

PAVEMENT AND SANITARY SEWER SPECIFICATIONS

PART 1 GENERAL

1.1 SUMMARY

- A. Sanitary sewers, 48 inches in diameter and smaller.
- B. Pavement for local roads.
- C. Audio–DVD/CD taping of existing and new storm sewer interiors.

1.2 STANDARDS

- A. All materials and construction shall be in accordance with the Standards and Specifications of the City of Perrysburg (the City) Department of Public Service/Utilities, and/or the American Society for Testing and Materials (ASTM), and/or the Wood County Engineer, and/or the Ohio Department of Transportation (ODOT) Construction and Material Specifications (CMS). In case of conflict, City Standards and Specifications shall take precedence.
- B. All references to Standards and Specifications are to the latest edition, unless otherwise noted.
- C. The City's Pavement and Sanitary Sewer Standard Details apply to these specifications.

1.3 PRE-CONSTRUCTION MEETINGS, INSPECTION, AND PERMITS

- A. The Department of Public Utilities (419-872-8050), shall be notified seven calendar days prior to the beginning of actual construction.
- B. Any work within the City's public rights-of-way requires a Street Opening Permit which is obtained from the City's Department of Public Utilities Office, at 211 East Boundary Street, 419-872-8050.
- C. All sanitary sewer installation and testing shall be inspected by the City or its representative.
- D. The City or its representative shall be present during all sanitary sewer TV inspection and taping.

1.4 DEFINITIONS

- A. Bedding: Material placed under, beside and directly over the pipe for the full width of the trench, from a depth of 4 inches below the outside bottom of the pipe barrel, when the pipe is laid on its final grade, up to a horizontal plane a distance of 12 inches above the top of the pipe barrel.

1.5 REGULATORY REQUIREMENTS

- A. Construction operations shall comply with the City's Noise and Vibration Control Ordinance, Section 634.11, as follows:
 - 1. No person shall use any pile driver, shovel, hammer derrick, hoist tractor, roller or other mechanical apparatus operated by fuel or electric power in building or construction operations between 10:00 p.m. and 6:00 a.m. of the next day in a residential area or within 500 feet of a school or church, except for temporary conditions approved by the Director of Public Service.
 - 2. No person shall perform any construction or repair work on any structure or building, or perform any excavation or road work, when such work entails the use of any power operated construction type device in such a manner that the noise created thereby substantially exceeds the noise customarily and necessarily attendant to the reasonable and efficient performance of such equipment.
 - 3. Whoever violates any of the provisions of this section is guilty of a minor misdemeanor for a first offense and a misdemeanor of the fourth degree for any subsequent offense. Punishment shall be as provided in Ordinance Section 698.02.
- B. In accordance with Codified 1040.07, Rule 24 of the City's Streets, Utilities, and Public Services Code, "The sewer contractor shall be required, for two years after the completion of the work, to make all necessary repairs, including filling and seeding if settlement occurs." The sewer contractor is the Contractor responsible for the performance of the Work.

1.6 QUALITY ASSURANCE

- A. Pipe Sewers, Manholes and Appurtenances:
 - 1. The manufacturer shall furnish an affidavit indicating that all pipe, fittings, manholes, and appurtenances have been manufactured and tested in accordance with the requirements of the applicable referenced Standards. A copy of the affidavit, indicating the project on which the material is to be used, shall be forwarded to the City prior to construction.
 - 2. All pipes, fittings, manholes, and appurtenances shall be appropriately marked for identification purposes. The materials and methods of manufacture, and completed pipes, fittings, manholes, and appurtenances shall be subject to inspection and rejection at all times. The City has the right to make all inspections.
- B. Pipe Sewer Inspection:
 - 1. Contractor shall have a minimum of 5 years experience in inspection of pipeline sewers in addition to TV-DVD/CD and summary reports.
 - 2. Perform Work in accordance with the latest standards for TV-DVD/CD recording procedures.
 - 3. Operation of equipment shall be controlled from above ground.
 - 4. The City shall have access to view monitor at all times.

- 5. Inspection shall include pipe sewers from manhole to manhole.
- 6. New sewers and existing sewers shall have its own separate DVD/CD and separate documentation.
- 7. Label new and/or existing accordingly for all documentation.

1.7 RESTORATION

- A. All existing features that are disturbed due to construction activities, such as mailboxes, shrubs, bushes, guardrails, pavement markings, swales, sewers, catch basins, curbs, seeded areas, etc. shall be replaced to their original condition, unless otherwise specified, in accordance with current ODOT specifications and to the satisfaction of the City. Existing survey monuments, bench marks, property corner points, and control points damaged or disturbed by construction shall be replaced by a registered land surveyor, licensed in the State of Ohio.
- B. Restoration of street openings shall be in accordance with the City's Standard Street Opening Repair Details.
- C. In existing streets, provide a temporary pavement upon completion of backfilling operations and maintain same until the permanent pavement can be placed. Temporary pavement shall be a minimum 2-inch thick asphalt concrete mix in accordance with ODOT Item 614.13.
- D. Regrade and reshape all road shoulders and all ditches and swales from existing high points to existing drainage structures or other outlets along the proposed improvement. Ditches, which are reshaped, shall have reasonable side slopes. Vertical or steep slopes will not be permitted.
- E. Seed all disturbed earth areas using the hydroseed method or placement of sod, both seed mixture and sod type shall be as approved by the City.

1.8 DESIGN REQUIREMENTS

- A. Sewers shall be of PVC plastic pipe and fittings.
- B. The following are the minimum permissible slopes at which sanitary sewers shall be installed:

Pipe Diameter	Minimum Slope in Feet per 100 feet
6 inch	1.00
8 inch	0.40
10 inch	0.28
12 inch	0.22
15 inch	0.15
18 inch	0.12
21 inch	0.10
24 inch	0.08

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Pipe Diameter	Minimum Slope in Feet per 100 feet
27 inch	0.067
30 inch	0.058
33 inch	0.052
36 inch	0.046
42 inch	0.037
48 inch	0.031

- C. Roof drains, foundation drains, and all other clean water connections to the sanitary sewers are prohibited.
- D. Manholes shall not be designed or constructed to be located within the landscaped islands of cul-de-sacs.

1.9 SEWER INSPECTION SYSTEM REQUIREMENTS

- A. Camera
 1. Capable of operation in 100 percent humidity conditions.
 2. Specifically designed and constructed for intended service.
 3. Resolution: 500 lines per inch; color image.
 4. Provided with built-in lighting system.
 5. Provide remote operation of lighting system and camera.
 6. Provide with pan and tilt, rotating head capabilities.
 7. Footage Meter: provide equipment with a footage meter so that the location of the camera and point of observation is known at all times.
- B. Monitor:
 1. Locate inside mobile TV studio large enough to accommodate a minimum of four people to view the monitor at all times.
 2. Capable of providing a color picture.
- C. DVD/CD Recorder:
 1. Compatible with closed circuit TV to allow direct recording during inspection.

PART 2 PRODUCTS

2.1 PIPE MATERIAL

- A. PVC Plastic Pipe and Fittings:
 1. ASTM D3034 (4" thru 15" pipe sewer).
 2. ASTM F679 (18" thru 27" pipe sewer).
 3. ASTM F 794 and ASTM F 1803 (30" thru 48" pipe sewer), as applicable and approved by the City, for the sizes involved, minimum pipe stiffness of 46 psi at 5 percent deflection when tested in accordance with ASTM D2412; ASTM D3212 elastomeric gasket joint (integral bell), push-on type with bell designed to retain the gasket to prevent pull-out during making of the joint.
 4. An exception shall be made for ASTM D3034 PVC plastic fittings 8 inches in size and smaller, with such fittings to have

a minimum wall thickness of SDR 35 as defined in Section 7.4.1, and elastomeric joints and minimum socket depths in accordance with Sections 6.2 and 7.3.2; to be molded in one piece using ASTM D1784 having a cell classification of 12454-B or C, or 12364 A; ASTM F477 gaskets having a minimum cross sectional area of 0.20 sq. in.

2.2 MANHOLES

- A. Materials
 1. Precast Concrete Sections: ASTM C478.
 2. Cast-In-Place Concrete: ODOT Class C Concrete.
 3. Concrete Fill: ODOT Class F concrete.
 4. Resilient Connectors: ASTM C923; A-Lok by A-Lok Corporation, Kor-N-Seal by National Pollution Control Systems, Inc. or as approved.
 5. Rubber Gasket Joints: ASTM C443.
 6. Flexible Plastic Gasket Material: Federal Specifications SS-S-210A and AASHTO M-198B; Hamilton-Kent Manufacturing Company, Concrete Sealants, Inc., or as approved.
 7. Manhole Steps: ASTM C478.
 8. Castings: ASTM A48, Class 30B heavy duty gray iron.
 9. Mortar: ASTM C270, Type S with no masonry cement; compose using two parts Portland cement to two parts sand by volume.
 10. Stone Fill: Standard size number 67 or number 57 stone or as otherwise approved.
 11. Sewer Pipe and Fittings for Drop Connections and Pipe Sewer Plugs: Same type as pipe sewer; plugs to be specifically designed for use with the pipe, and shall be watertight, for permanent or temporary use, and removable without damaging the pipe; stainless steel anchor straps for inside drop connections with stainless steel anchors.
 12. Grout: Non-shrink and non-corrosive; Five Star Grout, by Five Star Products, Sealtight 588 Grout by W.R. Meadows, Inc., or as approved.
 13. Joint Sealant: Madewell 806 Flexible Joint Sealant, Mastic.

- B. Components:
 1. Bases: Base riser section with integral floor; provide resilient connectors for connecting pipes to manholes; provide transition sections when base is greater than 48 inch diameter.
 2. Walls: Vertical precast concrete riser sections with rubber gasket joints; provide flexible plastic gasket material on the outside shoulder of the joints; external joint sealing bands on all joints; flexible plastic gasket material shall not interfere with proper sealing of the rubber gaskets.
 3. Tops: Eccentric cone top section narrowing down to a minimum 3 inch high vertical neck with an inside diameter of not less than 24 inches and outside diameter not less than that of grade rings, except reinforced flat slab top for manholes too shallow to accommodate a cone section; design flat slab tops to withstand H-20 traffic loading and

submit design calculations to the City upon request; provide grade rings for a minimum height of 4 inches and a maximum height of 12 inches as required to set castings at proper elevation; ring inside diameter equal to the top section access opening, and outside diameter not less than the outside diameter of the casting frame.

- 4. Manhole Steps: Aluminum or reinforced polypropylene.
- 5. Manhole Frame and Cover:
 - a. Minimum Total weight of 375 pounds, machined bearing surfaces, frame with four equally spaced anchor bolts in the base flange; 24 inch diameter clear opening and 7 inch height, cover with words "CITY OF PERRYSBURG, OHIO SANITARY" cast into top, and the following types:
 - 1) Gasketed Coves: East Jordan Iron Works Cat. No. 1040A with Type A Heavy Duty solid cover, or as approved, with the cover having a factory-installed gasket and no open pickholes.
 - 2) Gasketed Frame: East Jordan Iron Works Cat. No. 1045Z or as approved.
- 6. Drop Connections:
 - a. 12 inches Diameter and Smaller Inlet Pipe: Reliner Inside Drop System as manufactured by Reliner/Duran, Inc. of Lyme, CT. Consists of a marine grade fiberglass drop bowl, "A" size for up to 8-inch inlet pipe and "B" size for 10 and 12-inch inlet pipe; minimum of two 1-1/2 inch wide 11 gage Type 304 stainless steel adjustable clamping brackets; manufacturers stainless steel fasteners as required for bowl size and length of drop pipe. Provide an ASTM D3034 PVC SDR 35 drop pipe sized for drop bowl with 45 degree elbow at outlet end and flexible coupling to connect pipe to bowl outlet.
 - b. Larger Than 12 Inches Diameter Inlet Pipe: Consists of a tee at the upper end, a vertical section of pipe, and a 90 degree bend at the lower end. Encase outside drops in concrete with hook bolts and expansion shields. Secure inside drop in place with anchor straps and anchors. Diameter of drop connection to be two sizes smaller than the inlet sewer, but not less than 8 inches. Provide a plug in upstream end of tee when not immediately connected. Hardware for all internal drops shall meet the requirements of ASTM F593 Type 316, stainless steel

2.3 BEDDING MATERIALS

- A. Granular: ODOT Item 703, Size No. 67 or No. 57 crushed limestone.
- B. Concrete Encasement: ODOT Class C concrete.

2.4 BACKFILL

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- A. Earth Backfill: Excavated earth material. Use finely divided material, free of stones 3 inches or greater in any dimension, to at least 3 feet above pipe top.
- B. Granular Backfill: ODOT Item 304, crushed limestone.
- C. Control Density Fill (CDF): A mix of Portland cement, fly ash and selected granular materials with a compressive strength of 100 psi; Kuhlman Corporation "K-Krete", or as approved.

2.5 LOCAL ROADS

- A. Asphalt Concrete Pavement:
 - 1. 1-1/2 inches ODOT Item 448, Type 1 (medium traffic) Surface Course, PG 64-22.
 - 2. 2 inches ODOT Item 448, Type 2 (medium traffic) Intermediate Course, PG 64-22.
 - 3. 10 inches ODOT Item 304, Aggregate Base (placed in 2 lifts).
 - 4. On aggregate base, apply ODOT Item 408 Prime Coat at rate of 0.35 gallons per square yard. Installation to be directed by the City.
 - 5. ODOT Item 407; apply tack coat at the rate of 0.04 gallons per square yard to be placed between intermediate and surface courses and joints.
 - 6. Sealer for Contact and Mating Surfaces and Joints: Comply with ODOT Items 401.14 and 401.17.
 - 7. Pavement Sealer: When requested by and as approved by the City.
- B. Concrete Driveways and Parking Areas:
 - 1. Pavement: ODOT Item 452 Non-Reinforced Portland Cement Concrete Pavement.
 - a. Commercial Drives: minimum 9 inch thick or match existing
 - b. Residential Drives: minimum 6 inch thick or match existing
 - 2. Reinforcement: Match existing.
 - 3. Hook Bolts or Deformed Bars in Roadways:
 - a. Provide 5/8-inch hook or deformed bolts where new abuts existing.
 - b. Furnish and install at 30 inches center to center where new abuts existing longitudinally.
 - c. When thickness is less than 10 inches, as determined by the City, furnish and install at 20 inches center to center where new abuts existing transversely.
 - d. When thickness is greater than 10 inches, as determined by the City, furnish and install at 26 inches center to center where new abuts existing transversely.
- C. Concrete Curbs: ODOT Item 609.04; Class C concrete.
- D. Underdrains: ODOT Item 605 using pipe 706.06, 706.07, 706.08 or 707.41.

2.6 MONUMENT ASSEMBLY (IN PAVED AREAS)

- A. Neenah Foundry Company, R 1978 A2 with bolted lid.

2.7 CURB RAMP DETECTABLE WARNING TRUNCATED DOMES

- A. Materials:
 - 1. Follow current ODOT Specifications 712.14 as modified herein:
 - 2. Truncated Domes: Shall consist of cast-in-place reinforced polymer composite tiles.
 - 3. Material supplied shall be red color, and installed by pressing tiles into place in the freshly poured concrete.
 - 4. Material supplied and installed shall meet ODOT Standard Drawings and current approved products as listed at: <http://www.dot.state.oh.us/Divisions/Engineering/Roadway/DesignStandards/roadway/Pages/Approved%20Products.aspx> (DETECTIBLE WARNINGS)
- B. Concrete: ODOT Class C.

PART 3 EXECUTION

3.1 SANITARY SEWER PIPE AND FITTINGS

- A. Install PVC plastic pipe and fittings in accordance with ASTM D2321 (as modified by these specifications) and the requirements of these specifications.
- B. Excavate trenches to a depth of 4 inches below the outside bottom of the pipe barrel and bell when the pipe is laid on its final grade to allow for bedding material.
- C. Place bedding material (ODOT No. 67 or No. 57 crushed limestone) under, beside, and to 12 inches over the pipe sewer for the full width of the trench; place in 6 to 12-inch layers, loose measure, and work the crushed stone around the pipe to provide even support, to fill all voids, and to lightly compact the crushed stone (by hand).
- D. Construct concrete encasement for sewers under creeks.
- E. Install pipe at a minimum 10 feet horizontal distance from water mains and hydrants, and lay pipes at a minimum 18 inches vertical distance from water mains at their crossing, both as measured between the outside of the pipe walls. At crossings, install one full length of pipe so both joints will be as far from the main as possible.
- F. From the top of the bedding to a point 5 feet below the adjacent ground level, backfill trenches in and within 5 feet of the edge of existing and proposed paved or stoned streets, alleys, and parking areas with granular material (ODOT No. 304 crushed limestone). Place the crushed limestone material in maximum

36-inch layers, loose measurement. Mechanically level the crushed stone and compact each layer with an excavator-mounted vibratory plate compactor that produces a rated compactive force of at least 9 psi. Each layer to receive a minimum of two complete passes, except where CDF is indicated on the Drawings.

- G. The top 5 feet of the trench shall be backfilled with granular material (ODOT No. 304 crushed limestone). Place the crushed limestone material in maximum 12-inch loose layers and mechanically compact to not less than 100 percent of the maximum dry unit weight as determined in accordance with ASTM D698 (Standard Proctor), except where CDF is indicated on the Drawings.
- H. For trenches within 5 feet from the edge of existing and proposed paved or stoned streets, alleys, and parking areas, backfill with compacted granular material as specified above for trenches coming within same.
- I. For backfilling trenches in yard/grassed areas, replace as much of the excavated material as possible. Until backfilling has progressed to a depth of at least 3 feet over the top of the pipe barrel, use finely divided material, free of stones 3 inches or greater in any dimension, boulders and other harmful debris, and place in 18-inch layers, loose measurement, and compact by mechanical tamping. Place remainder of backfill in maximum 12-inch layers, loose measurement, and compact by mechanical tamping.
- J. For backfilling trenches within 5 feet of existing and proposed sidewalks and driveways, replace as much of the excavated material as possible. Until backfilling has progressed to a depth of at least 3 feet over the top of the pipe barrel, use finely divided material, free of stones 3 inches or greater in any dimension, boulders and other harmful debris, and place in 12-inch layers, loose measurement, and compact by mechanical tamping. In no case shall the compaction be less than 92% as determined by the Standard Proctor Test.
- K. Changes in pipe material to meet City Specifications shall occur only at manholes.

3.2 MANHOLES

- A. Install base with top surface level; install on cushion of approved compacted granular material, minimum 3 inches thick.
- B. Install wall sections plumb and level. When walls include steps, install with steps in the center of a traffic lane or between lanes where possible when in pavement, and, when outside pavement, with steps located away from the pavement edge unless the manhole is within a ditch line, then locate steps on the high side of the ditch slope.

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- C. Provide a drop connection for each sewer entering a manhole at an elevation of 24 inches or more above the manhole invert.
 - 1. 12 inches Diameter and Smaller Inlet Pipe: Provide Reliner Inside Drop System at both new and existing manholes. Install as instructed by manufacturer.
 - 2. Larger Than 12 Inches Diameter Inlet Pipe: Provide outside at new manholes, and inside at existing manholes unless otherwise noted.
- D. Set grade rings in a full bed of mortar, and mortar the interior of the grade rings to provide a smooth common surface from frame to top.
- E. Set casting frames firmly on top of grade rings with a full leveling bed of 1:1 cement mortar; in paved areas, make casting top 1/4 inch below top of pavement surface; in unpaved streets and alley areas, set the cover not to exceed 1 inch above the ground surface. On right-of-way and in ditches, cover elevation shall be as approved by the City.
- F. If not integrally cast with the base, after pipe installation provide an ODOT Class F concrete invert having a depth equal to 1/2 the sewer pipe diameter and sloping upward toward the walls approximately 3 inches; trowel concrete smooth. Include drop connections in inverts; do not discharge on sloped portion. For concrete inverts integrally cast with the base, fill void between base and wall with ODOT Class F concrete to match top of shaped invert.
- G. Encase all manhole frames located in pavement in concrete extending from a horizontal plane 4 inches below the lowest grade ring up to the top of the frame, unless otherwise shown or noted. Make the concrete encasement circular in plan by using a minimum 48-inch diameter steel casing ring as a form centered on the frame.
- H. Joint Sealant: Apply mastic, 1/4 inch thick, to interior surfaces of manhole chimney and grade rings as shown on Standard Detail.

3.3 SERVICE CONNECTIONS

- A. Provide for existing and future houses and businesses; minimum 6 inches in diameter unless otherwise shown; maximum two service connections per lateral; install at 1 percent slope.
- B. Connect to the main sewer by providing an appropriate sized stainless steel sewer pipe saddle as manufactured by The General Engineering Company, or as approved.
- C. Install three foot minimum into each lot, or as otherwise noted, true to line and on at least 1 percent grade with a minimum depth of 8 feet at the property line or the maximum depth possible for main sewers less than 8 feet deep, plus deep enough to serve all basements where the main sewer allows.

- D. Provide riser sections of pipe and fittings between the main line sewer connection and that portion installed on at least a 1 percent grade where depths to the main sewer invert exceed 12 feet. Fix riser in place for its full height by providing thoroughly tamped pipe embedment material as shown.
- E. Close service connections not immediately connected to an existing sewer with a plug. Plug shall be specifically designed for use with the pipe, shall be for use as a permanent or temporary plug, shall be watertight, and shall be removable without damaging the pipe.
- F. Do not backfill the ends of service connections until the location is referenced in accordance with the detail on the Drawings. Provide a 2 inch square oak pole accurately placed over the terminus of each service connection and extending vertically to flush with the surface of the ground so that it can be located.

3.4 CONNECTIONS TO STRUCTURES AND PIPES

- A. Connect new sewers to structures through stubs, wall castings, wall sleeves, etc., provided for same, or make an opening at the proper elevation in the wall of the structure, insert the pipe, and neatly and permanently close the opening around the pipe with grout.
- B. Make connections water-tight.
- C. Where necessary, reshape the bottoms of existing structures to give a smooth flow in all directions.
- D. Connect unlike types and sizes of pipe using proper adapter or connector by Fernco, Inc., Joints, Inc., or as approved.

3.5 SEWER INSPECTION

- A. Preparation:
 - 1. Upon successful completion of all testing verify with City new and existing sewers to be TV inspected.
 - 2. Flush and clean sewer interiors to remove sludge, dirt, sand, stones, grease, debris, and other materials from the pipe to ensure clear view of interior conditions.
 - 3. Contractor shall intercept debris at downstream manhole, remove and disposed at an approved location off site. Provide written documentation to City indicating disposal site location.
 - 4. Provide materials, labor, equipment, power, and maintenance to implement a temporary by-pass pumping system around the work area for time required to complete TV inspection.
 - 5. Coordinate with the City proposed time and duration of by-pass pumping.
- B. Closed-circuit TV (CCTV) Camera System:

- 1. Use equipment specifically designed and constructed for closed-circuit sewer inspection.
- 2. Utilize camera with pan and tilt capabilities to view entire sewer and each lateral connection at multiple angles.
- 3. Provide appurtenances and artificial lighting, as required to enhance the quality of the inspection.
- 4. Use equipment capable of traveling upstream and downstream.

C. Inspection Operations

- 1. The camera shall be moved through the pipe sewer in either direction at a moderate rate (at no time shall the speed be greater than 30 feet per minute).
- 2. The camera shall be stopped when necessary to permit proper documentation of the sewer's condition.
- 3. All service connections and inlets shall be noted on the tape.
- 4. Manual winches, power winched, TV cable and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line.
- 5. When manually operated winches are used to pull the television camera through the sewer line, telephones or other suitable means of communication shall be set up between the two manholes on the section being inspected to insure good communications between members of the crew.
- 6. Documentation made during inspection operations must conform to the following guidelines:
 - a. Meet minimum standards for CCTV inspection of sewers as prepared by the National Association of Sewer Service Companies (NASSCO).
 - b. Log Sheet: A written log sheet must accompany each DVD/CD.
 - c. For new sewers, Contractor shall utilize and make reference to manhole numbering as shown and indicated on the project Drawings.
 - d. For existing sewers, Contractor shall prepare and provide a map indicating manhole numbering.
 - e. Reference to new and existing manhole numbers on the DVD/CD, summary report, and pictures shall be consistent with the numbering sequence on the Drawings and on the map provided by Contractor.

3.6 LOCAL ROADS (UNLESS OTHERWISE APPROVED OR DIRECTED)

- A. Prepare subgrade in accordance with ODOT Item 203. Where it is necessary to construct pavement subgrade in fill, remove the existing topsoil beneath the proposed subgrade.
- B. Asphalt Concrete Pavement:
 - 1. 1-1/2 inches ODOT Item 448, Type 1 (medium traffic) Surface Course, PG 64-22.
 - 2. 2 inches ODOT Item 448, Type 2 (medium traffic) Intermediate Course, PG 64-22.

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3. 10 inches ODOT Item 304, Aggregate Base (placed in 2 lifts).
 4. On aggregate base, apply ODOT Item 408 Prime Coat at rate of 0.35 gallons per square yard. Installation to be directed by the City.
 5. ODOT Item 407; apply tack coat at the rate of 0.04 gallons per square yard to be placed between intermediate and surface courses and joints.
 6. Sealer for Contact and Mating Surfaces and Joints: Comply with ODOT Items 401.14 and 401.17.
 7. Pavement Sealer: When requested by and as approved by the City.
- C. Concrete Driveways and Parking Areas: ODOT Item 452.
- D. Concrete Curbs: ODOT Item 609.04 Type 2 Combination Curb and Gutter or Type 6 Curb.
- E. Pipe Underdrains: ODOT Item 605.03, and as shown on ODOT Standard drawing DM-1.2 and approved Drawings.
- 3.7 MONUMENT ASSEMBLY (IN PAVED AREAS)
- A. Place Type C monuments in accordance with ODOT Item 604, and Standard Construction Drawing RM-1.1.
- 3.8 CURB RAMP DETECTABLE WARNING TRUNCATED DOMES
- A. Material to be supplied shall meet ODOT's Office of Roadway Engineering Services Truncated Domes Approved List.
- B. Installation shall be in accordance with ODOT's latest Standard Construction Drawings for New Curb Ramps (with Truncated Domes) BP-7.1 and Retrofitted Curb Ramps BP-7.2.
- C. All curb ramps/retrofitted curb ramps shall include new ODOT Class C concrete where truncated dome material is to be installed.
- D. The City will approve proposed material to be installed.
- 3.9 FIELD QUALITY CONTROL
- A. The City may check compaction of the bedding and backfill at any time.
- B. All testing shall be in the presence of the City or its representative.
- C. For compacted bedding and backfill in trenches and for concrete work, the City may require the employing of a testing laboratory to make tests on site.
1. The City shall pay for required testing that meets the City bedding and backfilling specifications.
2. Contractor shall pay for any retesting required to meet specifications.
- D. Deflection Test:
1. Test 8-inch diameter and larger PVC plastic pipe for a maximum deflection of 5 percent not less than 30 days after final full backfill has been placed, as determined by the City.
 2. Conduct deflection tests with a representative of City present.
 3. Repair or replace pipes exceeding a deflection of 5 percent and then retest until satisfactory test results are obtained. Retesting shall not take place prior to 30 days after pipe repair/replacement and backfill have occurred. For sewers requiring retesting for deflection and previously tested for leakage, upon obtaining satisfactory deflection test results, retest the affected sewer section for leakage.
 4. Conduct tests by pulling an approved deflection probe, having a diameter not less than 95 percent of the base inside diameter or average inside diameter of the pipe depending on which is specified in the ASTM Specification, including the appendix, to which the pipe is manufactured, through the sewer line without mechanical pulling devices. Have a proving ring with an inside diameter equal to the outside diameter of the probe available at the time the probe is used to verify that the probe has the proper diameter by inserting the probe into the ring. The pipe shall be measured in accordance with ASTM D2122.
 5. Deflection Probe: By Wortco, Inc., Burke Concrete Accessories, Inc., or as approved; designed specifically for testing the deflection of the type and size of pipe subject to test, and complying with the following:
 - a. Odd number (no less than 9) of 1/2 inch by 3/16 inch bar stock runners equally spaced on edge around and welded to the circumference of two minimum 1/4 inch thick circular steel plates.
 - b. Distance between plates, out-to-out, of not less than 2 inches smaller than the nominal diameter of the pipe to be tested, with runners extending approximately 1-1/2 inches beyond each plate being bent inward for this distance at approximately 30 degrees.
 - c. Continuous 3/4-inch threaded rod through the center of the plates, having a hex nut drawn tight against the inside face of each plate, and extending each side as required for providing a 3/4-inch ferrule loop insert or similar piece for attaching the pulling medium.
- E. Sanitary Sewer Leakage Testing:
1. Performance Requirements
 - a. Perform leakage testing for the entire length of Work after deflection testing, where possible. If leakage testing is performed before deflection testing, a test section failing deflection testing shall be retested for leakage after acceptable deflection testing.
 - b. Perform with representative of the City present.
- c. Judgment of City's representative as to the acceptance of tests is final.
2. Preparation:
- a. Test each section of pipe for obstructions prior to testing for leakage using mandrels, solid cylinders, or balls with diameters of 95 percent of the pipe diameter. Remove obstructions.
 - b. Determine ground water level by installing ground water gages in manholes as selected by the City. Gages shall consist of a rigid section of 1/2 inch diameter pipe, approximately 10 inches long, inserted horizontally through the manhole wall as near as possible to pipe crown, sealing any opening around the pipe water-tight, and a clear plastic tube attached to the pipe within the manhole and extended vertically to the top of the manhole. Prior to connecting the tube, blow air through the pipe with sufficient pressure to clear the line. Upon satisfactory completion of leakage testing, remove gages and permanently close openings in the manhole walls with non-shrink and non-metallic grout.
 - c. Conduct an infiltration test on the main line sewer when pipe crown is covered with two feet or more of water at the highest point in the test section. Should ground water not provide sufficient head, flood trench within test section, bulkheading each end, to obtain or maintain the specified external head.
 - d. Plugs used during leakage tests shall be of a length at least equal to the diameter of the pipe being tested to ensure a watertight seal.
3. Infiltration Tests:
- a. The length of sewer subject to each test shall be the distance between two adjacent manholes as a minimum, 700 feet as a maximum, but shall be left to the discretion of the City.
 - b. Isolate test section and cap or plug all service connections and stubs within the section to prevent the entry of ground water.
 - c. Measure infiltration by a V-notch weir located in the downstream manhole.
 - d. Maintain test head for not less than 24 hours before a weir measurement is made.
 - e. Maximum allowable leakage, including manholes, shall be 100 gallons per inch of diameter per mile of pipe per day.
4. Exfiltration Tests
- a. The length of sewer subject to an exfiltration test shall be the distance between two adjacent manholes as a minimum, 700 feet as a maximum, but shall be left to the discretion of the City.
 - b. Close upstream and downstream manhole inlets with water-tight plugs and fill the test section with water until the elevation of the water in the upstream manhole is 2 feet above pipe crown in the line being tested, or 2 feet above the existing ground water in the trench, whichever is higher.

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- c. A standpipe may be used instead of the upstream manhole for providing the pressure head when approved by the City.
 - d. Measure exfiltration by determining the amount of water required to maintain the initial water elevation for 1 hour from the start of the test.
 - e. Maximum allowable leakage, including manholes, shall be 100 gallons per inch of diameter per mile of pipe per day.
5. Air Tests:
- a. Conduct an air test between each two consecutive manholes.
 - b. Pneumatic plugs shall be able to resist internal pressures without external blocking.
 - c. Plug each end of the section to be tested and all pipe outlets in the section with suitable test plugs.
 - d. One plug used at a manhole shall have an inlet tap or other provision for connecting an air hose from the air supply equipment.
 - e. The equipment shall include valves to control the rate at which air flows into the test section and pressure gages with minimum graduations of 0.1 psi and an accuracy of ± 0.04 psi to monitor the air pressure within the test section.
 - f. Apply air pressure slowly to the test section until the pressure reaches 4.0 psi, plus an adjustment of 0.433 psi for each foot of ground water above the pipe crown in the line being tested. Internal air pressure, including adjustment for ground water, should never exceed 5.0 psi.
 - g. When the pressure reaches 4.0 psi, plus adjustment for ground water, throttle the air supply so that the internal pressure is maintained between 4.0 and 3.5 psi for at least 2 minutes to permit temperature stabilization. When the pressure has stabilized and is at or above 3.5 psi, disconnect the air supply, start a stopwatch, and allow stopwatch to run until the pressure has dropped 1.0 psi.
 - h. Sewers of Plastic Pipe 27 Inches Diameter and Smaller: Calculate the permissible time allocated for the 1.0 psi pressure drop on the basis of the diameter and length of main sewer tested, no adjustment being made for service connections included in the test section. The air test for a section shall be considered acceptable if the time elapsed for the 1.0 psi pressure drop is equal to or greater than the time indicated, and shall be considered unacceptable if the elapsed time is less than that indicated in the following table:

MINIMUM HOLDING TIME IN MINUTES: SECONDS REQUIRED FOR 1.0 PSI PRESSURE DROP **				
PIPE DIAMETER	LENGTH OF MAIN LINE TESTED *			
	100'	150'	200'	250'
4"	3:46	3:46	3:46	3:46

6"	5:40	5:40	5:40	5:40
8"	7:34	7:34	7:34	7:34
10"	9:26	9:26	9:26	9:53
12"	11:20	11:20	11:24	14:15
15"	14:10	14:10	17:48	22:15
18"	17:00	19:13	25:38	32:03
21"	19:50	26:10	34:54	43:37
24"	22:47	34:11	45:34	56:58
27"	28:51	43:16	57:41	72:07

MINIMUM HOLDING TIME IN MINUTES: SECONDS REQUIRED FOR 1.0 PSI PRESSURE DROP **				
PIPE DIAMETER	LENGTH OF MAIN LINE TESTED *			
	300'	350'	400'	450'
4"	3:46	3:46	3:46	3:46
6"	5:40	5:40	5:42	6:24
8"	7:36	8:52	10:08	11:24
10"	11:52	13:51	15:49	17:48
12"	17:05	19:56	22:47	25:38

MINIMUM HOLDING TIME IN MINUTES: SECONDS REQUIRED FOR 1.0 PSI PRESSURE DROP **				
PIPE DIAMETER	LENGTH OF MAIN LINE TESTED *			
	100'	150'	200'	250'
15"	26:42	31:09	35:36	40:04
18"	38:27	44:52	51:16	57:41
21"	52:21	61:00	69:48	78:31
24"	68:22	79:46	91:10	102:33
27"	86:32	100:57	115:22	129:48

* Interpolate time for intermediate lengths.

** If the test section fails and service connections were included in the test, re-compute test time to include service connections in accordance with 9.6 of ASTM F1417.

- i. Sewers 30 Inches in Diameter and Larger: Conduct individual air tests at joints, and lift holes, along with visual inspection. Perform air tests in accordance with all applicable requirements, with a test to be acceptable if the pressure holds or drops less than 1 psi in 5 seconds.
- j. Sections may be air tested before backfilling the trench as a check for defects and workmanship, but such tests are at CONTRACTOR's option and are not a substitute for tests required after backfilling has been completed.
- k. For main line sewers tested by infiltration or exfiltration, conduct air tests for the purpose of testing service connections even when the crown of the pipe is covered with 2 feet or more of water. For such tests, the internal air pressure shall never exceed 5.0 psi, and the acceptability of the tests will be based on the minimum holding time specified for the size of the main line sewer.

6. Manhole Tests:

- a. Test each manhole after assembly and after all lift holes have been plugged with non-shrink grout and, at Contractor's option, before or after completing backfilling.
- b. Test by drawing a vacuum on the manhole using equipment specifically designed for such testing.
- c. Plug and brace pipes entering the manhole to prevent being drawn into the manhole.
- d. Place a test head with necessary gages and connections at the inside of the top of the cone section and seal in accordance with the manufacturer's instructions.
- e. Draw a vacuum of 10 inches of mercury and then shut the vacuum pump off.
- f. With valves closed, measure the time for the vacuum to drop to 9 inches. The test shall be successful if the time measured meets or exceeds the values indicated in the following table:

MINIMUM TEST TIMES IN SECONDS			
MANHOLE DEPTH	MANHOLE DIAMETER *		
	48"	60"	72"
8' or less	20	26	33
10'	25	33	41
12'	30	39	49
14'	35	46	57
16'	40	52	65
18'	45	59	73
20'	50	65	81
22'	55	72	89
24'	59	78	97
26'	64	85	105
28'	69	91	113
30'	74	98	121
32'	79	104	128
34'	83	110	136
36'	88	116	144
38'	93	122	152
40'	97	128	159

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MINIMUM TEST TIMES IN SECONDS			
MANHOLE DEPTH	MANHOLE DIAMETER *		
	84"	96"	108"
8' or less	40	48	56
10'	50	58	67
12'	59	69	79
14'	68	80	92
16'	77	91	104
18'	87	102	116
20'	97	113	129
22'	106	123	140
24'	116	135	152
26'	125	148	168
28'	135	157	179
30'	144	168	192
32'	154	179	204
34'	162	190	217
36'	172	201	229
38'	182	213	242
40'	191	223	254

* When there is a transition involved, add the times for each size based on the depth associated with each size.

3.10 MAINTENANCE OF TRAFFIC

Two way traffic shall be maintained at all times on dedicated roads. If construction along dedicated roads interferes with traffic, Contractor shall provide two flaggers and other traffic control devices in accordance with the latest edition of the Ohio Manual of Uniform traffic Control Devices

7. Repair/Replacement

- a. For any sewer test section failing to meet the limits of the Specifications, locate and remedy the defects causing the failure, retest the section, and continue repairs or replacement until the limits of the Specifications are satisfied.
- b. For sewers not accessible, should a test fail due to other than a leaking plug, conduct a closed circuit television inspection of the test section to determine the cause of the failure.
- c. When failure is the result of a leaking sewer joint, the joint may be chemically grouted.
- d. Television inspection and chemical grouting of sewer joints shall comply with all applicable "Recommended Specifications for Sewer Collection System Rehabilitation" of the National Association of Sewer Service Companies as approved by the City. Furnish the City two copies of a DVD/CD of all television inspections.
- e. If a manhole test is unsuccessful, make repairs and retest until a satisfactory test is obtained.
- f. Repair all visible leakage in sewers and manholes, even though tests may have been satisfactory.