

# **ITEMIZED SPECIFICATION NUMBER ONE**

## **PIPE SEWERS**

1.1 **SCOPE** - This item shall include the furnishing and installation of all pipe sewers of the types and sizes installed in open trench, or otherwise at the various depths as herein specified and as shown on the Drawings. Also included in this item shall be the extension and/or connection of existing sewers into the new sewers and provisions for service connections as herein specified and as shown on the Drawings.

1.2 **PIPE MATERIALS** - All pipes 12" diameter and smaller shall be either PVC meeting the latest requirements of ASTM F-794, with a minimum pipe stiffness of 60 PSI; PVC meeting the latest requirements of ASTM F-949, with a minimum pipe stiffness of 50 PSI; PVC meeting the latest requirements of ASTM D-3034, SDR 35 (Type PSM); or Reinforced Concrete Pipe meeting the latest requirements of ASTM C-76, Class III and ASTM C-443. All PVC pipe shall have a minimum cell classification of 12454-B, 12454-C or 12364-A per ASTM D-1784.

All pipe 15" diameter and larger and not otherwise specified, shall be either PVC meeting the latest requirements of ASTM F-794, with a minimum pipe stiffness of 46 PSI; PVC meeting the latest requirements of ASTM F-949, with a minimum pipe stiffness of 50 PSI or Reinforced Concrete Pipe meeting the latest requirements of ASTM C-76, Class III and ASTM C-443. All PVC pipe shall have a minimum cell classification of 12454-B, 12454-C or 12364-A per ASTM D-1784.

HDPE (High Density Polyethylene) pipe shall have a smooth interior and annular exterior corrugations. Pipe 10" and smaller shall meet AASHTO M252, Type S and the virgin material shall conform with the minimum requirements of cell classification 424420C. Pipe 12" and larger shall meet AASHTO M294, Type S or ASTM F2306 and the virgin material shall conform with the minimum requirements of cell classification 435400C. Cell classifications shall be per ASTM D3350 except carbon black content should not exceed 5%.

Metal pipe shall not be used unless approved by the ENGINEER.

1.3 **PVC PIPE** - All PVC pipe shall be appropriately marked for the purpose of identification and shall be subject to inspection and rejection at the factory, trench or other point of delivery.

All pipe shall be of the integral bell elastomeric gasketed joint type. The joints shall be push-on type meeting the requirements of ASTM D-3212 and the joint shall be designed to prevent displacement of the gasket when assembling the joint.

The pipe shall be installed in accordance with ASTM D-2321 and with the requirements of these Specifications. Any requirements of ASTM D-2321 which may be in conflict or inconsistent with the requirements of these Specifications shall be void to the extent of such conflict or inconsistency.

The ends of all ribbed PVC pipe that will be installed in manholes shall be provided with a factory installed oversleeve. Field installed oversleeves will not be permitted.

1.4 **REINFORCED CONCRETE PIPE** - Reinforced concrete sewer pipe (RCP) shall be appropriately marked for the purpose of identification and no pipe shall be delivered until it has reached the appropriate strength requirements. All (RCP) shall be subject to inspection and rejection at the factory, trench or other point of delivery.

Joints for RCP shall be of the rubber gasket type conforming to ASTM C-443. The gasket shall be the sole element depended upon to make the joint watertight.

Reinforced Concrete Elliptical Pipe shall be provided in accordance with ASTM C507.

1.5. **HDPE PIPE** - HDPE pipe shall only be used for gravity storm sewer or drainage tile applications. It shall be marked for the purpose of identification and shall be subject to inspection and rejection at the factory, trench or other point of delivery. Acceptable pipe size shall be 36" or less.

Pipe joints shall meet the requirements of AASHTO M252, M294 or ASTM F2306. Joints shall be watertight meeting the requirements of ASTM D3212. Gaskets shall be polyisoprene meeting the requirements of ASTM F477 and shall be installed by the manufacturer and covered with a removable wrap. Joint lubricant provided by the pipe manufacturer shall be used on the gasket and bell. Twelve inch (12") and larger pipe shall have a reinforced bell with a bell tolerance device installed by the manufacturer.

Pipe shall be installed in accordance with ASTM D2321 and the manufacturers guidelines. Minimum cover in traffic areas for 4" through 36" pipe shall be 12", however, pipe floatation shall also be considered.

1.6 **SERVICE CONNECTIONS** - Service connections in all pipe 15" diameter and smaller shall be installed into factory made tees of the same material as the main sewer.

Service connections in all pipe 18" diameter and larger shall be installed into the main sewer by one of the following methods. In PVC or HDPE sewer mains the connections shall be made with Inserta-Tees as manufactured by Fowler Manufacturing Company or approved equal. No alternative inserta-tees shall be considered equal until approved by the Engineer. In RCP sewer mains the connections shall be made by coring the concrete main and installing a flexible watertight Kor-n-Seal boot as manufactured by National Pollution Control Systems, Inc. or approved equal. No other boot assembly shall be considered equal until approved by the Engineer.

Materials used to construct sewer service connections shall be ASTM 3034.

Connection of existing sewer services to the new sewer services shall be with a Fernco or approved flexible watertight connection.

1.7 **PLUGS** - Plugs shall be provided at the following locations:

Permanent Plugs shall be provided at all locations where existing sewers are cut and not reconnected.

Temporary Plugs shall be provided at all locations where new pipe stubs are installed for future sewer extensions.

The plugs shall be designed specifically for use with the type of pipe in which they are installed, shall be watertight, and shall be capable of removal without causing damage to the pipe in which they are installed.

The cost of all labor, equipment, and materials required to install plugs shall be included in the appropriate unit price bid for the pertinent sewer item.

1.8 **PIPE REMOVAL** – Pipe removal shall be performed in accordance with ODOT Item 202.

Pipe removed shall be paid per lineal foot and shall include the pipe removed and any additional items as required on the drawings. The Contractor shall be responsible for the proper disposal of the materials at their cost.

1.9 **TRENCHES** - Except where otherwise specifically required or permitted by the ENGINEER, sewers shall be installed in open trench; shall be started at the lowest point; and shall have spigot ends pointing in the direction of flow.

The maximum allowable trench widths at the top of the pipe for the various sizes of pipe shall equal the pipes outside diameter plus 24 inches or as specified on the drawings. Whenever the maximum allowable trench width is exceeded for any reason, the ENGINEER reserves the right to direct the CONTRACTOR to utilize pipe of greater strength, to modify the type of backfill, to embed the pipe in concrete, or to utilize a combination of these procedures, all at the expense of the CONTRACTOR.

Trench excavation shall include the removal of existing pavements, curbs and sidewalks.

All trenches shall be kept sufficiently free of water during pipe laying and jointing to prevent damage to the joints. When water exists in the trenches at the time of pipe laying, the CONTRACTOR shall, at his expense, dewater the trench in a manner approved by the ENGINEER.

Trench excavation in earth and rock shall be 6-inches below the outside bottom of the pipe barrel and bell.

Excavation shall be paid per cubic yard and per plan quantities. Quantities have been calculated by the end area method and can be found in the drawings on the quantities sheet and the cross sections sheet.

1.10 **STORM SEWER AND TILE REPAIR** – All existing storm sewers, field tiles or other subsurface drainage facility damaged, interfered with or otherwise encountered and requiring repairs shall be replaced with new pipe. Drainage facilities shall include but may not necessarily be limited to piping, cleanouts or other appurtenances. The new pipe shall be constructed of materials meeting the requirements of this specification or as approved by the Engineer.

The section of pipe to be repaired shall be cut at a right angle to the centerline of the pipe, leaving sufficient length beyond a joint to install a Fernco adapter. Fernco adapters shall be used at all joints connecting new pipe to the existing pipe unless otherwise approved by the Engineer. The replaced pipe shall be installed to match elevations and size of the existing sewer.

Replacement of Storm Sewer or Tile Repair shall be paid on a per lineal foot basis based upon the bid item for pipe repair. The bid item shall include all backfill and bedding of the replaced section of pipe.

1.11 **PIPE LAYING** - Pipes laid in open trench shall be laid with their full lengths true to line and grade with the aid of laser beam equipment or other method approved by the ENGINEER.

Approved laser beam equipment shall be a rotating laser with grade/slope control or internal pipe laser with target.

Laser beam equipment is used it shall be checked a minimum of twice daily, once in the AM and once in the PM, in presence of the ENGINEER'S Representative to verify that the equipment is maintaining the established line and grade.

Regardless of the method used, the ENGINEER shall be immediately notified of any misalignment of the pipe when laid in accordance with established cuts or elevations.

1.12 **PIPE EMBEDMENT** - Pipe embedment shall include the material placed beneath the pipe to the depths of excavation previously specified and around the pipe in accordance with this specification and/or as shown on the Drawings.

The material shall be coarse aggregate meeting the requirements of the latest revision of the Ohio Department of Transportation Construction and Material Specifications for the respective bedding materials shown on the Drawings. All bedding material shall be provided at the CONTRACTOR'S expense. Granular material shall be approved by the ENGINEER.

No less than the minimum of bedding material shall be provided under the full length of each pipe, including pipe bells or couplings. The bedding material shall be shaped to conform to the bottom quadrant of the pipe barrel. The material shall be carefully placed so as not to damage the joints or displace the pipe and no material shall be dropped directly on the pipe.

The ENGINEER reserves the privilege of altering the type of bedding material, depending upon the water characteristics of the trench.

After the pipe is laid, the bedding material shall be shoveled, placed and tamped to fill all voids under and around the pipe to the limits previously specified. The bedding material beneath and up to the limits specified shall be placed in 6-inch lifts (loose measurement) and compacted by hand or mechanical methods to 95% Proctor Density (AASHTO T-99) to the satisfaction of the ENGINEER.

If material found at the specified depths of excavation below the elevation of the outside bottom of the pipe barrel is not suitable to provide adequate foundation for the pipe, a further depth shall be excavated and filled with granular bedding material approved by the ENGINEER. Such additional granular bedding material, as well as the additional excavation, will be at no cost to the OWNER; but will have been considered and included in the unit price bid for conduit.

Unauthorized excavation below the previously indicated levels shall be filled with the specified bedding material at the expense of the CONTRACTOR. The cost of the granular material for bedding shall be included in the unit price bid for conduit. Quantities for granular material have been calculated by the end area method and can be found in the drawings.

1.13 **BACKFILLING** - Backfill shall include the material placed above the bedding material and shall be as previously specified in GENERAL SPECIFICATION NUMBER TWO and/or as shown on the Drawings.

1.14 **LEAKAGE TESTING** - All sewers shall be tested for leakage.

Testing of storm sewers shall consist of a visual inspection of the sewer and appurtenant structures, with all visible leakage repaired to the satisfaction of the OWNER and ENGINEER.

In all subsequent references to test pressures, a pressure adjustment shall be made where ground water is above the sewer line being tested, by adding 0.433 psi pressure for each foot, the ground water level is above the invert of the pipe, based upon maximum for the testing section. The CONTRACTOR shall make provisions for determining the ground water level, and the level shall be confirmed by the ENGINEER.

Test procedure shall be as follows: The section of pipe to be tested shall be plugged at each end. The ends of all branches, wyes, and laterals shall be sealed or plugged. All plugs shall be braced to prevent slippage or blowout. One of the plugs provided shall have an inlet tap or other provision for connecting an air hose.

Connect one end of the air hose to the inlet tap on the plug and the other end to portable air control equipment, which shall consist of pressure gauges and valves to control the rate of which air flows

into the test section. Pressure gauges shall have a minimum graduation of 0.1 psi and an accuracy of  $\pm 0.04$  psi. The air control equipment shall be connected to a source of air supply such as an air compressor.

Air shall be applied slowly to the test section until the pressure reaches 3 psig (pounds per square inch, gauge), plus adjustment for ground water. The pressure inside the pipe shall not exceed 5 psig, plus adjustment for ground water. When the pressure inside the test section reaches 4.0 psig, the air pressure shall be throttled so that the internal pressure is maintained between 4.0 and 3.5 psig for at least two minutes, to permit temperature stabilization.

Upon expiration of the two-minute period, the air supply shall be shut off or disconnected and the pressure allowed to drop to exactly 3.5 psig. At the exact time 3.5 psig is reached, a stop watch shall be started and the time required for the pressure to drop to exactly 2.5 psig shall be determined.

**NOTE: Make proper pressure adjustments for ground water, where applicable, in determining the beginning and end of the period for the 1.0 psig pressure drop. To avoid over pressurizing the sewer the test pressure shall not exceed 9 psig.**

The permissible time allocation for the 1.0 psig pressure drop shall be calculated on the basis of the diameter and length of main sewer tested and no adjustment shall be made for service connections included in the test.

The air test for the test section shall be considered acceptable if the time elapsed for the 1.0 psig pressure drop, as previously specified, is equal or greater than the time, in seconds, indicated by ASTM F1417 and Uni-Bell PVC Pipe Association Uni-B-6 for PVC Pipe and ASTM C942 for Reinforced Concrete Pipe.

The CONTRACTOR shall include in his Bid all costs for labor and materials necessary to complete the leakage tests specified herein. All tests shall be conducted in the presence of the ENGINEER or his agent whose judgement shall be final as to the acceptance of any test.

1.15 **DEFLECTION TESTING** - The CONTRACTOR shall perform deflection tests on all flexible pipe. No tests may be conducted until after the final backfill has been in place for at least 30 days.

No pipe shall exceed a deflection of 5%. All deflection tests shall be performed without mechanical pulling devices.

The system will not be conditionally accepted until a satisfactory deflection test, witnessed by the ENGINEER, is obtained.

The CONTRACTOR shall include in the Bid all costs for labor and materials necessary to complete the deflection testing herein specified. All tests shall be conducted in the presence of the ENGINEER or his agent whose judgment shall be final as to the acceptance of any test.

1.16 **REMOVAL OF EXCAVATING MATERIALS AND STORAGE OF MATERIALS** - Removal of excavated material and storage of materials shall be as previously specified in GENERAL SPECIFICATION NUMBER TWO.

1.17 **MAINTAINING TRAFFIC** - Maintaining traffic shall be as previously specified in GENERAL SPECIFICATION NUMBER FOUR.

1.18 **MAINTENANCE OF TRENCHES AND EXCAVATIONS** - Maintenance of trenches and excavations shall be as previously specified in GENERAL SPECIFICATION NUMBER FIVE.

1.19 **MAINTENANCE OF DRAINAGE** - Maintenance of drainage shall be as previously specified in GENERAL SPECIFICATION NUMBER SIX.

1.20 **POST CONSTRUCTION TELEVISION INSPECTION** – After the deflection test has passed, the contractor shall televise all sewers. Sewers shall not be considered complete and accepted by the City of Bowling Green until recorded video has been received and reviewed by the Engineer.

Television Inspection – The contractor shall utilize Closed Circuit Television (CCTV) equipment to visually assess the condition of the sewers. All sanitary sewers constructed under this project shall be visually inspected. The Contractor shall provide a picture quality acceptable to the Engineer. The Engineer and Owner shall be notified 48 hours prior to the televising of all sewers and the Contractor shall make arrangements for representatives of the Engineering and Owner to witness the television inspection as required. The Contractor shall re-inspect the sewer if the inspection is determined to be unsatisfactory in the opinion of the Engineer.

Camera – The camera shall be moved through the line in either direction at a uniform rate not to exceed 3.00 feet per second and stopping when necessary to insure proper documentation of the sewer's condition. Equipment used to move the camera through the sewer shall not interfere with the camera view.

Inspection Logs – The Contractor shall submit a typed inspection log clearly indicating date, time, street, sanitary sewer number as well as the location of any significant points such as: damaged pipe, egg-shaped pipe, infiltration points, lateral locations or any other unusual conditions.

Video Record – The Contractor shall submit 2 copies of the video record in DVD format to the Owner. The video record shall have both audio and video tracks describing and depicting pertinent features viewed during the inspection. The video track shall include the following: street, manhole number and sewer section, date, current distance along reach and descriptive printed labels on each container. The audio track shall include the date and time of inspection, sanitary sewer number and section, verbal description of pipe size and type, description of any defects or significant features observed.

The Engineer reserves the right to require television inspection on any public or private sanitary sewer installation.

The Contractor shall include in the bid price for installed pipe all costs for labor, materials and equipment necessary to complete televising of the sewer.

1.21 **PROTECTION OF EXISTING UTILITIES** - Refer to GENERAL SPECIFICATION NUMBER SEVEN.

1.22 **PAVEMENT REPLACEMENT** - Pavement replacement shall be as subsequently specified in ITEMIZED SPECIFICATION NUMBER THREE.

1.23 **PROGRESS** - The Contractor shall be required to complete backfilling operations and general cleanup within a reasonable distance of trenching and pipe laying operations, and other excavations. The specific limitations of this paragraph shall be at the discretion of the ENGINEER, but the general intent is to require the CONTRACTOR to minimize the inconvenience to the public where the sewers are constructed in streets and alleys or in other locations where the construction produces an inconvenience. The ENGINEER shall be permitted to require the CONTRACTOR to cease trenching and pipe laying operations at such time as he feels that backfilling and cleanup have not progressed satisfactorily.

1.24 **MINOR DETAILS** - Minor details not specifically mentioned in these Specifications nor shown on the Drawings, but necessary to secure a workmanlike job and proper operation, shall be provided by the CONTRACTOR without extra cost.

1.25 **PRICE BID** - The price bid for Pipe Sewers shall include all necessary materials, tools, labor, and equipment to construct and test sewers in accordance with the foregoing Specifications and accompanying Drawings, and shall be the price per lineal foot installed complete. Lengths shall be the distance measured from center to center of all manholes and catch basins.