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## SECTION 6

### **SPECIFICATIONS FOR SANITARY SEWER**

#### **6.01 DESCRIPTION OF WORK**

The work shall consist of 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 of these 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 pipe shall be of the materials and strengths shown on the Plans and as specified. Only one type of pipe material is to be placed from manhole to manhole.

##### **6.02.01.01 Polyvinyl Chloride (PVC) Solid-Wall Pipe**

Polyvinyl chloride (PVC) solid-wall pipe shall conform to the requirements of ASTM Designation D-3034, with a standard dimension ratio of 35 (SDR-35).

Extra strength pipe shall conform to the requirements of ASTM Designation D-2241, with a standard dimension ratio of 26 (SDR-26) and shall be used for depths over sixteen (16) feet.

Joints for (PVC) solid wall pipe shall be elastomeric gasket seal as specified in current ASTM specification D-3212.

##### **6.02.01.02 Polyvinyl Chloride (PVC) Composite (Truss) Pipe**

Polyvinyl Chloride (PVC) Composite (Truss) Pipe shall conform to the requirements of ASTM Designation D-2680 with elastomeric gasket seal joints as specified in current ASTM specification D-3212.

Couplings and fittings shall be as supplied or recommended by the pipe fitting manufacturer.

#### 6.02.02 Cement Mortar

Cement mortar shall be non-shrink grout mixed in accordance with manufacturer's recommendations.

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.

##### 6.02.02.01 Cement

Air Entraining Portland Cement shall conform to the requirements for Type 1A of the current specifications for Air Entraining Portland Cement, ASTM Designation C-175.

##### 6.02.02.02 Masonry Sand

Masonry Sand shall conform to the requirements of "Natural Sand, 2 MS" of the current standard specifications of MDOT.

##### 6.02.02.03 Water

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

#### 6.02.03 Manhole Materials

##### 6.02.03.01 Adjusting Rings

Adjusting rings are to be precast grade adjusting rings conforming to the requirements of ASTM Designation C-478; a minimum of 6" adjusting rings are to be used up to a maximum of 15" of adjusting rings or up to 3" of EJ "Infra Riser" rubber casting adjustment rings may be installed in accordance with manufacturer's recommendations.

##### 6.02.03.02 Precast Manhole Units

All sanitary sewer manholes shall be precast meeting all requirements of ASTM C478, ASTM C443, and ASTM C-363. All manholes shall be a minimum of 48 inches in diameter. Manhole bases shall be integrally cast into the riser section.

Exterior of the Manhole shall be waterproofed with an asphalt or tar waterproof coating applied to a thickness of 7 mils.

Precast reinforced concrete manhole risers and precast reinforced concrete manhole cone sections shall conform to the requirements for reinforced concrete manhole risers and tops, ASTM C-478.

Joints for precast sections shall be watertight and shall include premium rubber O-ring seals and mastic or butyl flexible sealant (conforming to ASTM C990) placed between

sections of the manhole in the joint. All exterior joints of manholes will be sealed with a flexible Butyl rubber based tape (12" wide) centered over the manhole joint. Joints must be clean before applying, and primer used according to manufactures recommendations.

Backfill material around all sanitary sewer manholes shall be MDOT Class II sand compacted to a minimum of 95% maximum density or greater.

#### 6.02.03.03 Castings

Castings shall meet the requirements specified in the current Michigan Department of Transportation Standard Specifications Section 908. Manhole covers and rings and similar combinations of castings shall be machined to provide an even bearing.

Unless otherwise specified, manhole castings shall be an ej No. 1045Z frame or an approved equal manhole frame casting. All manhole covers in greenspace shall be an EJ No. 1040A solid cover with two pickholes. The Jamestown Township custom logo lid (EJ Product Number 00103677) is required in all paved areas.

Where indicated on the plans, water-tight or bolt down manhole covers (2 bolts) may be specified. Where a water-tight frame/cover is indicated on the plans or specified by the Township or Township Engineer it shall be an EJ No. 1045WT with an EJ No. 1040AGS solid cover with two (2) Epic® pickbars and two bolt holes and the bolts; where specified, shall be Stainless Steel with pentheads with anti-seize used on the threads during installation. Grouting shall be as shown on the standard manhole details.

Where indicated on the plans, pressure tight manhole covers (4 bolts) may be specified. Pressure tight manhole covers shall include a pressure tight gasket and be an EJ No. 1040AGS solid cover with two (2) Epic® pickbars and four bolt holes and the bolts; where specified, shall be Stainless Steel with pentheads with anti-seize used on the threads during installation

All manhole ductile iron castings; including the frames, covers, and accessories, shall be produced in the United States of America.

#### 6.02.03.04 Steel Reinforcement

Steel Reinforcement shall conform to the requirements for steel reinforcement of the current MDOT Standard Specifications.

#### 6.02.03.05 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 Place Corporation, "A-lok" by A-lok Products, Inc., or approved equal. Flexible manhole connectors shall conform to the requirements of ASTM Designation C-923, Resilient Connectors.

6.02.03.06 Manhole Steps

Unless otherwise specified, manhole steps shall be plastic coated steel steps conforming to the requirements of ASTM Designation C-478, or approved equal, spaced at 16" center to center.

6.02.03.07 Stainless Steel

Stainless steel components shall meet the specifications of A.S.T.M. type 304. All stainless steel threaded components shall be coated with "anti-seize" prior to tightening.

6.02.03.08 Manhole, Ring, and Frame Casting Sealing System

Where a manhole, ring, and frame casting sealing system is specified on the plans CCI Piping Systems "Wrapid Seal" frame casting and ring protection, or Cretex "Classic External Seal" frame casting and ring protection are to be installed in accordance with manufacturer specifications; or approved equal frame casting and ring protection.

**6.03 INSPECTION OF MATERIALS BY CONTRACTOR**

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. Any materials found to be defective or damaged, shall be promptly removed from the job site.

**6.04 LAYING PIPE**

6.04.01 Alignment and Grade

6.04.01.01 Staking Line and Grade of Pipe

The Owner's Engineer (or Surveyor) shall place line and grade stakes at each manhole location and every 50 feet upstream of each manhole and every 50 feet of sanitary sewer thereafter, at all clean-outs and at the end of each lateral, or more often as determined by the Township or Township Engineer. The Contractor shall check the line and grade at every point at which a stake has been placed and when requested by the Township or Township Engineer. Appropriate offset stakes shall be utilized at all locations and are the responsibility of the Contractor to maintain. Stakes that are disturbed for any reason shall be replaced by the Owner's Engineer (or Surveyor) at the request of the Township or Township Engineer.

6.04.01.02 Laser Alignment

The Contractor shall use the laser beam method of maintaining line and grade for sewer construction, unless otherwise approved by the Township or Township Engineer. The Contractor shall submit evidence to the Township or Township Engineer that a qualified operator will handle the laser beam equipment during the course of construction upon request.

6.04.01.03 Depth of Pipe

All pipe shall be laid with the top of the pipe a minimum of forty-two (42) inches below established grade, unless otherwise approved by the Township and/or Township Engineer.

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.

Pipe shall be carefully lowered into the trench in such a way as to avoid danger to the workers or damage to the pipe. Chains and steel cables are not permitted to be used to handle pipe at any time.

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.

Placement of sewer pipe within 10 feet of a manhole and including the manhole shall be placed on a prepared sub-grade material consisting of 4 inches of MDOT Class II sand (or MDOT 6A stone), plate compacted to 95% maximum density or greater. In wet conditions where de-watering of the trench is necessary a 1" stone (MDOT 6A) may be used to create a firm and stable sub-grade when filter fabric is placed to surround the stone to prevent fine material from migrating into the void spaces of the stone.

Where the slope of sewer pipe is 20% and up to 35% pipe anchors shall be added every 36 feet, for slopes greater than 35% and up to 50% pipe anchors shall be added every 24 feet, and for slopes greater than 50% pipe anchors shall be added every 16 feet.

#### 6.04.05 Cleaning Sewer

Prior to visual inspection, the interior of the sewer shall be cleaned of all jointing material, dirt and debris as the work progresses.

In sewers where cleaning after laying may be difficult, a swab or drag or jetting may be required in the pipe line to satisfactorily complete this work.

The Contractor shall place and maintain a plug in the downstream end of the newly constructed sewer to minimize dirt and debris from entering the existing sanitary sewer system. The plug shall be maintained by the Contractor until the newly constructed sewer has been accepted by the Township.

Where plugs are required in existing sanitary sewer manholes, they shall **NOT** be removed until authorization is received in writing from the Township or Township Engineer. These plugs shall be provided and installed by the Contractor at the start of the project.

#### 6.04.06 Channel Protection

Channel protection is required for any live manholes within which work will be performed and if required by the Township or Township Engineer in live manholes near where the construction of new sewer or repaving of the existing street is to take place. The Township or the Township Engineer may require channel protection in any manhole where, in the sole opinion of the Township or the Township Engineer, debris could be introduced into a manhole.

Channel protection is to consist of ¾" plywood cut to match the inside diameter of the manhole. Two 2" x 4" boards are to be nailed across the plywood for support. Geotextile fabric is to be placed on top of the plywood to collect debris. The contractor is to carefully remove the channel protection and all debris that may have fallen into the manhole upon completion of work and when authorization is given by the Township. See detail.

Alternative channel protection devices may be approved at the sole discretion of the Township and/or Township Engineer.

### 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

### SANITARY SEWER LATERALS

Connection to the sanitary sewer collection system and use of the sanitary sewer system is governed by the Township ordinance to administer, regulate, and provide for the connection to and use of the water and sewer system. See this ordinance for regulations governing use of the water supply system and penalties for violation of the Ordinance. Application forms and permits for connection are available at the Township Office. These forms will provide for payment of an inspection fee, assessments, and charges at the time request is made for service.

The Township or an authorized representative must inspect all lateral construction prior to backfill. Inspections can be scheduled by calling the Township or authorized representative a minimum of 24 hours prior to the time of inspection is needed. Inspections times are scheduled on a first come basis. A permit number and building street address is required to schedule an inspection.

Outside of public rights-of-way and easements the customer shall construct, own and maintain the sewer lateral at his or her expense in its entirety.

Sewer laterals in the Townships are to be installed in accordance with the following specifications:

#### 6.06.01 Location of Wyes and Tees

The approximate locations of wyes or tees are shown on the plans. These locations may be adjusted where necessary to best serve the various properties. Exact locations will be determined by the Township before the wyes or tees are installed. Wyes and tees shall be placed 5 feet or more away from the exterior wall of all manholes.

The Contractor shall keep an accurate record of measurements from the nearest downstream manhole to each wye or tee which is installed. These measurements shall be recorded on the record plans to be furnished by the Contractor.

All laterals shall be connected to sewer mainline pipe. Connections to manholes may only be allowed when approved by the Township or Township Engineer.

#### 6.06.02 Length

All sanitary sewer laterals shall normally be laid at right angles to the sanitary sewer mainline. Along existing streets, laterals shall extend to the street right-of-way (property line) unless otherwise directed. Along streets for new developments, laterals shall extend to the edge of easements for private utilities.

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



#### 6.06.03 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 two (2%) percent (1/4 in/ft.). Where minimum depths as specified herein cannot be obtained, minimum grades may be reduced to one (1%) percent (1/8 in/ft.) with the approval of the Township or Township Engineer.

Where the elevation of the end of the lateral to serve an existing structure is not shown on the plans it shall be set at three (3) feet below basement grade for standard houses (eleven (11) feet below first floor) or four (4) feet below basement grade for houses with walkout basements (twelve (12) feet below first floor) where the set-back is fifty (50) feet or less.

In other cases the lateral may be set at two (2) feet below the basement elevation for standard houses (three (3) feet for walkouts) plus an additional depth of two (2%) percent multiplied by the set-back distance to the structure.

#### 6.06.04 Risers

Where the sanitary sewer is more than twelve (12) feet deep, a main line riser shall be constructed in accordance with the standard details or as shown on the plan. Backfill 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 on all laterals. Property line risers shall be constructed at the end of the lateral. The property line riser shall consist of a six (6) inch sewer lateral pipe extended upward to a minimum of one (1) foot above the normal groundwater table but four (4) feet of cover shall be maintained on the riser in all cases.

#### 6.06.05 Markers and Measurements

After installation of the service lateral, but prior to backfilling, the Contractor shall provide and install a 2" x 2" wood marker for each lateral. The wood markers shall be set vertically from the end of the lateral to thirty-six (36) inches above finish surface elevations. Also, a 1/2" diameter by 3' long iron stake shall be placed vertically and adjacent to the wood marker with six (6) inches of cover. 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. Also, the Contractor shall provide the Construction Observer the depth of the lateral and property line riser relative to the street centerline elevation.

6.06.06 Materials (Sanitary Sewer Laterals)

6.06.06.01 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 water tight connection for the lateral to the main sewer.

Details of special fittings and/or adaptors for connection laterals of a material different than the main sewer shall be approved by the Township or Township Engineer before they are manufactured and installed.

“Cut-in” wyes shall be approved by the Township or Township Engineer before they are installed and shall have 2 stainless steel straps and a centering or locating lip and shall be a NAPCO Pipe & Fittings H-Series – SDR 26 Saddle Wye H4308-6R or approved equal.

6.06.06.02 Plugs and Caps

Plugs or caps for plugging the ends of laterals or risers which are not extended shall make a water tight seal and shall be solvent welded or glued.

6.06.06.03 Public Sewer Lateral Pipe (within public utility easements and right-of-way)

All Public Sewer Lateral Pipe shall be extra strength pipe and, unless otherwise specified, shall be of materials specified in Paragraph 6.02.01. All fittings to be heavy wall solvent weld or glued fittings or elastomeric gasket seal as specified in ASTM specification D-3212.

6.06.06.04 Private Building Sewer Pipe (outside of public utility easements and right-of-way)

All Private Building Sewer Pipe, unless otherwise specified, shall be of any of the following:

1. PVC solid wall pipe, ASTM D-3034, with a standard dimension ratio of 26 (SDR-26) with solvent weld or glued joints for 4” diameter pipe, or with elastomeric gasket seal joints as specified in current ASTM specification D-3212 or solvent weld or glued joints for pipe 6” in diameter or larger.
2. PVC solid wall pipe, ASTM D-2665 or ASTM F-891, Schedule 40 with solvent weld or glued joints for 4” diameter pipe, or for pipe 6” or larger in diameter with elastomeric gasket seal joints as specified in current ASTM specification D-3212 or solvent weld or glued joints.
4. Cast iron no hub soil pipe and fittings, ASTM A-74.
5. All fittings for building sewers shall be solvent weld, glued joints, or elastomeric gasket seal joints as specified in ASTM D-3212.

No new connections to the Township forcemains or the STEP system shall be allowed unless approved by the Township. Any new lateral connections or laterals already connected to Township forcemains or STEP systems shall be maintained and repaired with the following specifications:

1. STEP System: Building sewage shall drain to a 1,000-gallon concrete septic tank which includes the Township's PVC outlet baffle detail. A 2" PVC or SCH 40 lateral laid at a minimum 0.5% slope shall flow to the STEP system. Include a 2" PVC ball valve on the right-of-line. A 2" x 4" plastic reducer and tee shall be placed at the mainline STEP system sewer. Locator wire shall be run above the entire lateral line. See 1,000 Gal Septic Tank and STEP System Service Lateral details.
2. Forcemain Connections: Building sewage shall drain to a 1,000-gallon concrete septic tank. Sewage shall be pumped through a 1.5" PVC or SCH 40 pipe to the forcemain. A 1.5" x 4" plastic reducer and tee shall be placed at the mainline forcemain. Include a 1.5" PVC ball valve located on the right-of-way line and a 1.5" check valve on the private property. Locator wire shall be run above the entire lateral line.

#### 6.06.07 Size and Grade of Private Building Sewers

Four (4) inch minimum size for single and two-family residential laid at a minimum grade of 1/4 inch per foot (2% grade) from the lateral (stub) at the property line to the building.

Lateral sizes and materials must be approved by the Township or Township Engineer as suitable for the proposed application.

Grade of 1/8 inch per foot (1% grade) from the lateral (stub) at the property line to the building may be utilized only with approval in advance by the Township or Township Engineer.

#### 6.06.08 Private Building Sewer Cleanouts

1. A four (4) inch cleanout shall be placed within five (5) feet of the building. (A four (4) inch cleanout located just within the basement wall shall be sufficient)
2. Four (4) inch cleanouts shall be placed at all bends totaling greater than 45 degrees and at every one hundred (100) feet.

#### 6.06.09 Adapters

Adaptors for size changes and/or types of pipe shall be of any material specified in Paragraph 6.02.01. All adapters to be heavy wall solvent weld or glued fittings or elastomeric gasket seal as specified in ASTM specification D-3212.

Fernco adaptors shall not be used unless approved by the Township and/or designated representative.

6.06.10 Inspection manholes

Inspection manholes may be required by the Township to monitor flows of industrial and/or commercial users before entering the public sewer system. (Manholes to be ASTM C-478 or equal)

6.06.11 Grease Interceptors or Oil and Sand Separators

Grease Interceptors or Oil and Sand Separators may be required by the Township or Township Engineer in accordance with the Township ordinance to administer, regulate, and provide for the connection to and use of the water and sewer system.

6.06.11.01 Grease Interceptors

Where required, outdoor grease interceptors shall conform to the following:

- A. The grease interceptor must be an approved precast concrete structure (two pieces). The tank dimensions must be comparable to those listed on the figure on page 6-19.
- B. All booted openings must be PSX Boot Press-seal Gasket, NPC Kor-n-seal, or approved equal.
- C. Exterior wrap strip must be 12" EZ-WRAP (or approved equal).
- D. All chambers of grease interceptor (3 total) must be easily accessible.
- E. 2' diameter grade risers must be precast concrete.
- F. The top section of the tank must have an H20 load rating in traffic areas.
- G. Minimum size on inbound and outbound pipes is 4".
- H. The grease interceptor must be installed per Manufacturer's recommendation.
- I. An inspection of the installation of the grease interceptor must be scheduled with the Jamestown Township Water and Sewer Department with at least 24 hours notice.

6.06.11.02 Oil and Sand Separators

Where required, outdoor Oil and Sand Separators shall conform to the following:

- A. The oil separator must be an approved precast concrete structure (two piece). The tank dimensions must be comparable to those listed on the figure on page 6-20.
- B. All booted openings must be PSX Boot Press-seal Gasket, NPC Kor-n-seal, or approved equal.
- C. Exterior wrap strip must be 12" EZ-WRAP (or approved equal) for all joints in the precast sections.

- D. 20" diameter openings of oil separator (2 total) must be easily accessible.
- E. 2' diameter grade risers must be precast concrete.
- F. The top section of the tank must have an H20 loaded rating in traffic areas.
- G. Minimum size on inbound and outbound pipes is 4".
- H. The interior walls of the tank must be coated with an approved epoxy coating.
- I. Minimum volume of the oil and sand separators shall be 1,000 gallons. All larger size oil separators must be approved by the Jamestown Township Water and Sewer Department. Specification sheets must be submitted to the Authority prior to installation of the oil separator.
- J. The oil and sand separator must be installed per Manufacturer's recommendation.
- I. An inspection of the installation of the oil and sand separator must be scheduled with the Jamestown Township Water and Sewer Department with at least 24 hours notice.

## **6.07 MANHOLE CONSTRUCTION**

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

Precast bases shall be installed on the subbase in such a way as to provide a uniform bearing under the manhole base.

Future connections to manholes are to be cored and booted at the time they are required. Stubs shall only be provided in manholes for future connections as directed by the Township or Township Engineer. All such stubs shall be sealed with standard watertight, removable plugs.

All openings in manholes for the purpose of receiving pipes shall be fitted with a flexible type connector. Flexible connectors shall be factory installed.

Bituminous waterproofing shall be applied to the outer surface of all manholes at the rate of one (1) gallon per 100 square feet.

Flow channels through Manholes are to be the same height and width as the pipe size. Flow channels are to be brick smooth and shall have a minimum continuous slope of 0.1 feet over 4 feet.

## **6.08 CUT-INS**

When cutting into an existing manhole, the opening shall be no larger than is necessary to insert 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. Flow channels shall have a maximum of 1 foot of difference between pipe inverts. Pipe inverts higher than 6 feet from the primary flow channel will require an outside drop connection to within 6" from the primary flow channel.

## **6.09 ACCEPTANCE TESTS**

### **6.09.01 Alignment and Grade**

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

The Contractor shall be responsible to maintain plugs in existing manholes to prevent any water, debris, etc. from entering the existing sewer. These plugs shall remain in place until the new sewer system is accepted by the Township.

### **6.09.02 Leakage Tests**

The completed sewer shall be free from leaks either by infiltration or exfiltration. Manholes and sewer lines will be visually inspected for leakage. Any infiltration visually observed by the Township or Township Engineer shall be repaired by the Contractor at the Contractor's expense.

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

Leakage testing of the sewer shall be performed after all watermain, water services, and storm sewer proposed in the vicinity of the sanitary sewer has been installed. This requirement may be waived by the Township or Township Engineer in cases where the natural ground water table is above the grade of the sanitary sewer and dewatering is in place.

#### **WET TRENCH: WATER TABLE GREATER THAN 7 FT ABOVE PIPE**

All sewer which is submerged by ground water to an average depth of greater than seven (7) feet above the crown of the sewer at the time of the test shall be subjected to an infiltration test.

#### **WET TRENCH: WATER TABLE UP TO 7 FT ABOVE PIPE**

In a wet trench condition where the water table has risen above the pipe to a depth of less than seven (7) feet 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 0.43 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 a satisfactory test shall be in accordance with Table 1 following this section.

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

The allowable leakage as measured by either an infiltration test or an exfiltration test shall not exceed 50 gallons per day per inch of diameter per mile of sewer.

#### DRY TRENCH: NO WATER TABLE PRESENT AT SEWER INVERT DEPTH

The air test shall be performed on each section of pipe between manholes after laterals are installed and after grade is established to within 3" of final grade. In addition, where practical, base course of paving shall be placed prior to the air test. 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 prior to the beginning of the air test.

Pressure gauges are to have a range of 0-15 p.s.i.g. with increments of 0.10 p.s.i.g. and accuracy of +/- 0.04 p.s.i.g.

Where the expected water table level, as determined by the soil borings, is above the sewer elevation, the pressure testing limits for dry trench condition shall be as follows:

1. Where the expected water table level is zero (0) feet to seven (7) feet above the pipe, the test pressure limits will be 3.5 to 2.5 psig.
2. Where the expected water table level is over seven (7) feet above the pipe, the test pressure limits will be 4.5 to 3.5 psig.

Sewers shall be tested for exfiltration by isolating a section or sections of the sewers between manholes by means of an approved temporary type of water-tight bulkhead. The isolated section of sewer shall then be filled with water to a level which is two and one-half (2-1/2) feet above the existing water-table but not less than two and one-half (2-1/2) feet above the crown of the sewer pipe at the high end of the isolated section under the test. The length of the section shall be such that, where possible, the water level at its lower end will not be more than five (5) feet above the crown of the pipe except as may be required by a high water table.

The length of time and the exfiltration test period shall be at the discretion of the Township or Township Engineer. Determination of the amount of exfiltration shall be made by measurement of the loss of volume of water in the manholes. The amount of exfiltration over a 24 hour period will then be calculated from the measured loss of volume and time period.

On any section of sewer that the Township or Township Engineer deems impractical to test by means of the exfiltration test specified above, as may be the case when local connections are involved, a suitable infiltration test will be required.

#### 6.09.03 Pipe Deflection Tests (Flexible Pipe Only)

Flexible pipe is any pipe having a pipe stiffness of less than 200 psi as defined under the requirements of ASTM Designation D-2412. Deflection testing is required for pipe having a pipe stiffness equal to 200 psi (truss pipe) as defined under the requirements of ASTM Designation D-2412 when the buried depth is greater than 12 feet from the finished surface to the crown of the pipe.

The completed installation of any pipe shall at no point have out-of-round deflections in the main sewer pipe greater than five (5%) percent of the pipe's base original inside diameter (see chart for mandrel sizes below). Go/no go gauging tests, using an approved pointed mandrel with nine (9) points, shall be performed 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 (5%) percent shall be re-laid by the Contractor at no additional expense to the Owner. Vibratory re-rounding of failed sections is prohibited. More than one person, mechanical means, or leverage will not be allowed to force the mandrel through test sections.

The pipe shall have been in place a minimum of 30 days prior to the mandrel test.

The mandrel used must be specific to the type of pipe material and diameter, and must have the pipe type clearly identified.

#### MANDREL TEST SIZES (SDR -26)

<u>Pipe Diameter</u>	<u>Mandrel Diameter</u>	<u>Test Measurement</u>	
8"	7.11"	6.91"	
10"	8.87"	8.60"	
12"	10.54"	10.22"	
15"	12.90"	12.51"	
18"	15.76"	15.28"	
21"	18.57"	18.01"	
24"	20.87"	20.24"	

The test measurement is the height of the mandrel as it rests with two fins on a flat surface.



## MANDREL TEST SIZES (SDR -35)

<u>Pipe Diameter</u>	<u>Mandrel Diameter</u>	<u>Test Measurement</u>	
	8"	7.56"	7.33"
	10"	9.45"	9.16"
	12"	11.25"	10.91"
	15"	13.80"	13.38"
	18"	16.80"	16.29"

The test measurement is the height of the mandrel as it rests with two fins on a flat surface.

### 6.09.04 Televising

After the pipe deflection test, placement of the base course of asphalt (where the pipe is proposed under pavement), and pipe cleaning, the Contractor shall conduct a continuous digital video recording inspection of all sanitary sewers. Just prior to televising, the Contractor is required to run water down each sanitary sewer line.

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) standard 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 and Township Engineer'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.

The Contractor shall provide a written report, digital files of the sewer televising, and a digital copy of the exported PACP database (a PDF copy of all reports shall also be provided). The recording shall show the name of the project, the purpose of the 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 the "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 and/or the Township Engineer for evidence of compliance with the specifications 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.

After any necessary repair or reworking of the pipe, the Contractor shall conduct a follow-up television inspection if required by the Township or the Township's Engineer. The Township must approve all sewer televising prior to acceptance of the sewer.

6.09.05      Manholes

All new manholes shall be clean, dry, and free from inflow and infiltration.

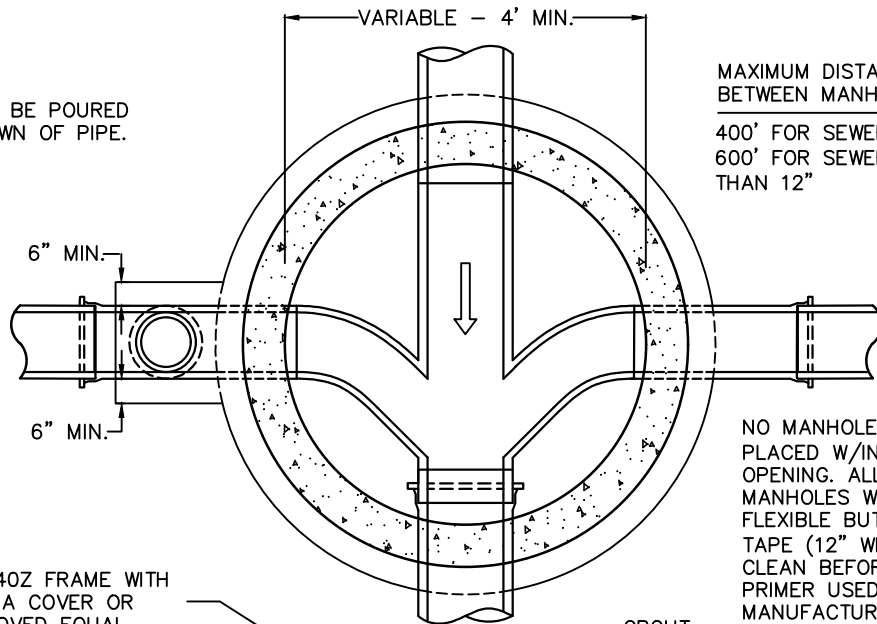
The Contractor is responsible to seal all joints to stop leaks and clean dirt and debris from the walls, benches, channels, and connected pipes prior to acceptance. If inflow and infiltration persist, Contractor shall use fast-drying grout, Preco, epoxy, and all available methods to stop water from entering the manhole. Manholes will not be accepted if active infiltration is observed.

6.09.06      Live Sewer Entry Permit

Any person wishing to access a live sewer manhole, a manhole connected by open pipes to a live sewer manhole, or any space where a potential hazard to safety may be present shall contact the Township to request a permit for access. No access shall be granted until proper protection is installed and operating correctly.

NOTE:  
BENCHES TO BE POURED  
TO THE CROWN OF PIPE.

MAXIMUM DISTANCE  
BETWEEN MANHOLES:  
400' FOR SEWER 12" & LESS  
600' FOR SEWERS LARGER  
THAN 12"



NO MANHOLE JOINTS ARE TO BE  
PLACED W/IN 12" OF A PIPE  
OPENING. ALL EXTERIOR JOINTS OF  
MANHOLES WILL BE SEALED WITH A  
FLEXIBLE BUTYLE RUBBER BASED  
TAPE (12" WIDE). JOINTS MUST BE  
CLEAN BEFORE APPLYING AND  
PRIMER USED ACCORDING TO  
MANUFACTURERS RECOMMENDATIONS.

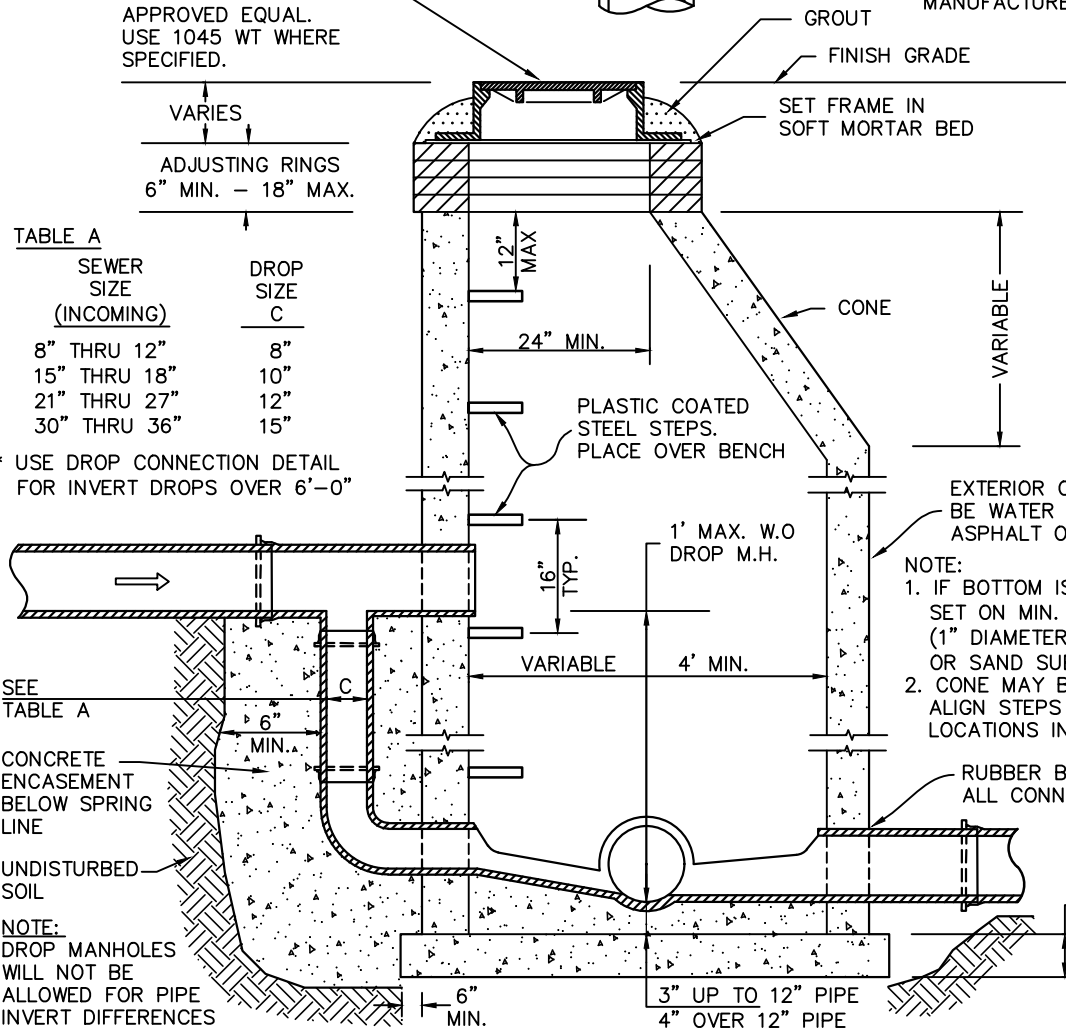
ej 1040Z FRAME WITH  
1040 A COVER OR  
APPROVED EQUAL.  
USE 1045 WT WHERE  
SPECIFIED.

VARIES  
ADJUSTING RINGS  
6" MIN. - 18" MAX.

TABLE A

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 6'-0"



HOLES FOR LIFTING  
PINS MAY NOT  
PROTRUDE THROUGH  
MANHOLE WALLS.

EXTERIOR OF MANHOLE TO  
BE WATER PROOFED WITH AN  
ASPHALT OR TAR COATING.

NOTE:  
1. IF BOTTOM IS PRECAST CONC.,  
SET ON MIN. 4" OF STONE  
(1" DIAMETER).  
OR SAND SUBBASE (CIP)  
2. CONE MAY BE ROTATED TO  
ALIGN STEPS IN VARIOUS  
LOCATIONS IN MANHOLE.

RUBBER BOOT FOR  
ALL CONNECTIONS.

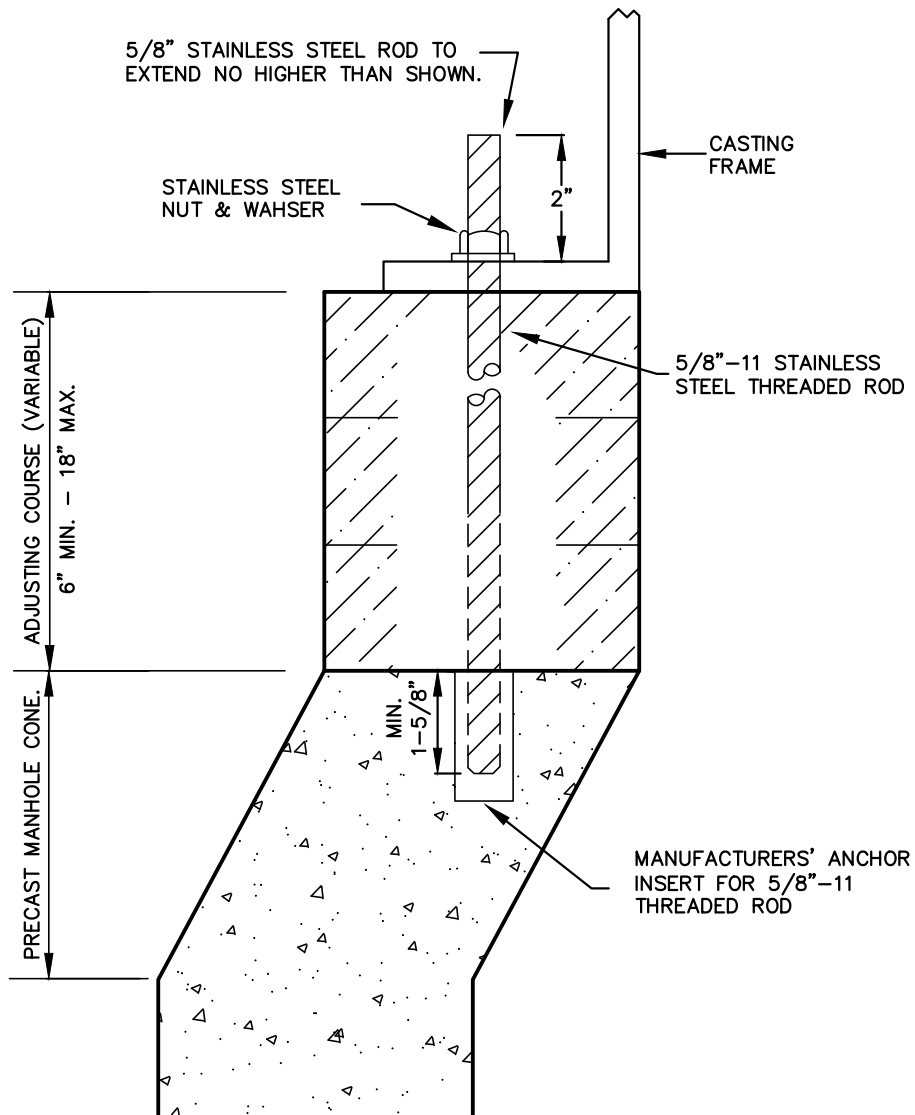
SEE  
TABLE A

CONCRETE  
ENCASEMENT  
BELOW SPRING  
LINE

UNDISTURBED  
SOIL

NOTE:  
DROP MANHOLES  
WILL NOT BE  
ALLOWED FOR PIPE  
INVERT DIFFERENCES  
OF LESS THAN 6".

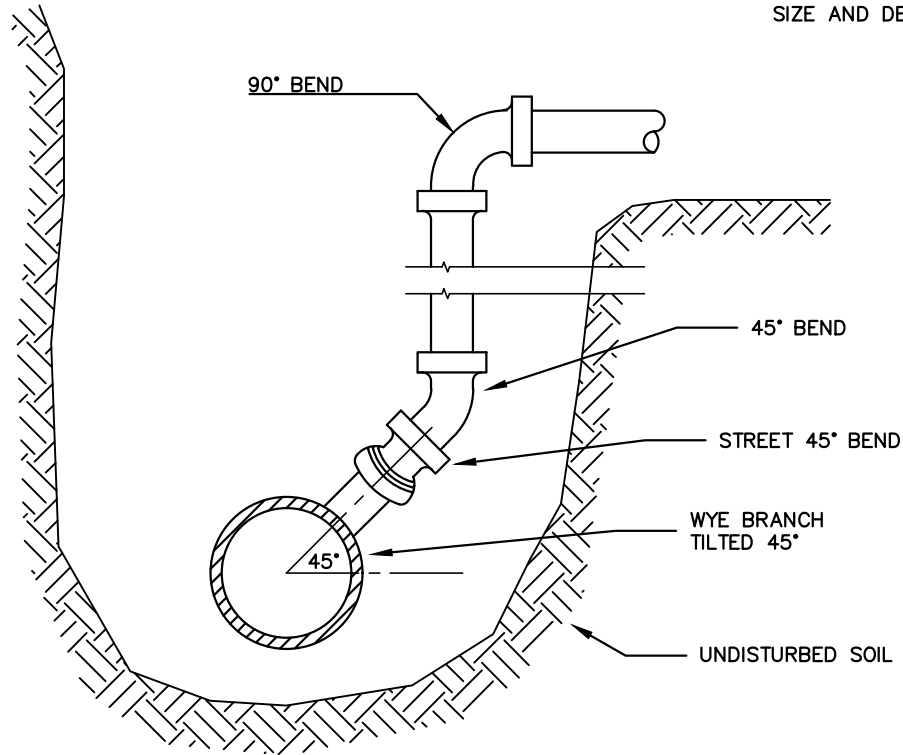
## STANDARD SANITARY SEWER MANHOLE WITH DROP (PRECAST CONCRETE)



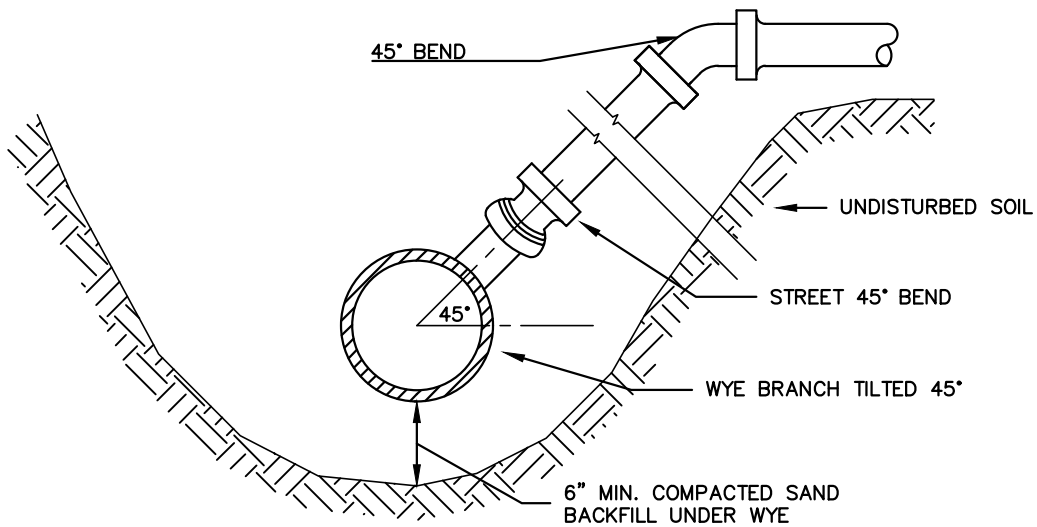
NOTE: FOR ALL PRESSURE TIGHT  
CASTING (4 PER COVER)

## ANCHOR DETAIL

NOTE: SEE PLANS OR SPECS FOR  
SIZE AND DEPTH OF LATERAL



### VERTICAL TRENCH



### SLOPING TRENCH

MAINLINE RISER DETAILS FOR SEWERS OVER 12' DEEP

ej 1120 FRAME AND COVER  
(W/ "SAN" LETTERING) SET IN  
FULL BED OF MORTAR.  
ADJUST TO FINISH GRADE,

CONCRETE COLLAR,  
6" THICK, 2500 PSI

3'-0"

FINISH GRADE

ADJUSTING RINGS  
10" MIN. - 18" MAX.

6"

CONCRETE BASE,  
6" THICK, 2500 PSI

GRAVEL

12"

6" DIA. THREADED  
PVC PLUG

6" DIA. 45° BEND

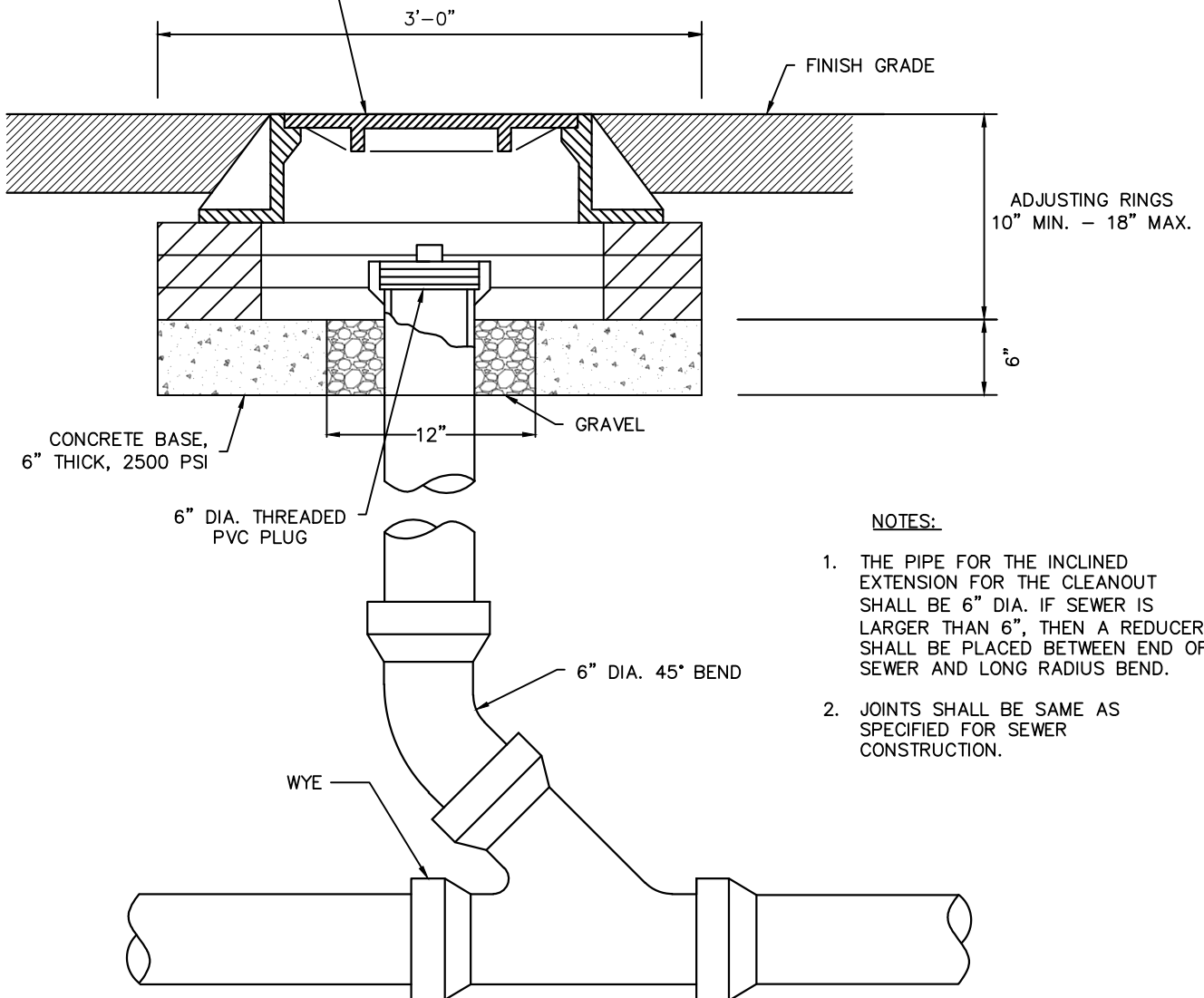
WYE

NOTES:

1. THE PIPE FOR THE INCLINED  
EXTENSION FOR THE CLEANOUT  
SHALL BE 6" DIA. IF SEWER IS  
LARGER THAN 6", THEN A REDUCER  
SHALL BE PLACED BETWEEN END OF  
SEWER AND LONG RADIUS BEND.
2. JOINTS SHALL BE SAME AS  
SPECIFIED FOR SEWER  
CONSTRUCTION.

LATERAL CLEANOUT WITH  
COLLAR IN LAWN

ej 1120 FRAME AND COVER  
(W/ "SAN" LETTERING) SET IN  
FULL BED OF MORTAR.  
ADJUST TO FINISH GRADE,



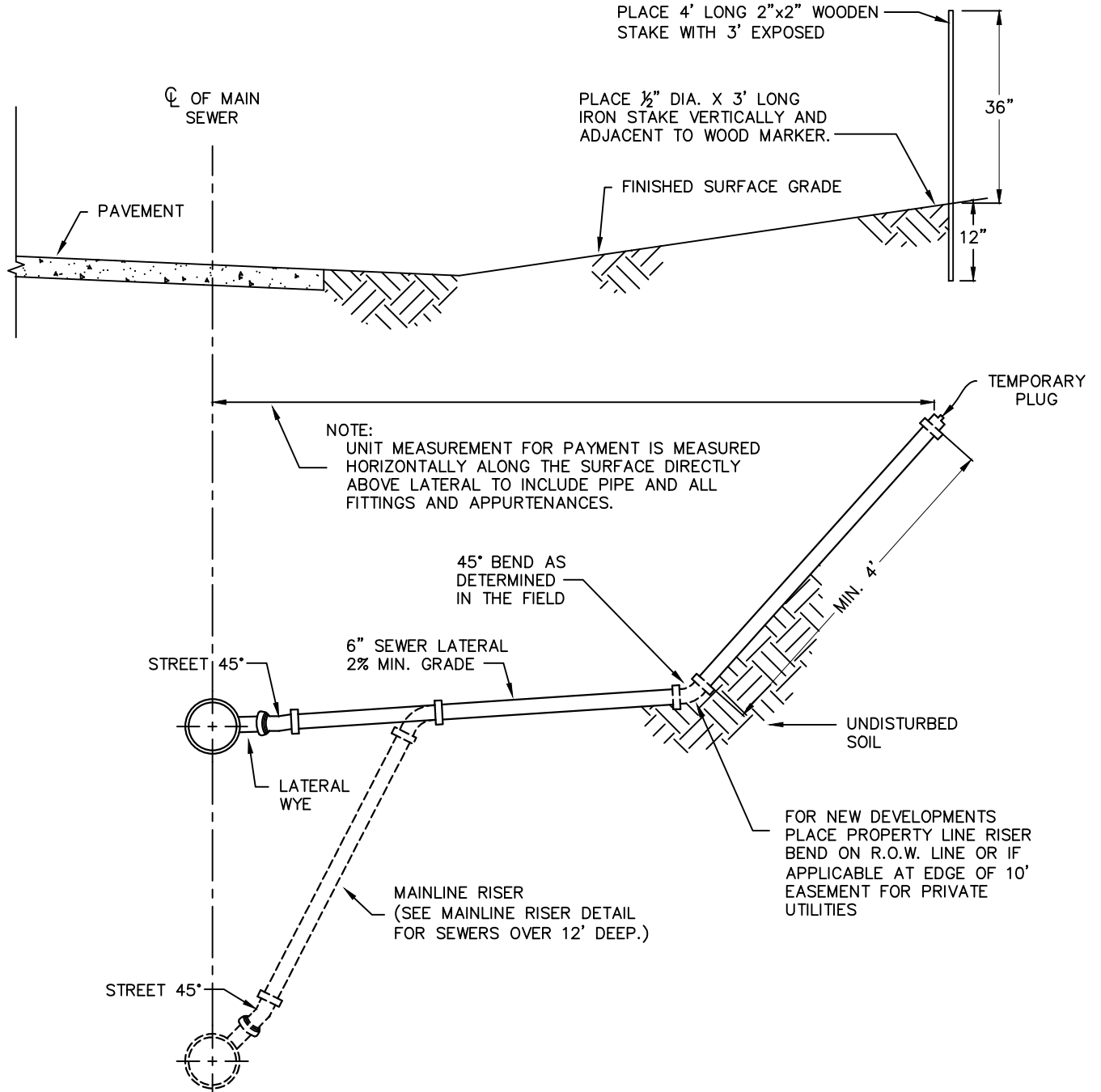
NOTES:

1. THE PIPE FOR THE INCLINED EXTENSION FOR THE CLEANOUT SHALL BE 6" DIA. IF SEWER IS LARGER THAN 6", THEN A REDUCER SHALL BE PLACED BETWEEN END OF SEWER AND LONG RADIUS BEND.
2. JOINTS SHALL BE SAME AS SPECIFIED FOR SEWER CONSTRUCTION.

LATERAL CLEANOUT  
IN PAVEMENT

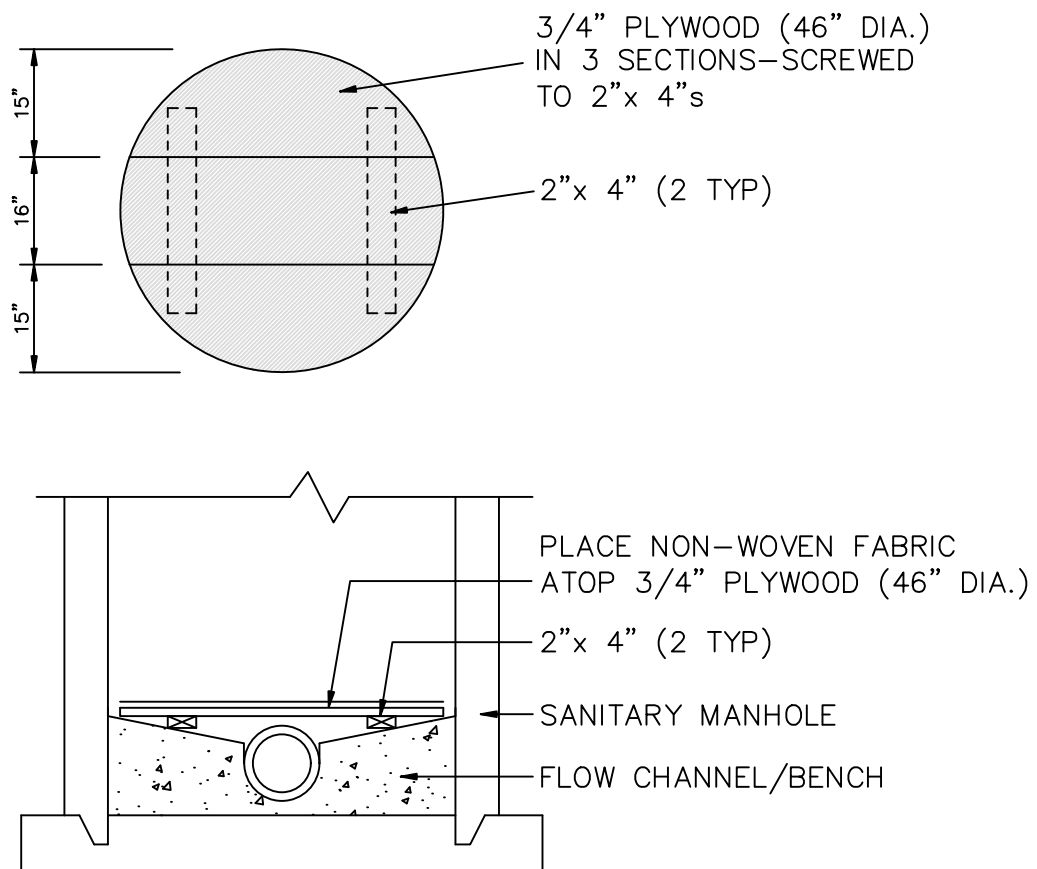
**NOTES:**

1. ALL LATERALS MUST BE SDR-26 INCLUDING FITTINGS.
2. WYES, STREET 45°, AND OTHER JOINTS IN ROW OR EASEMENTS MAY SOLVENT WELD, GLUED, OR GASKETED.
3. CAPS/PLUGS MUST BE SOLVENT WELD OR GLUED.

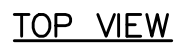


LATERAL AND PROPERTY LINE RISER DETAIL

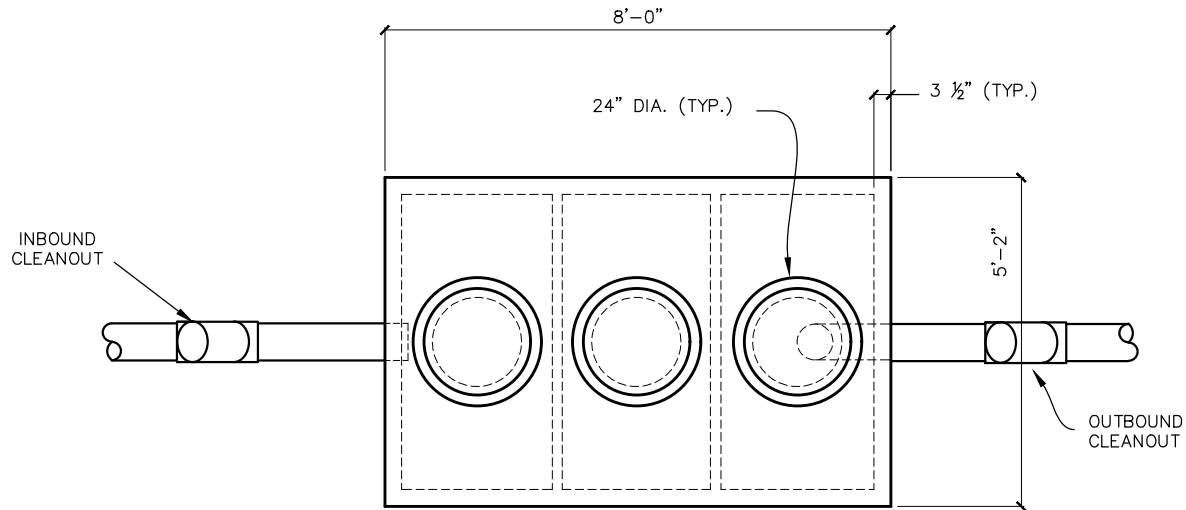




SANITARY MANHOLE FLOW  
CHANNEL PROTECTION DETAIL



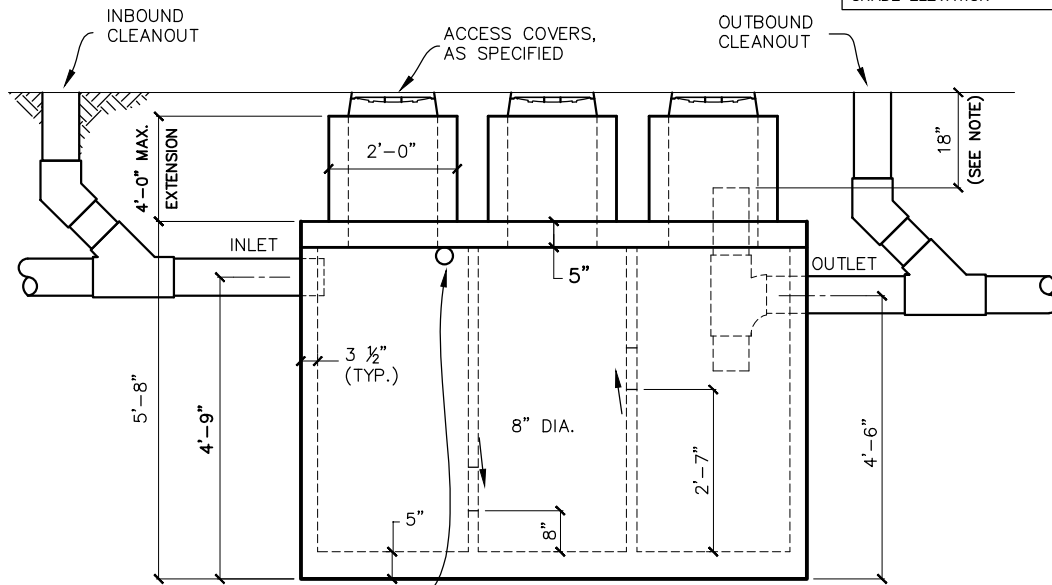
- 1,000 GALLON OUTDOOR OIL & SAND SEPARATOR  
(SHALLOW)



TOP VIEW

NOTE

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

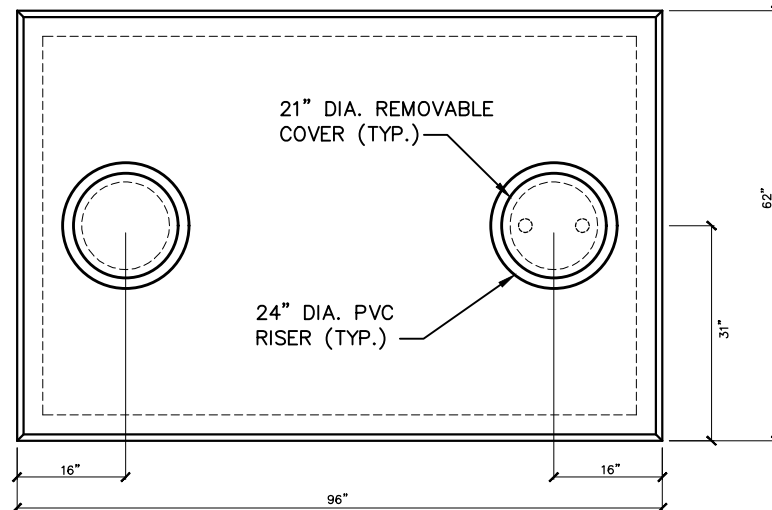


TANK VENT LOCATION  
3" MIN.

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 WRAPPED WITH 12" EZ WRAP.
- 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.

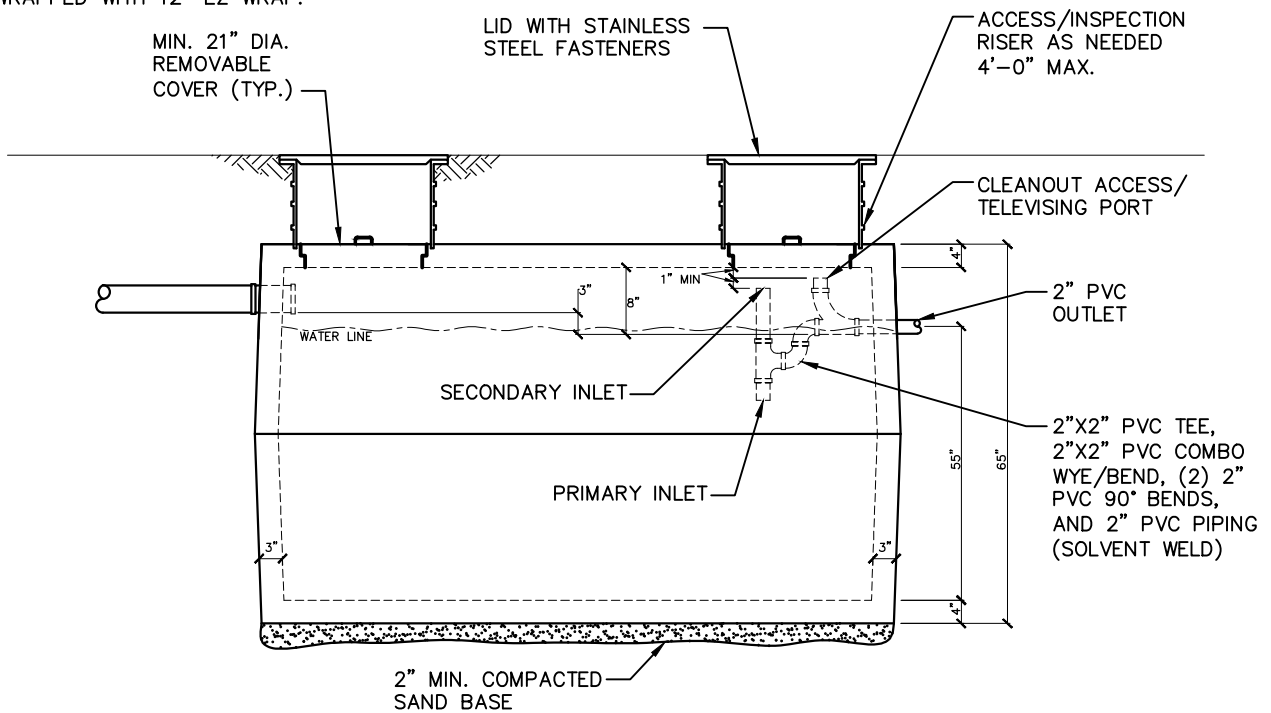
## 1,000 GALLON OUTDOOR GREASE INTERCEPTER



TOP VIEW

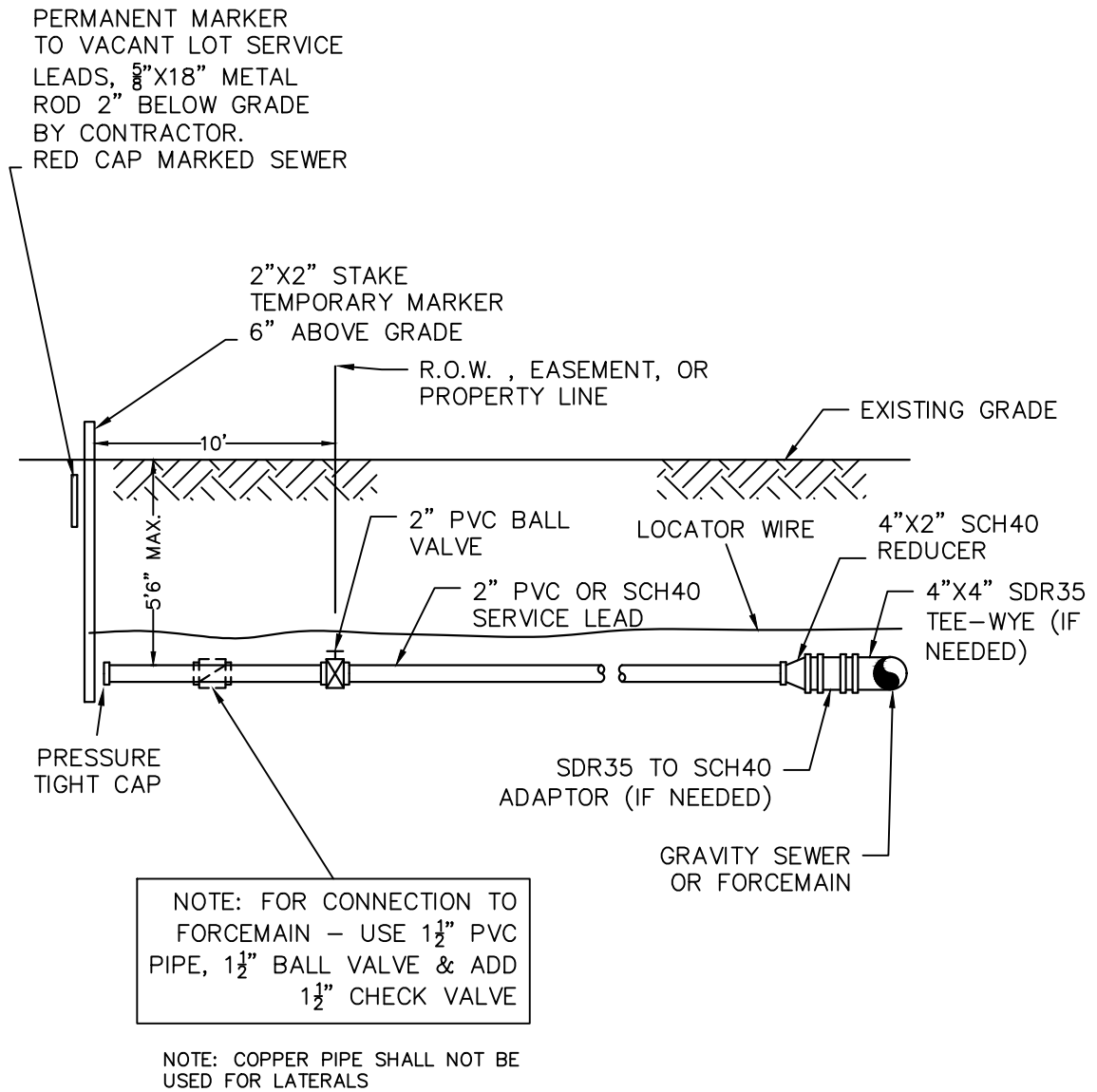
NOTES:

1. SEAL BETWEEN TANK AND EXTENSIONS MUST BE WATER TIGHT.
2. INBOUND AND OUTBOUND PIPES MUST HAVE BOOTED SEAL AT TANK OPENING.
3. THE TANK MUST BE GASKETED AND WRAPPED WITH 12" EZ WRAP.



SIDE VIEW

TYPICAL LOW PROFILE 1000 GAL. CONCRETE SEPTIC TANK  
NO SCALE



STEP SYSTEM/FORCEMAIN SERVICE LATERAL DETAIL