

Prior to the use of a laser beam, the contactor shall furnish a complete description of all equipment to be used, methods of use and proof of competency of the operator. If approved by the inspector, the Contractor may elect to use a laser beam as an alternative to utilizing batter boards for horizontal and vertical control of the sewer. If a laser beam is to be utilized, line and grade stakes shall be placed at 25 feet and 50 feet from the downstream manhole and then placed at every 100 -foot station to the next manhole. The laser beam shall be set up in such a manner that the alignment of the beam is through the pipe directly on the centerline of the pipe or outside the pipe directly above and parallel to the centerline of the pipe.

If the laser unit is set up on the centerline of the pipe, a blower shall be used to provide positive continuous air circulation within the pipe. A target shall be established on line and grade to provide a method of checking the setting of the laser beam as construction progresses. The Contractor shall provide means to ensure the grade pole is plumb when checking pipe grade. The grade pole shall be set on the invert of the pipe when checking alignment and grade. Should, in the opinion of the inspector, the laser method be found to be unsatisfactory, the contractor shall discontinue its use and complete the job using batter boards.
J. PIPE JOINT INSTALLATION

The preparation and assembly of the gasketed joint shall be performed as recommended by the pipe manufacturer. The elastomeric gaskets may be supplied separately in cartons of pre-positioned in the bell joint at the factory. When gaskets are color coded, be sure to consult the pipe manufacturers literature for the significance.

Prior to assembly, clean the gasket and bell interior, especially the groove area and the spigot area with a rag, brush or paper towel to remove any dirt or foreign material. Inspect the gasket, pipe spigot bevel, gasket groove, and sealing surfaces for damage or deformation. Use on gaskets which are designed for and supplied with the pipe. Insert them as instructed by the manufacturers literature.

Good alignment of the pipes is essential for ease of assembly. Align the spigot to the bell and then insert the spigot into the bell until it contracts the gasket uniformly. Do not swing or "stab" the joint; that is, do not suspend the pipe and swing it into the bell. If undue resistance to insertion of the pipe end is encountered, or the "home" mark does not position properly, disassemble the joint and check the position and condition of the gasket. If it is twisted or pushed out of its seat (fishmouthed), inspect components, repair or replace damaged items, clean the components, and repeat the assembly steps. Be sure both pipes are in concentric alignment. If the gasket was not twisted or out of position, verify proper location of the "home" mark. If not in the proper location, relocate the position of the "home" mark.

## K. FIELD CUTTING

To join field-cut pipe, it is necessary to first prepare the pipe ends. Square cuts are essential for proper assembly. Cut the pipes with a hacksaw, handsaw or a power handsaw with a steel blade or abrasive disc. The pipe should be marked around its entire circumference to assure a square cut. Use a factory furnished beveled end as a guide for proper bevel angle, and depth plus the distance to the "home" mark. The pipe can be beveled using a pipe beveling tool, wood rasp, portable sander or abrasive disc. Round off any sharp edges on the leading edge of the bevel with a pocketknife or file.

## L. TRENCH EXCAVATION AND BOTTOM PREPARATION

1. Trench Bottom

The trench bottom shall be constructed to provide a firm, stable and uniform support for the full length of pipe. Bell holes shall be provided at each joint to permit proper joint assembly and alignment. The trench shall be excavated not less than six (6) inches or more than 12 inches below the barrel of the pipe. All loose material shall be removed from the trench bottom. Any part of the trench bottom excavated below grade shall be backfilled to grade and should be compacted as required to provide firm pipe support. When an unstable subgrade condition is encountered which will provide inadequate pipe support, additional trench depth shall be excavated and refilled with suitable foundation material. Ledge rock, boulders and large stones should be removed to provide a minimum of six (6) inches of suitable material on all sides of the pipe and fittings.
2. Trench Width

Widths of trenches shall be held to a minimum to accommodate the pipe and appurtenances. The trench width shall be measured at the top of the pipe barrel and shall conform to the following limits:

## 2a. Earth excavation <br> Minimum Outside diameter of pipe barrel plus 8 inches, i.e. 4 inches on each side.

Maximum Nominal pipe diameter plus 24 inches.

## 2b. Rock excavation

Minimum 24 inches or less; outside diameter plus 12 inches larger than 24 "" outside diameter plus 18 inches.

Maximum Nominal pipe diameter plus 24 inches.
3. Foundation

All sanitary sewers are to be built on a good foundation. If, in the inspector's opinion, the material forming the trench bottom is not suitable for a good foundation, a further depth shall be excavated and the same filled with suitable material. Any excavation and the restoration of the foundation below the trench bottom shall be at the expense of the Contractor.

## M. PIPE BEDDING AND INSTALLATION

1. Pipe Bedding

Bedding is required primarily to bring the trench bottom up to grade. After preparation of the trench bottom, a pipe bed shall be prepared using crushed stone or crushed gravel meeting the following requirements:

| Nominal Pipe Size | AASHTO M43 SIZE |
| :---: | :---: |
| Less than 15 inches | 67,7 or 8 |
| 15 inches to 30 inches | 6 or 67 |
| Greater than 30 inches | 57 or 67 |

Table 12 - Pipe Bedding

The bedding material shall be placed to provide uniform and adequate longitudinal support under all surfaces of the pipe and spread the full width of the trench bottom. A compacted depth of at least six (6) inches is required. The pipe installer shall carefully prepare the bed for the pipe both from a line and grade standpoint.
2. Haunching

The most important factor affecting pipe performance and deflection is the haunching material and its density. The bedding material shall be placed so as to fill the space under the lowest part of the pipe by slicing under the haunches with a shovel. Where coarse materials have been used for bedding, the same coarse material shall also be used for haunching. After the pipe is laid, aligned and graded, the bedding material shall be brought halfway on the pipe (springline) for the full width of the trench.
3. Pipe Laying

The laying of the pipe on the prepared bed shall commence from the lowest point, with spigot ends pointing in the direction of flow. All pipes shall be laid true to line and grade. They shall be carefully centered so that when laid, they will form a sewer with a uniform invert. A pipe plug shall be used to prevent the entrance of foreign material whenever pipe-laying operations are not in progress.

## N. TRENCH BACKFILL

1. Initial Backfill

All trench excavations shall be backfilled immediately after the pipe has been laid and inspected. Initial backfill shall be completed to a point twelve (12) inches over the top of the
pipe. No tamping of the initial backfill directly over the top of the pipe is permitted as it could disturb the embedded pipe.
2. Initial Backfill Material

Shall be gravel, crushed gravel, or crushed stone meeting the following grading indicated in Table 12 below:

| INITIAL BACKFILL MATERIAL: 310 |  |
| :---: | :---: |
| Sieve | Total Percent Passing |
| $2 \frac{1}{2}$ | 100 |
| 1 inch | $70 \%$ to $100 \%$ |
| No. $4(3 / 16$ inch | $25 \%$ to $100 \%$ |
| No. 40 | $10 \%$ to $50 \%$ |
| No. 200 | $5 \%$ to $15 \%$ |

Table 13- Initial Back fill Material: 310

The fraction passing a no. 40 sieve shall have a liquid limit not great than 30 and a plasticity index not greater than six (6).
3. Final Backfill

Unless under paved areas, from 12 inches above the pipe barrel to the surface, excavated trench material may be used as backfill material. The material used in the final backfilling operation need not be as carefully selected as the bedding, haunching and initial backfill but no material shall be sued for backfill that contains frozen earth. Debris, large stones, or rocks, or earth with an exceptionally high void content. The Contractor may use mechanical equipment to place the backfill but this shall be done in such a manner that the material does not free fall, but shall be so placed that it will flow onto the previously placed material. The Contractor shall consolidate the backfill in such a manner as will insure the minimum possible settlement and the least interference with traffic. No compacting of the backfill with mechanical equipment such as wheeled vehicles will be permitted unless sufficient cover (minimum of four (4) feet is provided over the pipe to prevent damage to the pipe.
4. Backfilling Under pavements Driveways, etc

When backfilling under pavements, driveways, sidewalks, etc., granular material meeting the requirements o table 13 , page 58 , shall be used all the way to the surface. The trench shall be backfilled with granular material so placed and compacted as to make a satisfactory pavement subgrade and prevent further settlement. Granular material shall be placed in layers of approximately six (6) inches in thickness and compacted with mechanical tampers. It may be compacted with water if satisfactory drainage is provided for the free water. All backfilling under city streets must be approved by the City.
5. Casings

PVC sanitary sewer pipe installed under highways, etc., may be installed in casings if required by the Director. Such installations may be necessary to:

5a. Prevent damage to structures caused by soil erosion or settlement in the line installation effected by line failure or leakage.

5b. Permit economical pipe removal and replacement in the future.
5c. Accommodate regulations or requirements imposed by public or private owners of property under which the pipe is installed.

5d. Permit boring rather than excavation where open cutting would be impractical or prohibitively expensive.

The required spacing of support skids for various sizes of pipe is indicated below in Table 14:

| CASING SIZES |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| $\begin{array}{c}\text { Nominal Pipe Size } \\ \text { (Diameter in inches) }\end{array}$ | $\begin{array}{c}\text { Casing Size } \\ \text { (Inside Diameter) } \\ \text { inches }\end{array}$ |  | $\begin{array}{c}\text { Maximum Skid } \\ \text { Support Spacing }\end{array}$ |  |
|  | $8-10$ | $203-254$ | 4.7 | meters |$] .4$

Table 14 - Casing Sizes
When PVC pipe is installed in casings, skids must be used to prevent damage to pipe and bell joints during installation and to provide proper long-term line support. PVC pipe in casings should not rest on bells. Skids should properly position the pipe in the casing. Skids may extend the full length of the pipe, with the exception of the bell and shall be pressure treated lumber and be fastened securely to the pipe with stainless steel strapping or clamps.

Below Drawing \# PST 3001 shows a typical skid arrangement.


NOTE $12^{\prime \prime}$ \& UNDER - 4 SKIDS

Figure 24- Typical Skid Arrangement, PST \# 3001
6. Bulkheads

The Contractor shall place bulkheads of clay soil across the trench at 100 -foot intervals to resist the movement of groundwater through the granular material. Such bulkheads shall be carefully compacted and shall extend approximately three (3) feet in a direction parallel to the pipe and shall extend from the bottom of the trench to a height of 12 inches above the top of the pipe barrel.
7. Surface Conditions

The trench surface shall be periodically attended to during the course of the project. The trench shall be maintained in a safe condition and shall not interfere with natural drainage.

## 0. CONSTRUCTION AREA

The Contractor shall be responsible for the maintenance of all areas disturbed by construction for a period of one (1) year from the date of acceptance by the City.

# SECTION XIII - Inspection and Testing 

Reference - Ten State Standards, 1990

## A. CLEANING

Prior to the plug being pulled, the contractor shall pump as much of the accumulated water as possible from the new sanitary sewers. A high velocity sewer-cleaning machine shall then be used to clean the new sewers. Following the cleaning the sewer shall be tested by the appropriate method. (Note: Clean water shall be used for the exfiltration test at the expense of the contractor).

## B. LEAKAGE TEST PROCEDURE

1. Infiltration Test

The contractor must use an infiltration test when the height of the groundwater table is two (2) feet or more above the top of the pipe barrel, including house services, at the highest point of the section being tested. The amount of infiltration may be measured by means of a weir located in the downstream manhole and shall not exceed the allowable leakage. The inlet end of the upstream manhole shall be securely sealed. The test head shall be maintained for a period of not less than 24 hours before the weir measurement is made.
2. Exfiltration Test

The contractor must use an exfiltration test when the groundwater conditions defined in Section XII, B 1 (preceding paragraph) are not present. The inlet ends of the upstream and downstream manholes shall be closed with a watertight plug. The sewer along with the upstream manhole shall be filled with clean water until the elevation of the water in the upstream manhole is two (2) feet higher than the top of the pipe barrel, including house services or two (2) feet above the existing groundwater in the trench, whichever is the higher elevation. The entire length of section to be tested shall be filled and maintained full of water for a period of 24 hours prior to the start of the test. If the water level in the upper manhole has dropped during this 24 -hour period, the level shall be raised to the test elevation mark prior to the measurement of leakage. The exfiltration will be determined by measuring the amount of water required to maintain the above stated water elevation for a period of one (1) hour from the start of the test. The allowable leakage is based on a maximum difference in elevation of eight (8) feet between the level of water at the upper manhole and the invert of the pipe being tested in the lower manhole. If the difference in elevation exceeds eight (8)
feet, the allowable leakage shall be increased 5\% for each one (1) foot in excess of eight (8) feet.
3. Sanitary Force Mains

A force main leakage test section shall be any length the contractor elects to test. The section of force main to be tested shall be backfilled prior to testing. Each valved section of force main shall be slowly filled with clean water and the specified test pressure shall be applied by means of a pump connected to the force main in a manner satisfactory to the inspector. Before applying the specified test pressure, all air shall be expelled from the force main. The water pressure shall be brought up to 100 pounds per square inch unless otherwise noted on the plans or in the specifications and maintained for at least two (2) hours. Leakage will be determined by measuring the quantity of water to be supplied to maintain the specified test pressure.
4. Water

The developer of his contractor shall perform water leakage tests as specified herein. Air leakage tests may be used to isolate problems but are not acceptable for final approval of sewer lines by the Department of Public Utilities. The developer or his contractor shall provide gauges for force main tests. All water used for sanitary sewer testing supplied from the City water supply is at the expense of the developer. A leakage test section for sanitary sewers shall be from the inlet end of the downstream manhole to the inlet end of the upstream manhole, including the upstream manhole and all house services.

## C. LEAKAGE ALLOWANCE

1. Gravity Sewers The maximum leakage allowance for all gravity sanitary sewers shall be 100 gallons per inch diameter per mile of pipe per 24 hours.
2. Force Mains

The maximum leakage allowance for all force mains is 25 gallons per inch diameter per miles of pipe per 24 hours.

## D. DEFLECTION TEST

Deflection of the pipe diameter shall not exceed five (5) percent. All installed pipe shall be tested for deflection 30 days or more after the trench has been backfilled properly to finished grade. The method of testing shall be subject to the approval of the Director. If rigid balls or mandrels are used to test for excessive pipe deflection, no mechanical pulling devices shall be used. Failure of free passage of the testing device shall be cause for rejection of the sewer, and "recleaning", "rebidding" or "replacement" is at the expense of the Contractor.

All construction related costs such as inspection, testing, cleaning, approvals, etc. are at the expense of the Owner. A final inspection of all utility improvements will be performed by the Orrville Utilities prior to the end of the one year warranty period. Any deviations and/or problems, which develop during the warranty period, shall be corrected by the Owner as ordered by the Director prior to the release of the Owner's bond.

All tests performed for each test section shall be witnessed and approved by the sewer inspector prior to acceptance. In the event the developer or his contractor performs any test without witness by the sewer inspector, the developer will be required to test the section again in conformance with this specification.

## DIRECTORY of ORRVILLE UTILITIES CONTACTS

In an effort to enable you to quickly reach our different utility departments, Orrville Utilities has included this directory for your use. For all after business hour emergencies, please call 330.684.5120.

| Utility Electric Lines | 330.684 .5140 | Electric Department |
| :--- | :--- | :--- |
| Utility Sewer Lines | $330.684 .-5160$ | Sewer Department |
| Utility Water Lines | 330.684 .5130 | Water Department |
| Utility Fiber Lines | 330.684 .5095 | Technical Services |
| Inspections of Water \& Sewer | $330.684-.5044$ or | GIS/CAD Office |
|  | $330.684 .-5105$ | GIS/CAD Office |
| Line Locates | 811 OR | OUPS |
|  | 330.684 .5105 or | GIS/CAD OFFICE |
|  | 330.684 .5044 | GIS/CAD OFFICE |
| New Utility Service | $330.684-5021$ or |  |
|  | 330.684 .5105 or | Cashier's Office |
| OUPS - Ohio Utility Protection Service | $330.684-.5010$ |  |

## Questions on Rules \& Regulations

Electric Rules and Regulations 330.684.5140 OR 330.684-5105

Sewer Rules and Regulations 330.684.5044 OR 330.684.5160
Water Rules and Regulations 330.684.5044 OR 330.684-5130

## DEPARTMENT LOCATIONS

Cashier's Office, 125 West Water Street
Electric Office, 1115 Perry Street
GIS/CAD Office, 207 North Main Street
Sewer Department, 1530 North Main Street
Technical Services, 1115 Perry Street
Utility Director, 207 N. Main Street
Water Department, 300 Mineral Springs

All Departments located in Orrville, Ohio 44667.
Visit our website at www.orrutilities.com for more information.


[^0]:    

[^1]:    

[^2]:    * All dimentions ate ill inches. All weights include acecssories are in poundr and are approtimate.

