

SECTION 6

SPECIFICATIONS FOR SANITARY SEWER

6.01 DESCRIPTION OF WORK

The work shall consist of furnishing and installing sanitary sewer pipe of the specified size or sizes in a trench and shall include the construction of manholes, lateral connections to the abutting property and other appurtenant work. Excavating, trenching, and backfilling shall be as specified in Section 2.

The work shall be performed in accordance with the specifications and drawings, the MDOT 2020 Standard Specifications for Construction and the following specifications.

6.02 MATERIALS

All materials furnished by the Contractor shall conform to the specifications which follow. Where reference specifications are used, they shall be considered as referring to the current edition or latest issue. Certified test reports for strength from the manufacturer shall be submitted to the Township when the pipe is delivered to the site.

6.02.01 Sewer Pipe

All sewer pipes shall be of the materials and strengths shown on the drawings or as specified.

6.02.01.01 Polyvinyl Chloride (PVC) Solid-Wall Pipe

Polyvinyl chloride (PVC) solid-wall pipe less than 18 inches in diameter shall be extra-strength pipe conforming to the requirements of ASTM Designation D3034, with a standard dimension ratio of 26 (SDR-26).

Polyvinyl chloride (PVC) solid-wall pipe 18 inches in diameter and larger shall be extra-strength pipe conforming to the requirements of ASTM Designation F679, with a standard dimension ratio of 26 (SDR-26).

Joints shall be flexible elastomeric sealed type joint in accordance with ASTM D3212.

Color of the pipe shall be green or white.

6.02.01.02 Polyvinyl Chloride (PVC) Composite (Truss) Pipe

Polyvinyl Chloride (PVC) Composite (Truss) Pipe shall conform to the requirements of ASTM Designation D2680.

Joints shall be flexible elastomeric sealed type joint in accordance with ASTM D3212.

Color of the pipe shall be green or white.

6.02.01.03 Open Profile and Closed Profile Pipe

When approved for use by the Township, Polyvinyl Chloride (PVC) Open Profile Pipe shall conform to the requirements of ASTM Designation F949/F794 and shall be Contech A-2000 or approved equal.

When approved for use by the Township, Polyvinyl Chloride (PVC) Closed Profile Pipe shall conform to the requirements of ASTM Designation F1803 and shall be Vylon or approved equal.

Joints shall be flexible elastomeric sealed type joint in accordance with ASTM D3212.

6.02.02 Sanitary Sewer Laterals

All sewer laterals shall be extra strength pipe specified in Paragraph 6.02.01.01. Any specified bends or curves shall be smooth, long-radius type curves. No mitered or segmental type bends will be approved.

Joints for lateral pipe and fittings shall be solvent weld.

Sanitary lateral cleanouts shall be a screw type plug with a female adapter and raised plug. Lateral cleanouts shall include castings. In non-paved areas shall include an EJ No. 1566Z Assembly. Paved areas shall include an EJ No. V8502 Assembly.

6.02.03 Wyes and Tees

Wyes and Tees may be cast fittings of the same material and joints as the main sewer or may be an approved fabricated special fitting which provides a suitable connection for the lateral to the main sewer.

Details of special fittings and/or adapters for connecting laterals of a material different from the main sewer shall be approved by the Township before they are manufactured.

Wyes and Tees will be required as follows:

6" Wyes on main sewer of 8" or 10" diameter

6" Wyes or Tees on main sewer of 12" diameter or larger.

Six (6”) inch Inserta Tee or an approved equal shall be used for PVC Open Profile or Closed Profile sewers.

6.02.04 Lateral Caps

A glued-in cap shall be used for plugging the ends of laterals or risers which are not extended and shall make a watertight seal and shall be of such a design that they can be readily removed without damage to the pipe.

6.02.05 Cement Mortar

Mortar shall consist of one part Air Entraining Portland Cement, and two parts masonry sand. These proportions shall be measured by volume.

The sand and cement shall be mixed dry in a clean tight box until a mixture of uniform color is produced, after which water shall be added until the required consistency is obtained. Mortar shall be mixed only in such quantities as needed for immediate use. The retempering of mortar will not be permitted.

6.02.05.01 Cement

Air Entraining Portland Cement shall conform to the requirements for Type 1A of the MDOT 2020 Standard Specifications for Construction for Air Entraining Portland Cement, ASTM Designation C150.

6.02.05.02 Masonry Sand

Masonry Sand shall conform to the requirements of “Natural Sand, 2MS” of the MDOT 2020 Standard Specifications for Construction.

6.02.05.03 Water

Water for mixing mortar shall be obtained from the public water supply unless otherwise approved by the Township.

6.02.06 Concrete

Concrete for pipe encasement, special pipe embedment, manhole bases and similar items shall meet the requirements of the MDOT 2020 Standard Specifications for Construction for Grade 3000 concrete. Grade 3000 concrete shall have the strength of 3,000 psi at 28 days.

6.02.07 Manhole Materials

6.02.07.01 Adjusting Rings

Precast grade adjusting rings shall conform to the requirements of ASTM Designation C478.

6.02.07.02 Precast Units

Unless otherwise specified, all manholes shall be precast and watertight.

Precast reinforced concrete manhole risers and precast reinforced concrete manhole conical top sections shall conform to the requirements of ASTM C478, Precast Reinforced Concrete Manhole Sections. Bituminous waterproofing shall be applied to outer surface of manhole at a rate of one gallon per 100 square feet. Manholes shall be free of holidays and open pinholes.

Joints for precast sections shall be premium rubber O-rings per ASTM C443.

6.02.07.03 Castings

Castings shall meet the requirements specified in the MDOT 2020 Standard Specifications for Construction Section 908. Manhole covers and rings and similar combinations of castings shall be machined to provide an even bearing. All manhole covers shall be imprinted with the letter G.T. logo.

Unless otherwise specified, manhole castings shall be provided with 24-inch openings and shall be EJ No. 1045 with Type A solid cover or approved equal.

Where indicated on the plans, water-tight manhole covers shall be EJ No. 1045 WT, with Type A solid cover, or approved equal.

6.02.07.04 External Casting and Adjusting Ring Seals

When indicated by the Township, the casting and adjusting rings shall be wrapped with a watertight seal joint wrap with rubber backing to minimize infiltration into the manhole. Material shall be Wrapid Seal by CANUSA-CPS or Infi-Shield External Uni-band Seal by Sealing Systems or approved equal. All other manholes and casting rings shall be coated with mortar as indicated in the details.

6.02.07.05 Steel Reinforcement

Steel Reinforcement shall conform to the requirements for steel reinforcement of Section 905 of the MDOT 2020 Standard Specifications for Construction.

6.02.07.06 Flexible Manhole Connectors (Rubber Boots)

Flexible manhole connectors (also called rubber boots) shall be "Kor-N-Seal" by National Pollution Control Systems, Inc., "P.S.X." or "Press Wedge II" by Press Seal Gasket Corporation, "Lock Joint Flexible Manhole Sleeve" by Inter Pace Corporation, "A-LOK," "Z-LOK," or "QUIK-LOK" by A-LOK Products, Inc. or approved equal. Flexible manhole connectors shall conform to the requirements of ASTM Designation C923, Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals and shall include stainless steel bands.

6.02.07.07 Manhole Steps

Unless otherwise specified, manhole steps shall be plastic coated steel steps conforming to the requirements of ASTM Designation C478, or approved equal, spaced at sixteen inches (16") on center. Steps shall be aligned vertically over the downstream outlet.

6.02.07.08 Manholes with Corrosive Conditions

When shown on the drawings, or included in the proposal items, manholes that are anticipated to have corrosive conditions due to septicity, forcemain connection or other causes shall be provided with corrosion protection on the interior of the manhole.

Corrosion protection may be provided via a polymer concrete manhole or a bond welded PVC cast in place liner from Alternative Lining Technologies or approved equal.

6.03 INSPECTION

6.03.01 Shop Inspection

All materials furnished by the Contractor are subject, at the discretion of the Township, to inspection and approval at the Manufacturer's plant. The inspection in the plant of the manufacturer of materials furnished by the Contractor shall be made at the expense of the Township.

6.03.02 Field Inspection

It shall be the responsibility of the Contractor to inspect all materials for cracks, flaws, or other defects before they are incorporated into the work.

6.03.03 Disposition of Defective Material

All material found during the progress of the work to have cracks, flaws, or other defects shall be rejected by the Township. All defective materials furnished by the Contractor shall be promptly removed from the site. Any material furnished by the Owner and found defective shall be set aside and removed from the site of the work by the Owner.

6.04 LAYING PIPE

6.04.01 Alignment and Grade

6.04.01.01 Laser Alignment

The Contractor shall use the laser beam method of maintaining line and grade for sewer construction, unless otherwise approved by the Township. The Contractor shall submit evidence to the Township that a qualified operator will operate the

laser beam equipment during the course of construction.

The Engineer shall place line and grade stakes at each manhole and at 25-feet, 50-feet, 100-feet, and 100-feet points thereafter to the next manhole or more often, as determined by the Township. The Contractor shall check the line and grade at every point at which a stake has been placed and notify the Township where there is a grade discrepancy.

6.04.02 Handling

Pipe shall be protected during unloading and handling against impacts, shocks, and free fall. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground.

6.04.03 Direction of Laying

Excavation of trenches and laying of pipe shall begin at the outlet for the sewer and proceed upgrade with the individual pipe being laid with the spigot end downstream.

6.04.04 Placing

The pipe shall be placed on the prepared sub-grade and held firmly in place during subsequent pipe jointing and embedment operations. Successive pipes shall be carefully positioned so that when laid, they form a sewer with a uniform invert true to line and grade.

Sufficient pressure shall be applied by an approved method to each pipe as it is laid to ensure that the spigot is completely home in the bell. Care shall be exercised to prevent joints from opening as successive lengths of pipe are placed. The Contractor shall take the necessary precautions when using a trench box to prevent joint separation when the box is pulled ahead. All plastic/flexible pipe shall be installed in accordance with ASTM D2321.

6.04.05 Cleaning Sewer

The interior of the sewer shall be cleaned of all jointing material, dirt and debris as the work progresses.

In small sewers where cleaning after laying may be difficult, a swab or drag may be required in the pipeline to satisfactorily complete this work. Where possible, a plug shall be installed on the downstream end of the sewer to prevent any sand and debris from entering the existing sewer. The plug shall be maintained by the Contractor until the newly constructed sewer has been accepted by the Township.

6.05 PIPE JOINTS

Pipe joints shall be made in strict accordance with the pipe manufacturer's recommendations unless otherwise specified herein. All lubricants, gaskets and other materials required to make the joints shall be supplied or recommended by the pipe manufacturer and approved by the Township.

Pipe layers shall be fully qualified and experienced in the work being performed and shall check each joint after it is completed to see that no part of the joint material is left on the inside of the pipe and that the joint is properly made.

6.06 LOCATION OF WYES AND TEES

The approximate locations of wyes or tees are shown on the drawings. These locations may be adjusted where necessary to best serve the various properties. Exact locations shall be determined by the Engineer before the wyes or tees are installed.

The Contractor shall keep an accurate record of measurements from the nearest downstream manhole to each wye or tee which is installed, the length of each lateral, the depth at the end of each lateral and the distance to the down stream manhole parallel to the sewer at the end of each lateral. These measurements shall be recorded on the record plan to be furnished by the Contractor to the Township.

6.07 SANITARY SEWER LATERALS

6.07.01 General

Installation of sanitary sewer laterals shall meet all requirements specified for sanitary sewers. All laterals shall be inspected by the Township before the trench is backfilled.

6.07.02 Length

All sanitary sewer laterals shall be laid at right angles to the sanitary sewer mainline unless otherwise shown on the drawings.

The Contractor shall measure and record on his record drawing the horizontal length of the lateral from the main line sewer to the end of the lateral and provide this information to the Township.

6.07.03 Grade

It is intended that the ends of laterals at property lines will be deep enough to service the lowest floor of all existing buildings by gravity flow.

The minimum grade on the lateral shall be 2 percent (1/4 in/ft.). Where minimum depths as specified herein cannot be obtained and when approved by the

Township, minimum grades may be reduced to 1 percent (1/8 in/ft.).

In general, minimum depth of the lateral line shall be measured at the street right-of-way line or the easement line described as follows: laterals serving a standard house with basement shall be 12 feet below first floor elevation; for a tri-level house, laterals shall be 4 feet below basement floor elevation; For houses with a walkout basement, laterals shall be 5 feet below basement floor elevation; and commercial buildings, schools, churches and other buildings shall be determined in the field by the Township.

An unimproved lot or parcel served by sanitary sewer shall be 10 feet below the centerline of the street unless otherwise directed by the Township. Easement areas will be as determined by the Township.

6.07.04 Risers

Where the sanitary sewer is more than twelve feet deep and minimum depth of the sanitary lateral at the right-of-way line or edge of easement can be maintained, a main line riser shall be constructed in accordance with the standard details or as shown on the drawings. Backfill shall be 6AA crushed stone and shall be carefully placed and compacted around the riser in an approved manner which will not damage the sewer or riser.

Property line risers shall be constructed at the end of the lateral (at a point approximately five (5) feet from the right-of-way line or easement line unless otherwise specified).

The property line riser shall consist of a 6" sewer lateral pipe extended upward to a minimum of one (1) foot above the normal groundwater table, or to a depth provided from having a five (5) foot long (hypotenuse) riser whichever is the closest to finished grade. In all cases the lateral shall have a minimum of two (2) feet of cover.

6.07.05 Markers and Measurements

After installation of the service lateral, but prior to backfilling, the Contractor shall provide and install a 2" x 2" hardwood or 2" x 4" treated marker for each service. The wood markers shall be set vertically from the end of the lateral to three (3) feet above finish surface elevations. The Contractor shall assist the Construction Observer in locating the end of each lateral, and in recording the location by measuring to the nearest downstream manhole.

6.08 MANHOLE CONSTRUCTION

Manholes shall be constructed in accordance with the standard details and as specified herein. Manholes shall be watertight.

Unless specified otherwise, all manholes shall be precast.

Precast bases shall be installed on a minimum of 4 inches of pea gravel in such a way as to provide a uniform bearing under the manhole base.

Precast manholes with integral bottom and channel may be used; however, any changes to the structure due to minor field adjustments in alignment and grade required to meet construction conditions, shall be made by the Contractor at no additional cost to the Owner or the Township.

Benches shall be constructed from the invert to the crown on the pipe for the entire length of the manhole or junction point.

Stubs shall be provided in manholes for future connections as shown on the drawings or as directed by the Township. All such stubs shall be sealed with standard watertight, removable plugs.

All openings in manholes for the purpose of receiving pipes (including openings for future pipes) shall be fitted with a flexible type connector. Flexible connectors shall be factory installed. Openings for future connections shall be sealed by an approved prefabricated cap or plug.

Precast concrete adjusting rings shall be used to bring existing and new manhole structure covers within the proposed pavement, aggregate areas, non-pavement, and lawn areas to grade. After the cover is brought to grade, the entire hole created by excavating to raise the casting shall be filled in per the detail on page 6-18. Special care shall be taken to prevent debris from entering sewers. In aggregate areas, the casting shall be four to six inches (4" – 6") below finished grade with an 8-mil thick polyethylene sheet covering the casting before it is covered with aggregate. In non-pavement and lawn areas, the casting shall be brought up to finished grade.

6.09 CUT-INS

When cutting into an existing manhole, the opening shall be no larger than is necessary to admit the new sewer. The opening shall be made by a concrete drilling or coring machine and shall have a mechanically compressed flexible joint connection installed. All broken or surplus material falling inside the structure shall be removed.

Flow channels and/or drop connections shall be constructed as specified or as directed to accommodate the sewer being cut in. Pipe inverts higher than 2' from the primary flow channel will require a drop connection to the primary flow channel. No connections will be allowed between 6" and 2' above the primary flow channel. The inlet pipe slope must be revised so that the pipe enters within 6" from the primary flow channel.

Unless otherwise specified, cut ins shall be considered part of the major items of work, and no specific payment will be made therefor.

6.10 ACCEPTANCE TESTS

6.10.01 Alignment and Grade

Each section of sewer may be checked by the Township for alignment and grade using television inspection, or other similar means. The Contractor shall assist the Township in the performance of these tests when necessary.

If a section of sewer is determined by the Township not to be acceptable for alignment or grade, the Contractor shall relay the sewer at no additional cost to the Township.

6.10.02 Leakage Tests

The completed sewer shall be free from leaks either by infiltration or exfiltration. Manholes will be visually inspected for leakage. No more than 1,000 feet of main sewer will be considered for partial payment until it has been satisfactorily tested and approved.

The Contractor shall provide all necessary labor, equipment, and supervision to perform air tests in accordance with the requirements of the Township. All sewers shall be subjected to an air test unless otherwise specified below.

The air test shall be performed on each section of pipe between manholes after laterals are installed and the base course of the road is paved. The Township will not witness or accept any air test until the base course is paved with exception if the water table is above six (6') feet over the pipe. In this situation, the Township will require at minimum two (2) air tests: one air test during the dewatering operations at 3.5 psig and one air test at the maximum of 6.0 psig when the road base course has been paved. The Contractor is encouraged to perform an air test upon completion of the installation of the sewer and laterals and prior to restoration or installation of the utilities for his own benefit.

Testing shall conform to ASTM F1417 for plastic flexible pipe. The section of pipe being tested shall be sealed at each manhole using inflatable plugs or other approved devices. All plugs shall be adequately braced.

In a wet trench condition where the water table has risen above the pipe to a depth of less than six (6) above the crown of the pipe prior to testing, the air testing limits shall be determined by adding to the original 3.5 psig. an additional 0.433 psig. for each foot the water table is above the crown of the pipe, or as determined in the dry trench condition, whichever is greater. Maximum test pressure shall be 6.0 psig.

The air pressure in the section under test shall be raised to an initial pressure of 0.5 psig. above the beginning test pressure and allowed to stabilize for a minimum of five (5) minutes. Air shall be added during this stabilization period as required to maintain the pressure at or above the beginning test pressure.

The rate of air loss shall be determined by measuring the time interval required for the internal pressure to decrease 1.0 psig. within the limits previously specified.

Minimum time interval for satisfactory test shall be in accordance with Table 1 and Table 2 following this section.

In the event the Township determines that the results of the air test are inconclusive because of visible infiltration, unsatisfactory or incomplete records, or improper application of testing methods or equipment, or other similar reasons, the Township may require either an exfiltration test or an infiltration test for the section or sections of sewer involved.

6.10.03 Pipe Deflection Tests (Flexible Pipe Only)

Flexible pipe is any pipe having a pipe stiffness of 115 psi. or less as defined under the requirements of ASTM Designation D2412.

The completed installation of flexible pipe shall at no point have out-of-round deflections in the main sewer pipe greater than five percent (5%) of the pipe's actual original inside diameter. Go/no go gauging tests, using an approved pointed mandrel with nine (9) points, shall be performed in a proving ring first and the sewer second by the Contractor in the presence of the Township, or his authorized representative after the trench is backfilled, and before the surface restoration is begun. Pipe with deflections greater than five percent (5%) shall be relaid by the Contractor at no additional expense to the Township. Use of mechanical devices or equipment to complete the go/no go tests and vibratory rerounding of failed sections are prohibited. Both a minimum of thirty (30) days must elapse and the placement of base course before mandrel testing will occur with the Township.

6.10.04 Televising

After the groundwater table has returned to approximate level prior to dewatering operations, pipe deflection tests, placement of base course (when the pipe is proposed under pavement), leakage tests, and pipe cleaning (when the sewer has been live prior to televising), the Contractor shall conduct a continuous digital video recording inspection of all sanitary sewers. The inspection and documentation shall meet the requirements of the National Association of Sewer Service Companies (NASSCO) specification for television inspection of sewers. Closed-circuit television (CCTV) recording shall be conducted in compliance with the North American Pipeline Assessment and Certification Program (PACP) standards for sewer defect identification and assessment. Work shall be performed by a PACP-certified operator and delivered on professional quality recording media with audio input that is compatible with the Township's equipment for viewing.

The televising software shall be PACP-certified by NASSCO and shall be capable of both exporting to and importing from the standard PACP database.

If the television inspection of an entire section (manhole to manhole) cannot be successfully performed from one manhole, a reverse setup shall be performed per PACP requirements as a second survey. In addition, televising shall not occur at the same time as the sewer is being jetted and vacuumed out. Test balls shall not be left in during televising.

The Contractor shall provide on a flash drive a written report, a digital copy of the exported PACP database, and a digital copy of the videos. The recording shall show the name of the project, the purpose of inspection, the date and approximate time of recording, the name of the street, the manhole numbers of each end of each run (the “from” and “to” manholes) and stationing between manholes. The recording shall clearly show the pipe interior, joints, alignment, and wye locations and stations, and shall be reviewed by the Township for evidence of compliance with the Contract Documents for workmanship and materials. The written report shall contain a log for each recording to provide a written record of the information provided on the recording and shall show the name of the project and all other pertinent data.

If the video indicates visible leaks, the Contractor shall be required to repair the leakage sections by removing and replacing pipe and/or sealing with grout as determined by the Township. The line shall then be re-televised at no additional cost to observe where the observed leaks were repaired.

6.11 RECORD DRAWINGS

See Sections 1.06, 1.08, and 1.12.07 for more information on record drawing submittal requirements. Below are the individual requirements for record drawings for all sanitary sewer construction. Records from the Contractor will be provided every Friday to the Township.

6.11.01 Connection to Existing Sanitary Sewer

Details will be required for connecting into the existing sanitary sewer.

6.11.02 Sanitary Laterals

For laterals, witnesses shall be reported on the record drawing. The witnesses shall be to both frontage property corners.

Wye location measured from the downstream manhole shall be required. Length of the lateral and main and property riser details for each lateral shall also be required.

6.11.03 Sanitary Sewer

Type of pipe and a list of materials shall be reported on the record drawings. Clearances between utilities shall also be reported on the record drawings. Length of the main manhole to manhole shall be required on the record drawings.

6.12 MEASUREMENT AND PAYMENT

6.12.01 General

All proposed construction shall be measured for payment by the Township in accordance with the items listed in the Proposal.

The unit price bid for each Proposal item shall be payment in full for completing the work, ready for use as specified.

6.12.02 Sanitary Sewers

Measurement of the length of the sewer shall be in lineal feet along the centerline of the sewer from center of manhole to center of manhole.

Where depth classifications are provided, the depth of the sewer connecting two adjacent structures shall be considered as being the average of the depth from earth grade to the sewer invert at these structures.

6.12.03 Manholes

Manholes and Drop Manholes shall be paid for in accordance with the units established in the Proposal. When no Proposal item is provided for castings, the castings and their installation shall be considered part of the major items of work.

When corrosion protection is needed for existing manholes, this shall be paid for separately in accordance with the units established in the Proposal. When called for on the drawings or in the project specifications for corrosion protection in new manholes, this shall be paid for separately in accordance with the units established in the Proposal; if no Proposal item is provided, corrosion protection shall be considered included in the Proposal item for manholes.

6.12.04 Wyes or Tees

When a specific item is provided in the Proposal for Wyes or Tees the unit price bid shall be the additional cost of furnishing and placing the wye or tee over and above the cost of furnishing and laying the sewer pipe.

When no Proposal item is provided, the wyes or tees and their installation shall be considered part of the major items of work.

6.12.05 Sanitary Sewer Laterals

The length of sewer laterals shall be measured horizontally from the center of the main sewer to the end of the lateral as specified excluding fittings and mainline/property line risers.

6.12.06 Cut-Ins

Cut ins shall be considered part of the major items of work and no specific payment will be made therefor.

6.12.07 Stubs

Stubs shall be considered part of the major items of work and no specific payment will be made therefor.

6.12.08 Risers

The length of main line risers shall be measured vertically from the top of the main sewer to the end of the riser. The length of property line risers shall be measured per unit from the lower bend for the riser to the end of the riser. When no Proposal item is provided, the risers and their installation shall be considered part of the major items of work.

TABLE 1 – PVC and DI Pipe

Pipe Diameter, in.	Minimum Time, min:s	Length for Minimum Time, ft	Time for Longer Length, s	Specification Time for Length (L) Shown, min:s								
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft	
4	3:46	597	0.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24	
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48	
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38	
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04	
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41	
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31	
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33	
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48	
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15	
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53	
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46	

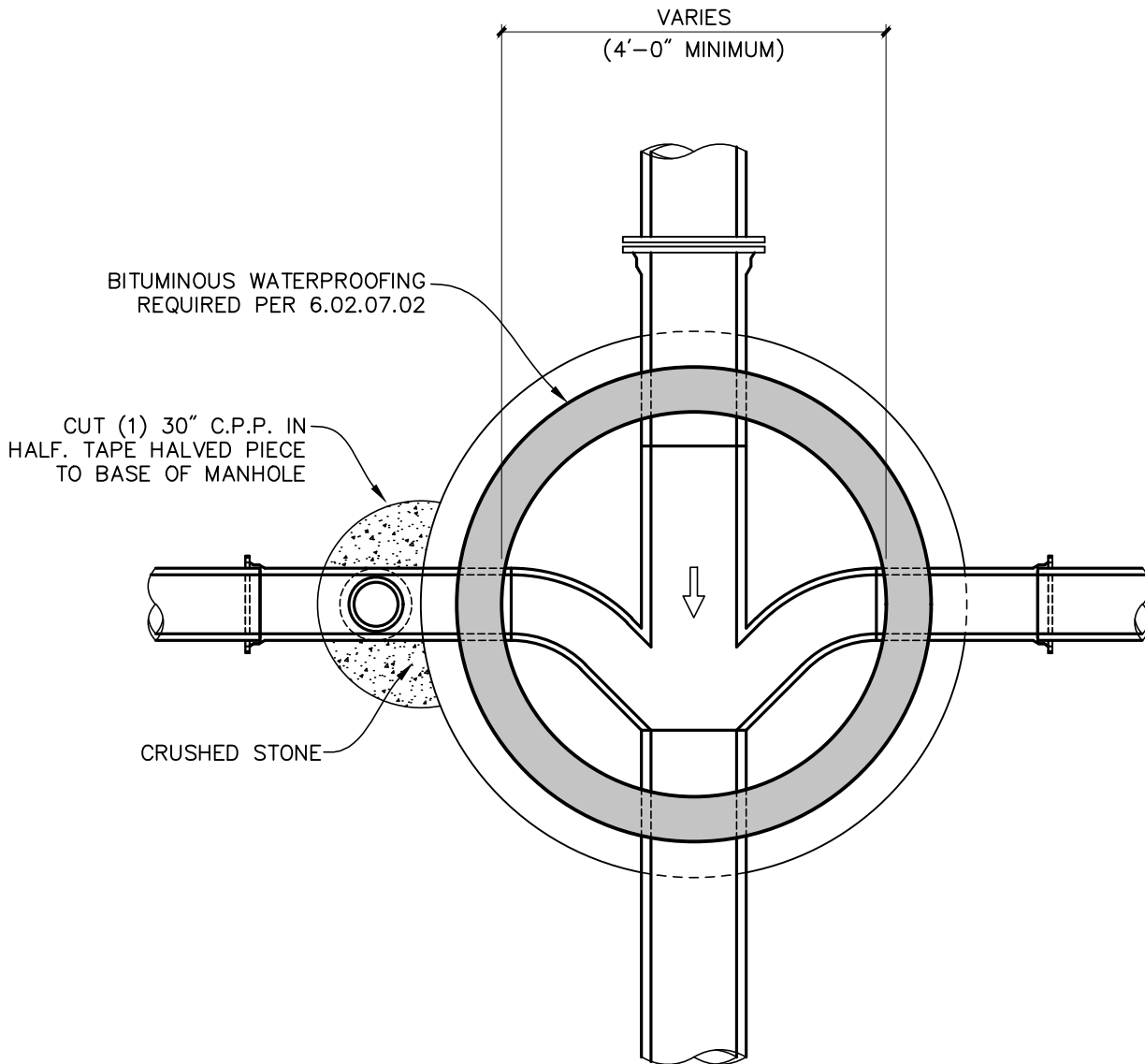
TABLE 2 – VCP and Concrete Pipe

Pipe Diameter, in.	Minimum Time, min:s	Length for Minimum Time, ft	Time for Longer Length, s	Specification Time for Length (L) Shown, min:s								
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft	
4	1:53	597	0.190 L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	0.427 L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12	
8	3:47	298	0.760 L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42	
10	4:43	239	1.187 L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54	
12	5:40	199	1.709 L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50	
15	7:05	159	2.671 L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02	
18	8:30	133	3.846 L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51	
21	9:55	114	5.235 L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16	
24	11:20	99	6.837 L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17	
27	12:45	88	8.653 L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	64:54	
30	14:10	80	10.683 L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07	
33	15:35	72	12.926 L	21:33	32:19	43:56	53:52	64:38	75:24	86:10	96:57	
36	17:00	66	15.384 L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23	

Note: Table to be used when testing one diameter only.

When testing two sizes of pipe simultaneously, time shall be computed by the ratio of lengths involved.

$$\text{Time} = \frac{\text{Length 1} \times \text{Time 1} + \text{Length 2} \times \text{Time 2}}{\text{Length 1} + \text{Length 2}}$$



PLAN VIEW

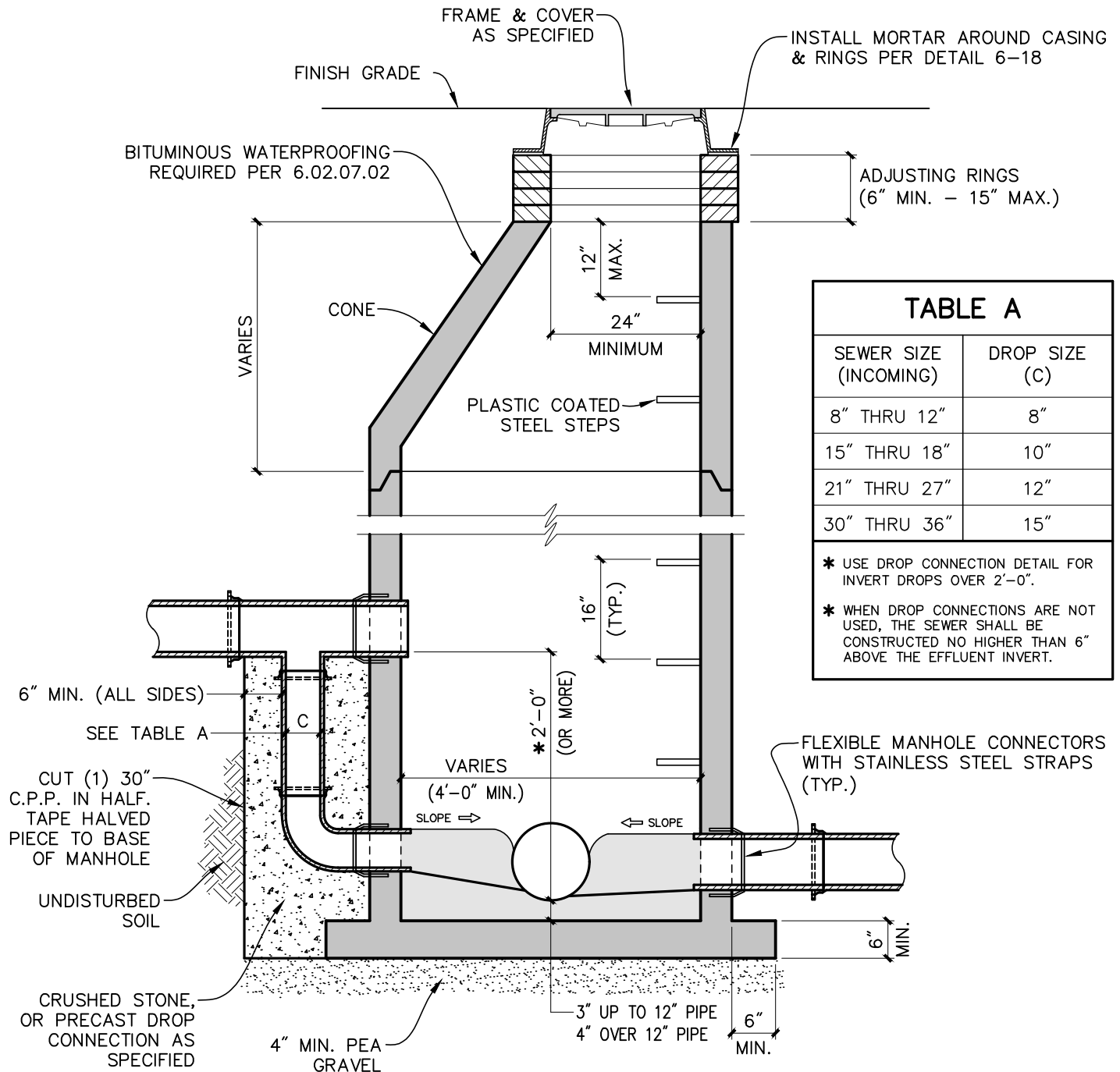
STANDARD SANITARY SEWER DROP MANHOLE

(PRECAST CONCRETE)

SCALE : NONE

NOTES

1. IF BOTTOM IS PRECAST CONCRETE, SET ON MINIMUM 4" PEA GRAVEL (CIP) WRAPPED WITH GEOTEXTILE FABRIC..
2. MANHOLE STEPS SHALL BE ALIGNED VERTICALLY OVER THE DOWNSTREAM OUTLET.
3. FLOW CHANNEL WALL HEIGHT SHALL BE EQUAL TO CROWN OF PIPE.



SEWER SIZE (INCOMING)	DROP SIZE (C)
8" THRU 12"	8"
15" THRU 18"	10"
21" THRU 27"	12"
30" THRU 36"	15"

* USE DROP CONNECTION DETAIL FOR INVERT DROPS OVER 2'-0".

* WHEN DROP CONNECTIONS ARE NOT USED, THE SEWER SHALL BE CONSTRUCTED NO HIGHER THAN 6" ABOVE THE EFFLUENT INVERT.

SECTIONAL VIEW

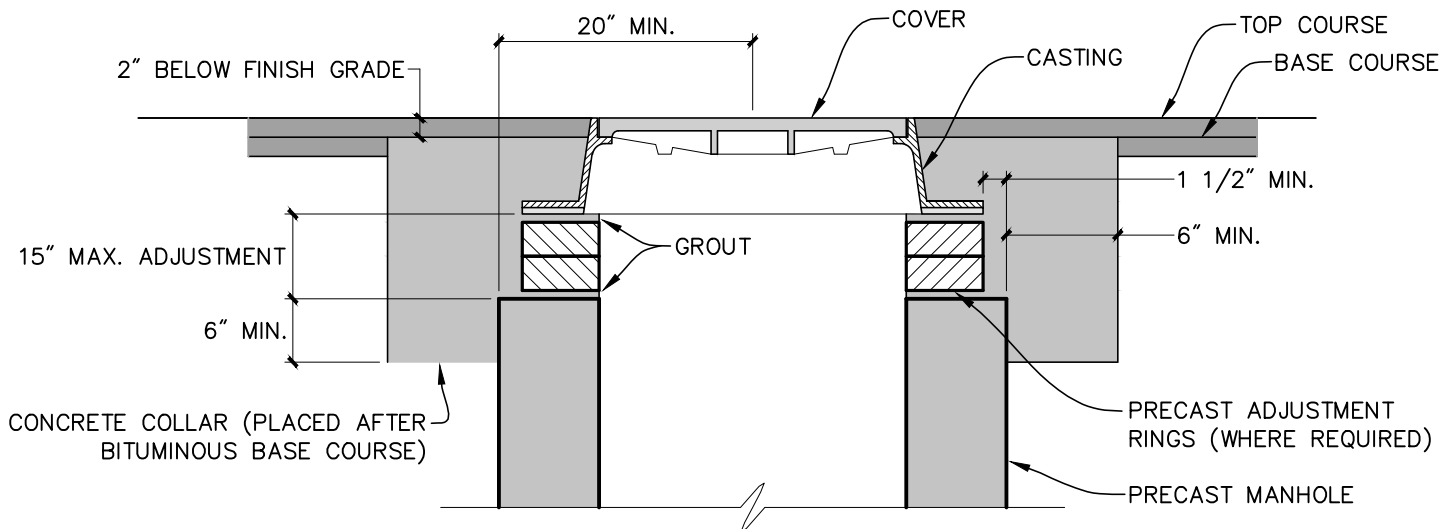
STANDARD SANITARY SEWER DROP MANHOLE

(PRECAST CONCRETE)

SCALE : NONE

NOTES

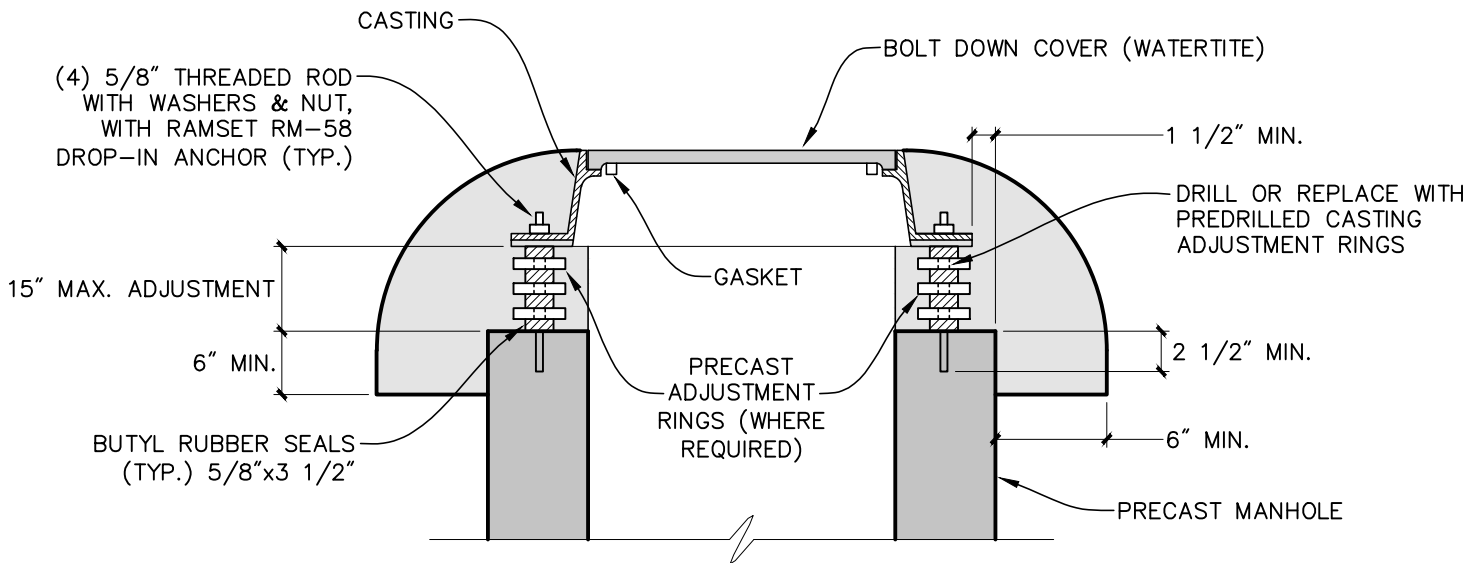
1. PRECAST CONCRETE MANHOLE SHALL MEET ASTM C478.
2. SET ON MINIMUM 4" PEA GRAVEL (CIP) WRAPPED IN GEOTEXTILE FABRIC.
3. MANHOLE STEPS SHALL BE ALIGNED VERTICALLY OVER THE DOWNSTREAM OUTLET.
4. FLOW CHANNEL WALL HEIGHT SHALL BE EQUAL TO CROWN OF PIPE.



CASE I : MANHOLE IN ROADWAY

NOTE

WRAPIDSEAL BY CANUSA-CPS, INFI-SHIELD EXTERNAL UNI-BAND BY SEALING SYSTEMS PER MFG. SPEC. OR APPROVED EQUAL SHALL BE USED IN LIEU OF MORTAR AS DESIGNATED BY THE TOWNSHIP.



CASE II : MANHOLE IN EASEMENT-OUTSIDE OF ROADWAY

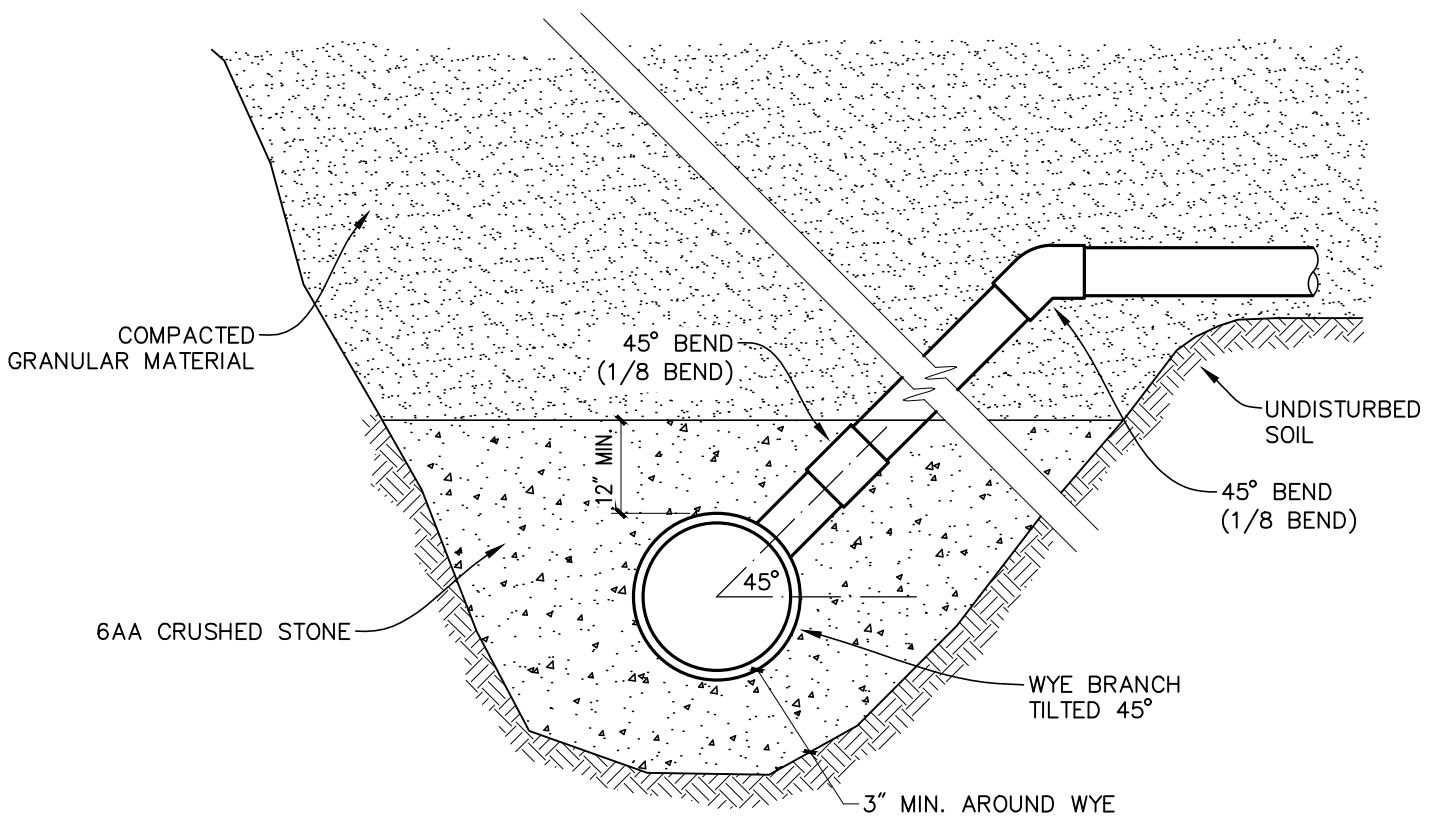
BOLT DOWN CASTING WITH RUBBER GASKET SEAL

NOTE

WRAPIDSEAL BY CANUSA-CPS, INFI-SHIELD EXTERNAL UNI-BAND BY SEALING SYSTEMS PER MFG. SPEC. OR APPROVED EQUAL SHALL BE USED IN LIEU OF MORTAR AS DESIGNATED BY THE TOWNSHIP.

STANDARD SANITARY SEWER CASTING DETAILS

SCALE : NONE



SLOPING TRENCH

(STANDARD)

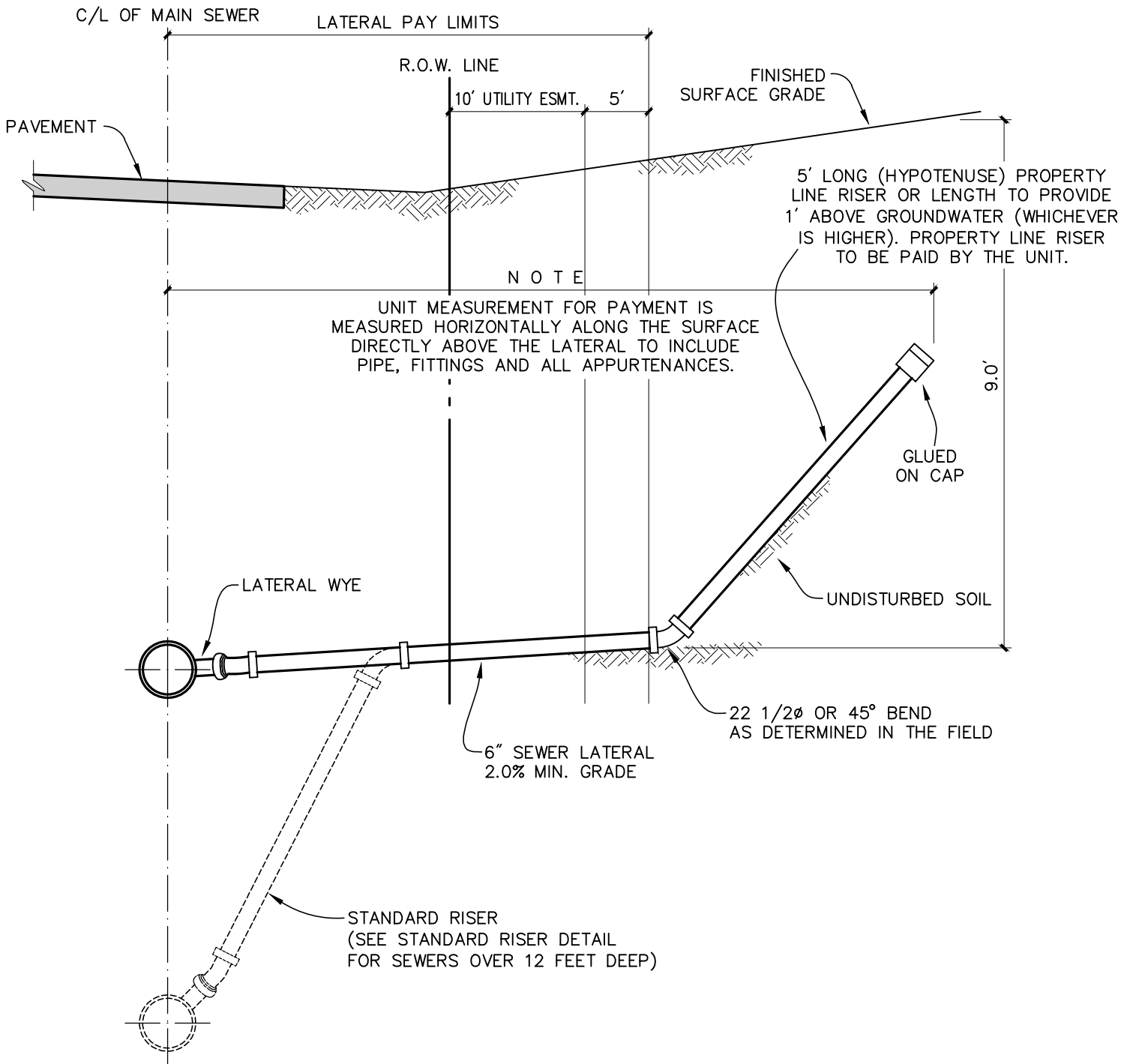
STANDARD RISER DETAILS

(SEWERS OVER 12 FEET DEEP)

SCALE : NONE

NOTES

- | |
|--|
| <ol style="list-style-type: none"> 1. MAIN LINE RISER SHALL NOT BE VERTICAL. 2. SEE PLANS OR SPECS FOR SIZE AND DEPTH OF LATERAL |
|--|

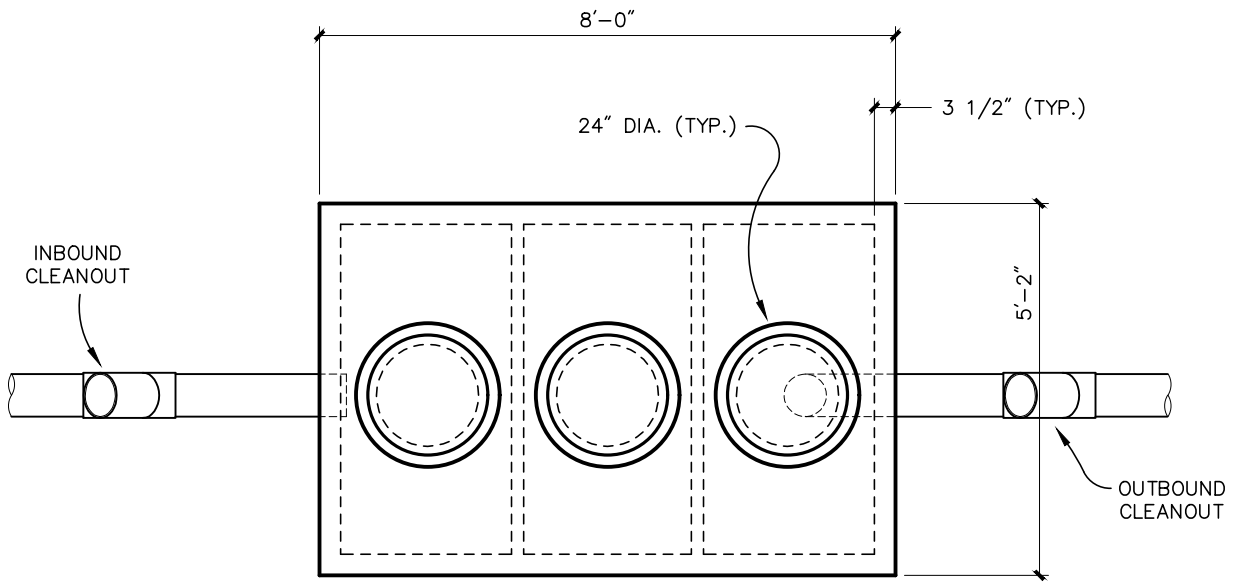


LATERAL AND PROPERTY LINE RISER DETAILS

SCALE : NONE

NOTE

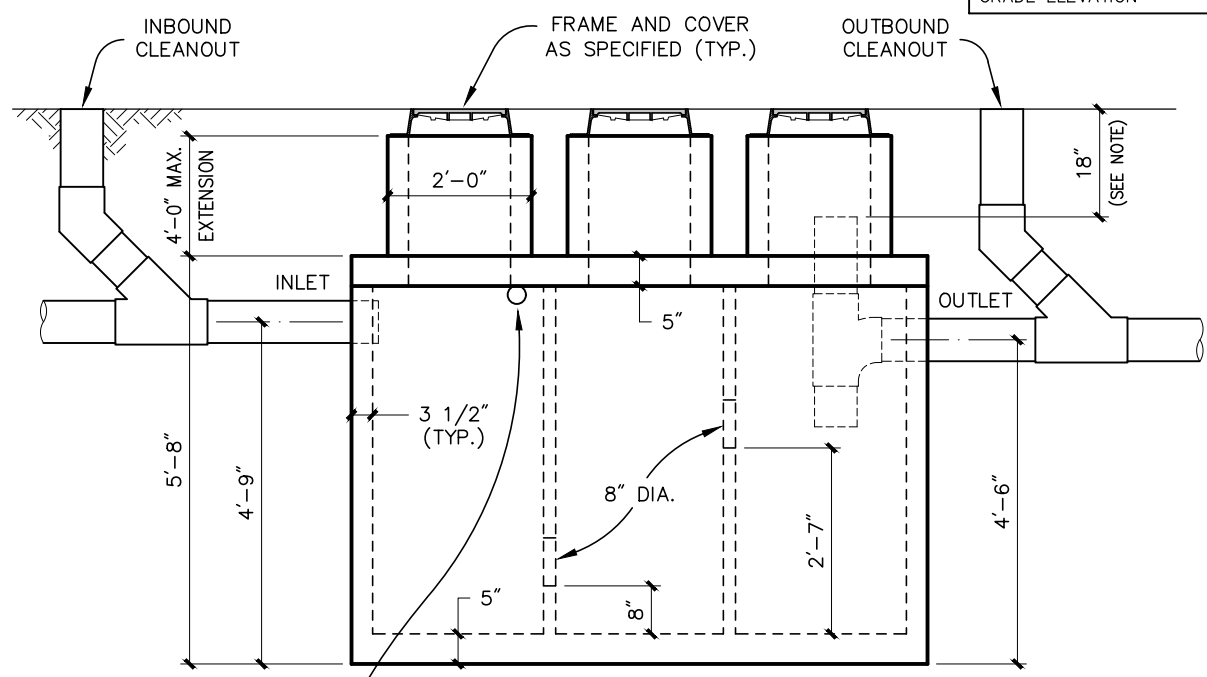
PROPERTY LINE RISER IS REQUIRED WHEN LATERAL IS IN WATER OR WHEN OTHERWISE SPECIFIED.



TOP VIEW

NOTE

DROP LEG ASSEMBLY RISER MUST BE BROUGHT UP TO WITHIN 18" OF GRADE ELEVATION

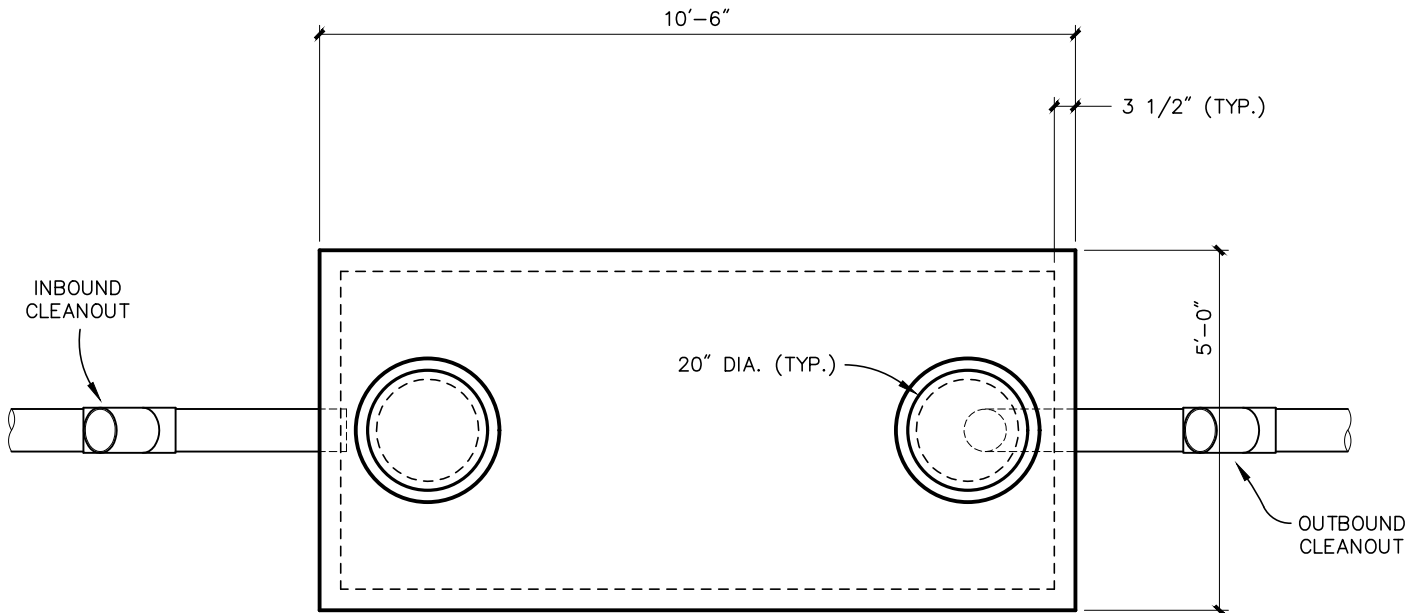


SIDE VIEW

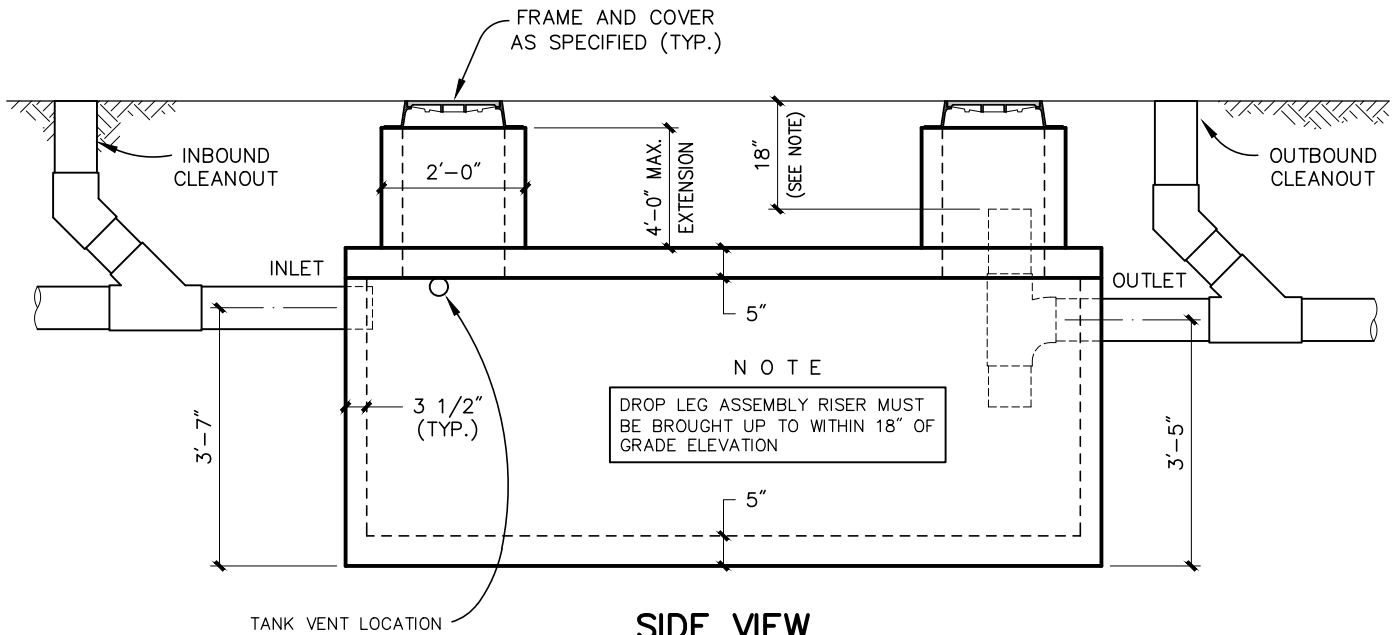
- ACCESS COVERS MUST BE RATED FOR ANTICIPATED TRAFFIC LOAD.
- SEAL BETWEEN TANK AND EXTENSIONS MUST BE WATER TIGHT.
- THE TANK JOINT MUST BE GASKETED AND ENCAPSULATED WITH WRAPIDSEAL OR INFI-SHIELD.
- THE TANK MUST HAVE A VENT ABOVE ALL TANK INVERTS AND MUST BE MADE WATER TIGHT.
- INBOUND AND OUTBOUND PIPES MUST HAVE BOOTED SEAL AT TANK OPENING.
- 18" MINIMUM LENGTH ON OUTBOUND DROPLEG
- A SANITARY TEE MUST BE INCLUDED ON THE DROPLEG ASSEMBLY.

1,000 GALLON OUTDOOR GREASE INTERCEPTOR

SCALE : 3/8" = 1'-0"



TOP VIEW



SIDE VIEW

- ACCESS COVERS MUST BE RATED FOR ANTICIPATED TRAFFIC LOAD.
- SEAL BETWEEN TANK AND EXTENSIONS MUST BE WATER TIGHT.
- THE TANK JOINT MUST BE GASKETED AND ENCAPSULATED WITH WRAPIDSEAL OR INFI-SHIELD.
- THE TANK MUST HAVE A VENT ABOVE ALL TANK INVERTS AND MUST BE MADE WATER TIGHT.
- INBOUND AND OUTBOUND PIPES MUST HAVE BOOTED SEAL AT TANK OPENING.
- 18" MINIMUM LENGTH ON OUTBOUND DROPLEG
- A SANITARY TEE MUST BE INCLUDED ON THE DROPLEG ASSEMBLY.

1,000 GALLON OUTDOOR OIL & SAND SEPARATOR

SCALE : 3/8" = 1'-0"