

GRAVITY SEWER GENERAL NOTES

1. GENERAL STANDARDS

All material and construction shall be in accordance with the current American Water Works Association (AWWA) Standards and Specifications, the current Ohio Department of Transportation (ODOT) Standards and Specifications, the current Ohio Environmental Protection Agency (OEPA) Standards and Specifications, Recommended Standards for Wastewater Facilities (10 State Standards), and American Society of Testing Materials (ASTM).

A minimum of 10 feet horizontally and 18 inches vertically shall be maintained from any sanitary sewer. In the event that specified clearances cannot be maintained between the sanitary sewer and an existing water main, the sanitary sewer pipe shall be installed in accordance with the requirements of 10 States Standards.

Reference to the "ENGINEER" in these specifications shall mean the City of Findlay or the designated representative.

2. CLEAN WATER CONNECTIONS

Roof drains, foundation drains, and other clean water connections to the disposal system are prohibited.

3. INSPECTION AND REJECTION

All pipe sections, fittings and appurtenances shall be appropriately marked for purposes of identification. Notify the ENGINEER for a visual inspection when the pipe delivery is onsite. The materials and methods of manufacture and the completed pipe, fittings and appurtenances shall be subject to inspection by the ENGINEER at all times. Unsatisfactory items will be rejected and shall not be used in construction.

4. MANUFACTURER'S AFFIDAVIT

The manufacturer shall furnish an affidavit indicating that all pipe, fittings and appurtenances have been manufactured and tested in accordance with all requirements of the applicable referenced specifications. A copy of the affidavit, indicating the project on which the material is to be used, shall be forwarded to the ENGINEER prior to construction.

5. MAINTENANCE OF EXISTING FLOWS

The CONTRACTOR shall maintain flow in all pipelines encountered during the work. Sewage or other liquid must be handled by the CONTRACTOR either by connection into an existing sewer or by temporary pumping to a satisfactory outlet as approved by the ENGINEER. Sanitary sewage and storm drainage shall not be drained to the same outlet.

The CONTRACTOR shall be prepared to perform the work on weekends and or evenings so as to minimize disruptions to the public

6. SANITARY SEWERS, FITTINGS, AND MATERIAL

a. SANITARY SEWER PIPE MATERIAL

Sanitary Sewers that are 15-inches or smaller shall be solid wall premium joint SDR35 PVC sewer pipe conforming to ASTM D3034, and shall have minimum pipe stiffness of 46 psi at 5% deflection when tested in accordance with ASTM D2412. Sanitary sewers that are 18-inch or larger shall be solid wall premium joint PVC sewer pipe in accordance with ASTM F670.

The pipe shall be of the elastomeric gasket joint (integral bell) type. Joints shall provide a watertight seal and shall be made in accordance with the pipe manufacturer's instructions. Joints shall be of the push-on type meeting the requirements of ASTM D3212 and, in addition, the bell shall be designed to retain the gasket to prevent pull-out during the making of the joint.

The pipe shall be installed in accordance with ASTM D2321, and with the requirements of these specifications. Any requirements in these specifications which may be in conflict or inconsistent with the requirements of ASTM D2321 shall be void to the extent of such conflict or inconsistency, except in all cases material for pipe embedment shall be as subsequently specified.

b. SANITARY SEWER FITTINGS

PVC Pipe Fittings shall have a minimum cell classification of 12454-B as defined in ASTM D1784. The SDR ratio for fittings shall be equal to or greater than the SDR ratio of the pipe used for the construction of the gravity sewer main.

PVC pipe sanitary sewer fittings installed greater than 20-feet below grade shall be ASTM D3034 SDR26 deep socket style fittings.

7. STORM SEWERS, FITTINGS, AND MATERIAL

a. STORM SEWER PIPE MATERIAL

All Pipe shall meet the requirements of ODOT Item 611 Storm Sewer material used for Type B or Type C conduit may consist of any of the following materials.

- Reinforced Concrete Pipe (RCP): Shall not be less than Class III and shall conform to ASTM C76. All sizes of concrete pipe are acceptable for storm applications. Joints shall be bell and spigot type, with compressive type joints, conforming to ASTM specifications C361. The integral concrete spigot end shall have factory formed, gasket retaining groove to hold in place a confined O-ring type seal.
- Polyvinyl Chloride (PVC): Meeting ASTM 3034 SDR35, for sizes up to and including 15 inch, having a minimum stiffness of 46 PSI, D2241 SDR26 for all sizes, or ASTM F679 for sizes 18 inch and up.
- High Density Polyethylene (HDPE or N12): Shall be corrugated smooth lined pipe and shall conform to AASHTO M252 or AASHTO M294, Type S, SP or D, with modifications to AASHTO M294 as listed in ODOT CMS 707.33.

b. STORM SEWER FITTINGS

All storm sewer fittings, included but not limited to reducers, tees, wyes, saddle taps, plugs, etc. shall be manufactures in the same manner as the conduit that is being used in the storm application. No "field-made" or injected molded fittings will be acceptable.

c. STORM SEWER CATCH BASINS, TYPE B and TYPE C

Shop drawings shall be submitted for approval prior to the fabrication of any portion of the catch basins. Included in this bid item shall be any necessary adjusting rings, castings, etc.

Catch basin details shall be as shown on the City of Findlay Standard Detail Sheet. Adjustment of catch basin or inlet frames shall be accomplished using rectangular HDPE grade rings or precast concrete grade rings. Catch basin adjustment shall be considered an incidental item.

8. MANHOLE GENERAL

- Bases shall be of precast reinforced concrete unless otherwise specified. Standard manhole bases shall be 48 inches inside diameter, with a minimum base thickness of 8 inches and a wall thickness of 5 inches, unless otherwise specified. Manhole bases shall also be constructed monolithically with bottom reinforcement tied to side reinforcement to form an integral structure. If not integrally cast with the base, the contractor shall provide an ODOT Class C concrete invert after installation of the pipes in the manhole. The provided invert shall meet the qualifications of ASTM C478 7.1.4. All concrete shall be troweled smooth. Bases shall be set plumb and at the proper elevation on a bed consisting of a minimum of 6 inches of granular material meeting the ODOT Material Specification No. 57 stone.

- Walls shall be vertical concrete risers having an inside diameter of 48 inches unless specified otherwise. The top section shall narrow down eccentrically to the proper diameter to receive the frame and cover, or shall be of the flat slab type as required by the depth of the manhole. The top of all precast dome sections shall have a minimum 4-inch vertical surface inside and minimum 3-inch vertical surface outside to provide a chimney seal bearing surface. Concrete manhole sections shall be reinforced with steel wire mesh and shall meet the requirements of ASTM C478, except the walls shall not be less than 5 inches thick. Manhole walls shall NOT be equipped with steps. Adjoining sections shall be firmly keyed together by means of tongue and groove joints with rubber "O" ring gaskets meeting the requirements of ASTM C443. Each manhole frame shall be set at the proper elevation by use of precast concrete adjusting rings. Brick, wood, block, etc. are not acceptable materials for adjusting new or existing manholes to grade. Adjusting rings shall be held in place with mortar composed of one (1) part, by volume, Portland cement and two (2) parts clean, hard sand. A minimum riser height of six (6) inches shall be incorporated for the purpose of future adjustments. The total height of all adjusting rings shall not exceed sixteen (16) inches.

- All manhole frames and covers shall be gray iron castings conforming to ASTM A48. Frames and covers shall be per City of Findlay Approved Construction Materials List (Manhole section) with solid cover. Both the underside of the cover and the upper surface of the ledge upon which it rests shall be machined so as to prevent rocking of its supporting surface. Sanitary manhole covers shall be supplied with concealed or closed pick holes which allow no water to enter. Manhole covers shall have the words "SANITARY" or "STORM" as appropriate, cast into the top. The manhole frames shall be firmly set on top of the adjusting rings with a full leveling bed of one to one (1:1) cement mortar. Where manholes are located in paved areas, the surface of the cover shall be made 1/4 inch below the pavement surface. In unpaved streets and alley areas, the cover shall be set not to exceed 1 inch above the ground surface. On right-of-way and in ditches, cover elevation shall be as approved by the ENGINEER. Where covers and frames must be angled for placement within sloped pavement such as driveway aprons, the top manhole adjustment ring must be cast in place concrete to achieve the correct finished surface angle. After installation, the tops of the frames and covers may be painted with one coat of asphalt paint if deemed necessary by the engineer.

- The contractor shall install identification posts for manholes as specified. The identification posts shall be plastic, approximately 4 inches wide and 8 feet long, with the appropriate decals in place. The City of Findlay will provide the posts and decals. The ENGINEER reserves the right to change the shape and/or material of the identification posts at any time.

- Expanding spray foam shall not be used as an alternative to grouting around pipe connections, unless approved by the ENGINEER.

9. SANITARY MANHOLES

- All sanitary sewer manholes shall be precast concrete sections provided in accordance with ASTM C478. Pipe connections shall be a minimum of 6-inches from any joints in the structure. Doghouse type manholes constructed over the existing sewer shall not be permitted. New manholes installed on existing sewers shall be constructed in accordance with the details shown on the plans.

- CASTINGS: Standard cast iron manhole frame and covers shall be East Jordan Iron Works 1022, Neenah 1772, or approved equal with the words SANITARY cast on cover.

- RUBBER GASKET JOINTS: An O-ring type gasket shall be provided at all manhole joints in accordance with ASTM C443.

- JOINT SEALANT- Manhole joint sealants shall meet the Requirements of ASTM C990, Federal Specification SS-S-210A or AASHTO M198B.

- CHIMNEY SEALS- All manhole adjustment rings and castings shall be sealed with an internal or external seal. Internal seals shall be Flex-Seal, Cretex Internal Manhole Chimney Seal, or approved equal. External seals shall be Wrapid Seal, Infi-Shield, Cretex External Manhole Chimney Seal, or approved equal.

- STUBS OUT OF MANHOLES - The stubs shall be the same type of pipe as being provided on the Project for the respective sizes of pipe and shall extend a minimum of 24 inches and a maximum of 36 inches beyond the outside wall of the manhole. The end of each stub shall be provided with a pipe plug specifically designed for use with the pipe. Plugs shall be for permanent or temporary use, shall be watertight, and shall be removable without damaging the pipe.

- PIPE CONNECTIONS: New piped connections to existing or new manhole structures shall be a resilient type connection in accordance with the requirements of ASTM C-923. Resilient type pipe connections shall be Kor-N-Seal boots, Press-Seal Gasket or approved equal. No other utilities shall be installed inside a sanitary sewer manhole.

- DROP CONNECTIONS: A drop pipe shall be required for all pipes entering the manhole at an elevation of 24-inches or more above the flow line of the manhole. The minimum drop pipe diameter for sanitary sewer manholes shall be 6-inches.

- OUTSIDE DROP CONNECTIONS: All new manholes that include drop connections shall be constructed using an outside drop connection.
- INSIDE DROP CONNECTIONS: Inside drop connections are not permitted in new manholes or when connecting to an existing manhole.

10. PIPE LAYING

Pipes shall be laid with their full lengths true to line and grade with the aid of batter boards, grade pole and grade string, laser beam or other method approved by the ENGINEER and shall rest on the bedding material provided.

When batter boards are used, not less than three, set at 25 foot intervals, shall be installed and maintained in proper position at all times as a check on the accuracy of the grade line.

When laser beam equipment is used, it shall be checked a minimum of twice daily, once in the A.M. and once in the P.M., in the presence of the ENGINEER 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.

Pipes shall be laid at a minimum 10 foot horizontal distance from water mains and 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, one full length of pipe shall be installed so both joints will be as far from the main as possible.

11. BEDDING

The gravity sewer shall be laid on a properly shaped and firm bedding meeting the requirements for a Type B or Type C trench as shown on the City of Findlay Standard Detail plan sheets. The materials shall be placed in lifts not exceeding 6 inches in thickness and securely compacted by hand or mechanical tamping to secure a good compaction.

Pipe bedding material for gravity sewers shall consist of a bed of granular stone with a thickness of six (6) inches below the bottom of the pipe to provide proper support, twelve (12) inches to a plane twelve (12) inches to the left and right of the outside of the pipe, and extending to a plane twelve (12) inches above the crown of the pipe. Granular bedding material shall be No. 57 aggregate stone, meeting current ODOT Specification requirements.

If directed by the ENGINEER, the CONTRACTOR shall excavate unstable material below the bottom of the pipe bedding and shall be replaced with approved granular material. The cost of the pipe embedment shall be included in the cost of the pipe.

Trenches in rock shall, at a minimum, be bedded 6 inches below the pipe and up to twelve (12) inches above the top of pipe (even if the trench is classified as Type C), and the trench width in rock shall be no less than 24 inches greater than the outside diameter of the pipe. Payment limits for rock excavation shall be limited to these dimensions. Any excavation beyond the payment limits will not be directly compensated for if a specific pay item is present for "Rock Excavation – Gravity Sewer" (paid per CY).

12. BACKFILL

Backfill shall be to the limits shown on the drawings and include the materials placed above the pipe embedment. Backfill material shall be placed and compacted, according to the requirements of this section, for the entire length, width, and height of the trench or excavation. See City of Findlay Standard Detail plan sheets for more detailed information. Backfill shall consist of finely divided soil free from stones, large lumps or other harmful debris.

Trenches shall be backfilled immediately after the pipe is placed and bedded. Backfill material shall be placed in the presence of the ENGINEER. The backfill material shall not contain stones, rock, pieces of masonry, organic material, frozen earth, debris, and earth with a high void content or other material considered unsatisfactory by the ENGINEER.

- TYPE C TRENCHES, NON-STRUCTURES: Backfill not under structures or outside the pavement influence area shall be compacted in 12-inch layers as directed by the ENGINEER for the entire width, length, and vertical height of the trench.
- TYPE B TRENCHES, STRUCTURES: Backfill under structures or adjacent to pavement shall be ODOT Type 304 or 411 and compacted in 12-inch lifts to 95% compaction based on standard or modified proctor. Structures include manholes, pump stations, grinder pumps, roads, drives, sidewalks, and any other miscellaneous items called out on the drawings.
- PAVEMENT INFLUENCE AREA: Excavations below a line extended from the edge of pavement (or back of curb) at a 45 degree angle downward from the surface shall be backfilled as specified for structures. Areas of the excavation above the 45 degree projection may be backfilled as listed for non-structures.
- Water may be used to attain the proper moisture content in achieving compaction requirements. Prior to the placement of soil over the granular material all free water shall be drained from the excavation. Flooding of the trench to achieve compaction shall be prohibited.

The ENGINEER may check compaction of the backfill at any time.

The CONTRACTOR shall be required to regrade and reshape all road shoulders and all ditches or swales from existing high points to existing drainage structures or other outlets along the proposed improvement. The CONTRACTOR and the ENGINEER shall mutually agree and establish all ditch grades to be restored prior to construction. Ditches which are reshaped shall have reasonable side slopes. Vertical or steep slopes will not be permitted.

13. CONNECTIONS TO STRUCTURES OR PIPES

When required, the new sewers shall be connected to structures and pipes through stubs, wall castings, wall sleeves, etc. provided for same or an opening shall be made at the proper elevation in the wall of the structure or pipe. The pipe inserted and the opening around the pipe shall be neatly and permanently closed with a Kor-N-Boot for sanitary applications and non-shrinking and no corrosive grout for storm applications. For approved sanitary sewer connection material, please see section 18 of these notes. Grout shall be Five Star as manufactured by the U.S. Grout Corporation; Sealight 588 Grout as manufactured by W.R. Meadows, Inc.; or equal. All connections shall be watertight. Where necessary, the bottoms of existing structures shall be filled and reshaped to give a smooth flow in all directions.

Connections to unlike types and sizes of pipe shall be accomplished using the proper adaptor as manufactured by Fernco, Inc; Joints, Inc.; or equal. Connections to structures and pipes shall be at the expense of the CONTRACTOR.

14. SANITARY SEWER TESTING REQUIREMENTS

a. TESTING REQUIREMENTS

1. The CONTRACTOR shall furnish the necessary pumping equipment, pipe connections, taps, gauges, auxiliary water containers, bulkheads, plugs, and any other equipment required to perform pressure and leakage tests.
2. Leakage testing on gravity sanitary sewers shall not be performed until deflection testing has been successfully completed. If air testing is performed prior to deflection testing, the CONTRACTOR will be required to repeat the leakage testing of the sewer following deflection testing.

b. GRAVITY SEWER DEFLECTION TESTING

1. All sewers of PVC plastic pipe shall be tested for a maximum deflection of 5% of the pipe average inside diameter not less than 60 days after final full backfill, including jetting, has been placed, as determined by the ENGINEER.
2. Deflection testing shall be performed by pulling an approved mandrel, having a diameter not less than 95% of the internal diameter of the pipe being tested. The CONTRACTOR shall provide all testing equipment and material needed to properly perform deflection testing. The CONTRACTOR shall pay all costs associated with the test.

15. MANHOLE LEAKAGE TESTING

- a. Manhole leakage testing shall be performed by drawing a vacuum of 10-inches of mercury into the manhole using equipment approved to conduct such testing in accordance with ASTM C1244. With the vacuum pump turned off and all valves closed, the time for the vacuum to drop from 10-inches to 9 inches shall be recorded. The vacuum test shall be considered acceptable if the elapsed time is equal to or greater than that specified in the chart shown in these Specifications. The test pressure may be adjusted to account for the depth of groundwater above the invert of the manhole as shown in the chart.
- b. The CONTRACTOR shall plug and brace all pipes entering the manhole and seal any cracks, or holes with a non-shrink grout to prevent air being drawing into the manhole.
- c. The use of detergents, soaps, or other similar agents will not be permitted to be applied to any of the internal joints of the manhole before testing of the manhole. The contractor will be permitted to apply soap, detergent, or a similar agent to the joints after a failed test to determine the location of the leak.

16. REPAIRS

Any section of sewer failing to meet the testing requirements outlined in this section shall be remedied by presenting a plan for review by the ENGINEER.

Mainline and lateral repairs are to be made using solid pipe couplers. The use of Fernco type flexible couplings for repair sections shall not be acceptable.

17. SANITARY SEWER CLEANING AND TELEVISION INSPECTION

The CONTRACTOR shall clean and televise all sections of the new gravity sewers to the satisfaction of the ENGINEER. Cleaning and television inspection shall be performed after successful deflection and air testing.

- a. **CLEANING** - Prior to televising sanitary sewer facilities, the CONTRACTOR shall utilize high velocity water jet equipment to remove all debris from the sanitary sewer facilities. The CONTRACTOR shall properly dispose of any debris removed from the sanitary sewer. If additional cleaning is required following the television inspection, water required for additional cleaning shall be at the CONTRACTOR's cost.
- b. **TELEVISION INSPECTION** - The CONTRACTOR shall utilize CCTV equipment to visually inspect the condition of the sanitary sewers with a picture quality acceptable to the ENGINEER. The CONTRACTOR shall re-inspect the sanitary sewer if the inspection is determined to be unsatisfactory. Lighting for

television inspection shall be provided by a camera mounted lamp capable of lighting the entire inside circumference of the sanitary sewer pipe. The camera shall be moved through the line in either direction at a uniform rate not to exceed three feet per second and stopping when necessary to insure proper documentation of the sewer's condition and lateral sewer locations.

- c. **CAMERA** - The television camera shall be specifically designed and constructed for sanitary sewer television inspection. The camera shall be of viewing the entire inside circumference the sanitary sewer pipe. The camera shall be self-propelled or mounted on adjustable skids. The camera view shall be transmitted to an above grade monitor.
- d. **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 features such as; damaged pipe, pipe bellies, infiltration points, lateral locations or any other unusual conditions.
- e. **VIDEO RECORD** - The CONTRACTOR shall submit 2 copies of the video record in DVD format to the ENGINEER for review. The video record shall have both audio and video tracks describing and depicting appropriate features viewed during the inspection. The video track shall include the following: street, sanitary sewer section, date and current distance along reach complete with descriptive printed labels on each DVD case.

18. CITY OF FINDLAY ACCEPTABLE MANHOLE MATERIAL

IRON COVER AND FRAME

<u>EAST JORDAN IRON WORKS</u>	<u>NEENAH FOUNDRY</u>
-1051-1 or 1050Z1 (9")	-R-1713 (9")
-1022 (7")	-R-1772 (7")
-1037 (4")	-R-1647 (4")

For bolt-down or waterproof applications where specified: East Jordan Iron Works 1051-1 WT, Neenah Foundry R-1916-C

EXTERNAL CHIMNEY SEAL

<u>PRODUCT</u>	<u>(MANUFACTURER / DISTRIBUTOR)</u>
Infli-Shield	(D.A. Van Dam & Associates)
Cretex External Manhole Chimney Seal Products)	(Municipal & Contractor Sealing Products)
Wrapid Seal	(CANUSA)

INTERNAL CHIMNEY SEAL

<u>PRODUCT</u>	<u>(MANUFACTURER / DISTRIBUTOR)</u>
Cretex Internal Manhole Chimney Seal Products)	(Municipal & Contractor Sealing Products)
Flex-Seal Utility Sealant	(D.A. Van Dam & Associates)
NPC Internal Chimney Seal	(NPC, Inc.)

FLEXIBLE PIPE CONNECTIONS

<u>PRODUCT</u>	<u>(MANUFACTURER / DISTRIBUTOR)</u>
Premium Joint A-Lok	(NPC, Inc.)
Press-Seal Gasket Products	(Press-Seal Gasket Corporation)
Kor-N-Seal	(NPC, Inc.)

MINIMUM TIME REQUIRED FOR 1.0 PSI PRESSURE DROP FOR SIZE AND LENGTH OF PIPE											
Pipe Diameter (in.)	Minimum Time (min : sec)	Length for Minimum (ft.)	Time for Longer Length (sec)	Specification Time (min : sec) for Length (L) Shown							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
6	5:40	39.8	0.427L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	8:24
8	7:34	29.8	0.760L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	23.9	1.187L	9:26	9:26	9:26	9:26	11:52	13:51	15:49	17:48
12	11:20	19.9	1.709L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	15.9	2.671L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	13.3	3.836L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
24	22:40	9.9	6.837L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
30	23:30	8.0	10.683L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:00	7.2	12.926L	43:05	64:38	86:10	107:43	129:19	150:43	172:21	193:53
36	34:00	6.6	15.384L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

ASTM C1244 MINIMUM TEST TIMES FOR VARIOUS MANHOLE DIAMETERS				
Depth (ft.)	Diameter (in)			
	48	60	72	≥84
Time (sec)				
≤8	20	26	33	A
10	25	33	41	S
12	30	39	49	
14	35	46	57	S
16	40	52	67	P
18	45	59	73	E
20	50	65	81	C
22	55	72	89	I
24	59	78	97	F
26	64	85	105	I
28	69	91	113	E
>30	74	98	121	D