

## SECTION 02731 - SANITARY SEWER PIPE

### PART 1 - GENERAL

#### 1.1 Related Sections:

Section 02201 - Trench Excavation and Backfill  
Section 02730 - Manholes

#### 1.2 DESCRIPTION OF WORK:

- A. The work within this section includes, but is not limited to, the furnishing of all equipment, labor and materials and performing all operations necessary to construct all gravity sanitary sewers, including all main sewers and service connections of whatever size and type required, in accordance with the Township Specifications.

#### 1.3 QUALITY ASSURANCE:

- A. Referenced standards shall be the following:
  - 1. American National Standards Institute (ANSI)
  - 2. American Society for Testing and Materials (ASTM)
  - 3. American Water Works Association (AWWA)

#### 1.4 SUBMITTALS:

- A. Certificates: Contractor shall submit three (3) copies of each manufacturer's certification attesting that the materials meet or exceed specification requirements.
- B. Shop Drawings: Submit manufacturer's descriptive and technical product data for gravity sanitary sewer pipe and fittings prior to start of work for approval in accordance with Section 01300.

### PART 2 - MATERIALS

#### 2.1 POLYVINYL CHLORIDE PIPE (PVC):

- A. Pipe and Fittings: The pipe and fittings shall be made of virgin Type 1, Grade 1 PVC compounds as defined and described in ASTM D3034 (PSM) for Rigid Poly (Vinyl Chloride) Compounds and Chlorinated Poly (Vinyl Chloride) Compounds. Pipe wall thickness shall conform to SDR 35. Pipe and fittings shall be joined with an integral bell-and-spigot type rubber gasketed joint. Each integral bell joint shall consist of a formed bell with a single rubber gasket. Gaskets shall conform to ASTM F477.

## 2.2 DETECTION TAPE

- A. Detection tape shall be a metal detectable reinforced underground utility marking tape with a 50 gauge (0.0005") solid aluminum foil core with permanent printing under a mylar layer.
- B. The detection tape shall consist of a minimum 9.0 mil (0.0009") overall thickness, coated and colored cross woven polyethylene, with no less than 2,500 lbs. of tensile break strength per 12" width and color coded suitable for direct burial.
- C. Detection tape shall be 2-inch width minimum.

## 2.3 CEMENT LINED DUCTILE IRON PIPE:

- A. Ductile iron pipe shall be in full accordance with ANSI A21.51 or AWWA C151, latest editions, for the material class or pressure designated and ANSI A21.50 or AWWA C150, latest edition, for wall thickness.
- B. Minimum Thickness: The minimum thickness shall be Class 52. Pipe for railroad crossing shall be Class 56.
- C. Cement Mortar Lining: Cement mortar linings shall be in full accordance with ANSI A21.44 or AWWA C104, latest edition, except the thickness of linings should not be less than the following:

|                 |       |
|-----------------|-------|
| 3" through 12"  | 1/8"  |
| 14" through 24" | 3/16" |

- D. Iron Fittings: Iron fittings shall be ductile or gray iron and be in full accordance with the standard specification set forth in ANSI A21.10 or AWWA C110, latest editions. All fittings shall be minimum Class 150 with cement lining and joints as required for pipe restraint.
- E. Joints: Joints shall be of the push-on type or mechanical joint type in full accordance with ANSI A21.11 or AWWA C111, latest editions, for all pipe except at changes in alignment or other conditions requiring pipe restraint or as noted on the drawings. Joints requiring pipe restraint shall be Lok-Type or TR Flex as manufactured by US Pipe; Super-Lock as manufactured by Clow; Lok-Fast as manufactured by American Pipe; Locked Mechanical Joint as manufactured by Atlantic State and Griffin; or approved equivalent. Adequate tie rods must be provided to develop full joint restraint and must extend to the adjacent fitting or joint as approved by the National Board of Fire Underwriters No. 24, "Standard for

Outside Protection". Mechanical joint retainer glands shall not be used. Proposed joint restraint system shall be submitted for Township's review and approval.

#### 2.4 INSPECTION:

- A. Field Inspection: All pipe shall be installed and tested for defects in material and/or workmanship in the manner specified and in the presence of and as approved by the Township.

#### 2.5 HANDLING OF MATERIAL:

- A. Replacement of Damaged Material: Any material furnished by the Township that becomes damaged after acceptance by the Contractor shall be replaced by the Contractor at his own expense.
- B. Responsibility for Safe Storage: The Contractor shall be responsible for the safe storage of material furnished by or to him and accepted by him, and intended for the work, until it has been incorporated in the completed project. The interior of all pipe, fittings and other accessories shall be kept free from dirt and foreign matter at all times. All equipment and materials subject to damage from freezing shall be drained and stored in a manner which will protect them.
- C. Hauling: All materials furnished by the Contractor shall be delivered and distributed at the site by the Contractor. Materials furnished by the Township shall be picked up by the Contractor at points designated by the Township and hauled to and distributed at the site.
- D. Pipe, fittings, items of equipment, and other materials of construction shall be loaded and unloaded by lifting with hoists or skidding to avoid shock or damage. Under no circumstances shall such materials be dropped. Materials handled on skidways shall not be skidded or rolled against materials already on the ground.
- E. At Site of Work: In distributing the material at the site or the work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench, or as otherwise directed by the Township. Under no circumstances should lawns, grass plots or other private property be used for this purpose without the consent of the property owner.
- F. Handling of Pipe and Fittings: Proper implements, tools and facilities satisfactory to the Township shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All pipe, fittings, jointing materials, etc. shall be carefully lowered into the trench piece by piece by means of a derrick, ropes or other suitable tools or equipment in such a manner as to prevent damage to sewer line materials and/or workmen and in strict accordance with the manufacturer's recommendations. Under no circumstances shall such materials be dropped or dumped into the trench.

## 2.6 LATERALS:

- A. Laterals shall be constructed of SDR 35 PVC pipe as shown and noted on the construction details.

## PART 3 - CONSTRUCTION

### 3.1 PIPE INSTALLATION:

- A. General: All pipe shall be laid to a uniform line and grade between manholes, socket ends upgrade, with a firm and even bearing along the barrel of the pipe, close joints and smooth invert. The spigot end of the pipe is to be centered in, shoved tight, and secured against the bell or socket of the previously laid pipe.
- B. The interior of each pipe shall be cleaned of all excess joint and foreign material before the next pipe is laid. The pipe shall be laid in the backfill materials as specified. Pipe laying shall commence at the lowest point and proceed upgrade. At the close of each day's work and at such other times when pipe is not being laid, the open end of the pipe shall be protected with a close fitting stopper.
- C. Construction Control: If grade boards are to be used, the Contractor shall provide at least three grade boards in advance of pipe laying at all times at intervals not exceeding 50 feet and stretch a line parallel with the grade line. From this line, the trench and every pipe laid shall be tested as to grade and alignment. Base lines and controlling elevations established for the construction of the work shall be preserved and kept uncovered so they can be examined at any time.
- D. The use of laser equipment shall be permitted. Grade boards as specified will not be required if a laser is used.
- E. Contractor shall provide verification of grade as work progresses. Pipe not laid to proper line and grade will be removed and reconstructed at the Contractor's expense.
- F. Variations: The Township reserves the right to vary the line and/or grade from that shown on the drawings for pipe lines and manholes when such changes may be necessary and advantageous. No claims for extra work will be allowed for changes in location or grade except as when such changes are made after trenching has been done.
- G. Pipe Clearance in Rocks: Ledge rock, boulders and large stones shall be removed to provide a clearance of at least 6 inches below and on each side of all pipe and fittings for pipes 24 inches or less in diameter, and 9 inches for pipes larger than 24 inches in diameter.

- H. The specified minimum clearances are the minimum clear distances which will be permitted between any part of the pipe and/or fitting being laid and any part, projection or point of such rock, stone or boulder.
- I. Pipes at Manholes or Other Rigid Structures: Pipe directly connected to or supported by rigid structures shall be as indicated on the drawings.
- J. Diversion of Sewage during Construction
  - 1. Sewage flowing in existing sewer shall be temporarily plugged or diverted around or through the construction by means of by-pass pumping, fluming, or any other means acceptable to the Township.
  - 2. At completion of each workday tie sewage back into existing sewer. Tie-in shall be covered so there is no visible sewage.
  - 3. Prior to beginning work, Contractor shall have on hand all required materials necessary to accomplish the work.
  - 4. Contractor shall be responsible for any property damage caused by sewage handling.

### 3.2 CONCRETE CRADLE AND ENCASEMENT:

- A. Preparation: Prior to the formation of the cradle or encasement, temporary supports consisting of timber wedges and solid concrete bricks or cap blocks shall be used to support the pipe in place. Temporary supports shall have minimum dimensions and shall support the pipe at not more than two locations, one at the bottom of the barrel of the pipe adjacent to the shoulder of the socket and the other near the spigot end.
- B. Placing: After jointing of the pipe has been completed, concrete shall be uniformly poured beneath and on both sides of the pipe as shown on the details. Placement shall be wet enough during placement to permit its flow, without excessive prodding, to all required points around the pipe surface. The width of cradle shall be such as to fill completely the trench width. In case of extremely wide trenches, concrete easement may be confined above the top of the pipe to a narrower width but in no case shall it be less than the width of trench required for the size of pipe being used.
- C. Before depositing concrete, the space within the limits of the pour shall have been cleared of all debris and water. Water shall not be allowed to rise adjacent to, or flow over, concrete deposited for less than 24 hours. Concrete shall be protected from the direct rays of the sun and kept moist, by a method acceptable to the Township, for a period of seven days or until backfilling is begun. In no case shall backfilling begin within 24 hours of the time of placing and the Engineer shall have strict control of the rate of backfilling.

### 3.3 DROP CONNECTIONS:

- A. The Contractor shall build drop connections where shown on the drawings, where drop in the invert is 2 feet or more, or as required by the Township, and in conformity with the detail drawings and as specified herein. Drop connections shall be of the same pipe material used to construct the main from which the drop connection is made.

### 3.4 SERVICE CONNECTIONS:

- A. Fittings (wye branches, risers and bends) and service pipe shall be installed in strict accordance with these specifications and any and all practices and precautions required for the street sewers are equally applicable to the building connections from the sewer to the right-of-way line, or to a location designated by the Township. The Contractor shall place a 2" x 4" wooden marker at the end of each sewer lateral. The marker shall be one piece and may not be constructed from two or more smaller pieces. The marker shall extend from the lateral invert to 12 inches above grade.
- B. Standpipe: In general, where the sewer is laid in trench and the depth of the invert is more than 12 feet, or elsewhere as required, service connections will enter the sewer as shown on the detail drawings for "Service Connection - Deep Sewer".
- C. Plugs: The upper free ends of service connection lines and wye or tee branches and pipe outlets (when connections are not made thereto at the time the mains are laid) shall be provided with a carefully fitted plug. The type of plug used and the manner in which it is secured and braced shall be acceptable to the Township. After installation, all plugs shall be capable of being secure and completely airtight when subjected to the test procedures specified hereinafter.

### 3.5 END OF PIPE TO BE PROTECTED:

- A. In all cases the mouth of the pipe shall be provided with a circular board or stopper, carefully fitted to the pipe, to prevent earth or other substances from washing into the pipe.
- B. In rock excavation, the mouth of the pipe shall be carefully protected from all blasts, and the excavation shall be fully completed at least 25 feet in advance of laying of the pipe.

### 3.6 STORM SEWER OBSTRUCTION:

- A. When it is necessary to construct a pipe sewer beneath an existing storm sewer in a location where the vertical separation between the top of the pipe sewer piping and the bottom of the storm sewer piping is 3 feet or less, the pipe sewer piping shall be encased in concrete, which encasement shall extend for a distance of not less than 5 feet on each side of the outside surface of the storm sewer piping.

### 3.7 TESTS:

- A. General: Contractor shall notify the Township at least 72 hours in advance of testing for scheduling. Conduct tests in presence of and to the complete satisfaction of the Township. Test shall include alignment, deflection, infiltration, air and TV inspection.
- B. The Contractor shall submit to the Township for approval the detailed test procedure and list of test equipment he proposes to use prior to testing.
- C. Cleaning Prior to Tests: Before tests are conducted, clean piping including sewers, branches and service connections until free of dirt or silt or construction.
- D. Alignment: After the mains have been laid and backfilled, a light will be flashed between manholes or manhole locations to determine whether the alignment of the sewer is true and whether any pipe has been displaced, broken or otherwise damaged subsequent to laying. This test will again be conducted before final acceptance of the sewer. Each section (manhole to manhole) of sewer shall show a good light circle throughout its length and any and all defects shall be corrected by the Contractor, to the satisfaction of the Township, before the work shall proceed and before acceptance of the lines.
- E Deflection Test: Provide GO-NO-GO Mandrel and incidental equipment for Deflection Test. Mandrel to conform to following requirements:
  - 1. Cylindrical in shape with odd number of arms not less than nine, spaced evenly around the mandrel.
  - 2. Minimum 12 inches contact length of mandrel arms with pipe well.
  - 3. Mandrel diameter ninety-five percent (95%) of inside pipe diameter.
  - 4. Conduct deflection testing no less than fifteen (15) days after section of pipe sewer main and service connection between adjacent manholes is backfilled.
  - 5. Pull mandrel through pipe section manually; powered pulling devices not permitted.
  - 6. Consider sewer line section which mandrel cannot pass through, to have more than maximum allowable deflection of five percent (5%).

F. Air Testing: The Contractor shall test each section of sewer between manholes and all laterals to the limit of this contract using low pressure air. Testing shall not be performed until all backfilling has been completed. The Contractor may, at his option, test the section of sewer for his own purposes, prior to completion of backfilling; however, the requirements of this subsection shall not be deemed to be completed until the lines have been tested after the backfilling has been completed and trench settlement has been minimized. The costs of any testing incurred prior to authorization from the Township after backfilling has been completed shall be borne by the Contractor.

1. A minimum period of two minutes shall be provided to allow equilibrium of the air temperature with pipe wall before test readings shall commence. The rate of air loss shall be determined by measuring the time interval required for the average internal pressure to decrease by 1.0 psig.
2. The initial test pressure to be developed in the sewer and laterals shall be determined as follows:
3. Internal pressure in psig shall be calculated as the sum of 3.5, plus the maximum height in feet between the invert of the sewer and the existing ground surface in the section of sewer to be tested divided by 2.3. (For example, if the maximum height is determined to be 9.2 feet, the added pressure would be 4.0 psig. The initial test pressure in the sewer would then be 7.5 psig. The allowable drop would be to 6.5 psig within the time indicated elsewhere in this subsection.) In no case shall the test pressure in the sewers or laterals be greater than 10 psig or the maximum internal differential joint pressure recommended by the manufacturer of the pipe, whichever is less.
4. The pipe shall be considered acceptable if the air loss rate does not exceed 0.0030 cubic feet per minute per square foot of internal pipe surface when tested at the initial pressure previously defined in this subsection. The time for the air pressure to decrease 1.0 psig shall not be less than the time indicated in the following table:

| <u>Pipe Diameter</u> | <u>Minutes</u> | <u>Seconds</u> |
|----------------------|----------------|----------------|
| 6" - 12"             | 6              | 0              |
| 15" - 18"            | 8              | 0              |

5. If the above rates of leakage are exceeded, the Contractor shall, at his expense, determine the source of leakage and make all necessary corrections and retest.

G. Infiltration: After the air testing described in the preceding subsection has been completed by the Contractor, regardless of any indications of the test results made by the Township,

the Township reserves the right to perform field investigations, prior to final written acceptance period specified elsewhere in these specifications, to establish the leakage of groundwater into the sewer and laterals constructed under this contract. The cost of these investigations shall be borne by the Developer/Contractor.

1. Should the leakage exceed 100 gallons per day per inch diameter per mile of pipe for any section, the Contractor shall, at the direction of the Township, and at no cost to the Township, perform any additional testing or corrective work required to reduce the infiltration in each manhole run from those lines installed by the Contractor to less than 100 gallons per day per inch diameter of pipe. This leakage applies to each manhole run separately and should not be construed to mean total leakage in the total system. The scope of this corrective work shall include, but not be limited to, cleaning, televising and testing the sewer and laterals to the limits installed by the Contractor, to include testing and grouting of joints, excavation and replacement of faulty or damaged portions of the work, and all final restoration.

#### H. TV Inspection

1. Prior to final acceptance, the Contractor will be responsible for having the newly installed main completely televised, including flow control. This work shall be performed by a company specializing in such services using a color camera specifically designed for this application. The Contractor shall televise one manhole section at a time.
  2. The Contractor shall provide two (2) copies of the video tape to the Township and the Township Engineer.
  3. Each sewer section shall also be video tape recorded using high quality color VHS video tapes with audio. In the event that a sewer section must be excavated and repaired during televising work, the township may request that videotape recordings be taken both before and after repairs, and shall be included as part of the records.
- I. Acceptance: Observation of successful testing of sewers by the Township does not constitute acceptance of the system or any portion thereof.
- J. Only upon final inspection by the Township, and upon written acceptance for same will the system or portion thereof be considered substantially completed. Upon such acceptance, the warranty period as specified for the sewers will commence.
- K. The final inspection will include, but not be limited to, visual inspections, lamping of lines and random air testing of lines. If, during the final inspection, any irregularities are observed, the condition must be corrected at the Contractor's expense prior to acceptance.
- L. Eleven months from substantial completion, the Contractor shall televise the entire sewer system and supply the tape to the Township for review. Defects detected by this inspection

shall be repaired by the Contractor at no cost to the Township. Defects shall include but are not limited to line sags, pipe cracks, detected leaks, etc.

END OF SECTION