

NORTHWESTERN WATER & SEWER DISTRICT

SANITARY SEWER GENERAL NOTES AND SPECIFICATIONS



NORTHWESTERN WATER & SEWER DISTRICT
12560 MIDDLETON PIKE, BOWLING GREEN, OH 43402
PHONE NUMBER: (419) 354-9090



SANITARY SEWER
GENERAL NOTES AND SPECIFICATIONS
LAST UPDATED: 10/2011

DRAWN BY:		CHECKED BY:	
#	DATE	BY	REVISION
	6/10/09	NM	SECTION 6 TESTING- SEC. 8 DRILLING
	10/27/09	BR	UPDATE ALL SECTION
	10/26/11	NM	UPDATE ALL SECTION (temp)

1.0 GENERAL

1.1 Professional Standards

- A. In general, all material and construction shall meet the most recent standards and specifications of The American Water Works Association (AWWA), The Ohio Department of Transportation Standards and Specifications (ODOT), The Ohio Environmental Protection Agency (OEPA) and The American Society of Testing Materials (ASTM).
- B. A minimum of ten (10) foot horizontal and eighteen (18) inches vertical separation must be maintained between sanitary sewers and public water main.

1.2 Regulations

- A. All work must comply with applicable Federal, State, and local regulations in all respects.
- B. The contractor shall at all times follow all applicable local, State and Federal safety requirements during the execution of the work. Special care shall be taken during all excavating operations. Sheeting and bracing, cribbing, etc, must be installed in full compliance with OSHA requirements.

1.3 Clean Water Connections Prohibited

- A. Roof drains, foundation drains, sump pumps and other clean water connections to the sanitary sewer are strictly prohibited.

1.4 Beginning Construction

- A. A Pre-Construction Meeting shall be held prior to the start of construction.
- B. The Northwestern Water and Sewer District shall be notified a minimum of (72) hours prior to the beginning of sanitary sewer construction.
- C. A Pre-Construction Video is required before starting Construction. For Details See Section 6.1 of this Spec.

1.5 Construction Limits

- A. The Contractor must at all times conduct his operations within the public right-of-way, easements, or work agreement as shown in the Contract Documents.

1.6 Underground Utilities

- A. The location of all underground utilities shown on the plans are as obtained from the owners of the utility. No guarantee of accuracy of these utilities is made.

1.7 Utilities Notification

- A. At least three (3) working days prior to commencing construction operations in an area which may involve underground utility facilities, the Contractor shall notify the Project Engineer, and the Ohio Utility Protection Service (OUPS) (1-800-362-2764). www.oups.org
- B. The owner or its agent of the underground utility facility shall, within seventy-two (72) hours, excluding Saturdays, Sundays, and legal holidays after notice is received from contractor, stake, mark or otherwise designate the location of the underground utility facilities. The marking or locating shall be coordinated to stay approximately two (2) days ahead of the planned construction.

1.8 Maintenance of Existing Flows

- A. Where existing sewers are encountered and are interfered with, flow shall be maintained. Sewage or other liquid must be handled by the Contractor either by connection into other sewers or by temporary pumping to a satisfactory outlet as determined by the Northwestern Water and Sewer District Engineer. Sewage or other liquids shall not be pumped, boiled or flumed over the street.
- B. All by-pass pumping plans must first be approved by the District.

2.0 GRAVITY SANITARY SEWERS, FITTINGS, STRUCTURES, AND MATERIALS

2.1 Gravity Sanitary Sewer Pipe

- A. Gravity sanitary sewers shall be premium joint polyvinyl (PVC) sewer pipe conforming to ASTM D-3034-06 SDR35 for installs 18" in depth or less.
- B. Gravity sanitary sewers shall be premium joint polyvinyl (PVC) sewer pipe conforming to ASTM D-3034-06 SDR-26 for installs greater than 18" in depth.
- C. Compounds with a superior cell classification shall be acceptable as long as proper documentation is submitted showing the cell classification to be superior to 12454-B.
- D. Gravity sanitary sewer pipe 18-inches in diameter and larger shall be provided in accordance with ASTM F-679-08.

2.2 Gravity Sanitary Sewer Fittings

- A. Fittings shall have a minimum cell classification of 12454-B as defined in ASTM D-1784.
- B. Fittings for installs 18" in depth or less shall be SDR-35.
- C. Fittings for installs greater than 18" in depth shall be SDR-26.

2.3 Sanitary Sewer Manholes

- A. **PRECAST CONCRETE MH'S:** Barrel Sections shall meet ASTM C-478.
- B. **ADJUSTMENT RINGS:** Precast concrete adjustment rings and domes shall meet ODOT Item 706.02 except for minimum designs and marking. The minimum wall thickness shall be 5-inches and circular steel reinforcement shall be provided at a minimum of 0.18 sq. inches per foot. Concrete shall have a minimum compressive strength of 4000 psi.
- C. **CASTINGS:** Standard cast iron manhole frame and covers shall be East Jordan Iron Works Cat. No. 1020A or Neenah 1772 with "District Logo" cast on cover.
- D. **RUBBER GASKET JOINTS:** Shall meet the requirements of ASTM C443. Acceptable 48-inch diameter joints shall be of the "O" ring gasket type or approved equal.
- E. **RESILIENT CONNECTORS:** Shall meet the requirements of ASTM C923. Kor-N-Seal boots by National Pollution Control Systems, Inc, or approved equal.
- F. **JOINT SEALANTS:** Shall meet the Requirements of ASTM C-990-91, Federal Specification SS-S-210A or AASHTO M198B. Shall be ConSeal by Concrete Sealants or approved equal.
- G. **CHIMNEY SEALS:** All manholes adjustment rings and casting shall be sealed with an internal or external seal. Internal seals shall be FLEX Seal. If contractor elects to use an external seal, Contractor shall use WRAP-ID Seal. Any other uses or applications will not be approved unless given the prior approval by NWWSD.

- H. **MANHOLE STEPS:** Shall be polypropylene and meet the requirements of ODOT Item 711.31.
- I. **MANHOLE IDENTIFICATION:** The following shall be clearly stenciled or impressed on each MH section: 1. Manhole Number, 2. The date manufactured, 3. The name or trademark of the manufacture and location of plant.
- J. **MANHOLE REPAIRS:** Damaged MH Sections may be repaired. However all repairs are subject to the approval of the Engineer. Repaired sections shall conform to the requirements of ASTM C-478.
- J. In pavement areas, after the casting is set to grade, a circular area with a width of 12-inches shall be neatly cut away down to the bearing of the flange of the casting. The excavated area around the casting shall then be filled and compacted to 1/4-inch below the new surface with Class "C" concrete, meeting the requirements of ODOT Item 499.

2.4 Sanitary Manhole Connections

- A. **Inside Drop Connections**
 - a. The minimum inside drop diameter for sanitary sewer MH's shall be 6-inches.
 - b. A drop pipe shall be required for all pipes entering the MH's at an elevation of 24-inches above the flow line of the manhole.
 - c. Inside Drop Connections shall be per the detail on page 3 of these specifications
 - d. Inside Drop Connections may only be used on existing manholes.
- B. **Outside Drop Connections**
 - a. The minimum outside drop diameter for sanitary sewer manholes shall be 6-inches.
 - b. A drop pipe shall be required for all pipes entering the manhole at an elevation of 24-inches above the flow line of the manhole.
 - c. Outside Drop Connections shall be per the detail on page 3 of these specifications
 - d. Outside Drop Connections shall be used on all new manholes.

2.5 Service Laterals

- A. **Sewer Pipe and Fittings**
 - a. Sanitary sewer laterals shall be 6" premium joint polyvinyl (PVC) sewer pipe conforming to ASTM D-3034-06 SDR35 unless otherwise approved by NWSO.
 - b. Fittings shall have a minimum cell classification of 12454-B as defined in ASTM D-1784, and shall be conforming to ASTM D-3034-06 SDR-35 unless otherwise approved by NWSO.
 - c. For installs greater than 18', fittings are to be ASTM D-3034 SDR-26 deep socket style fittings.
- B. **Installation**
 - a. All Service Connections must be installed by a Licensed Sewer Tapper.
 - b. Pipe shall be installed per the Trench and Bedding Detail of these Specifications.
 - c. Laterals shall terminate at the R/W line with bell end and plug.
 - d. A treated 2x4 shall be placed at the end of the lateral to within 1' of finished grade for future locating purposes.
 - e. A "dirt dam" is to be installed around the lateral. Dirt Dam will consist of placing a non-pervious material under, around and over the pipe for a minimum of 6 horizontal feet to prevent the filtration of ground water back to the buildings foundation. Dirt dams must be between pipe joints. No dirt will be permitted around the bell of the pipe.
 - f. Service laterals installed to a vacant lot shall be installed to a depth no greater than 8' deep at the R/W line unless otherwise approved by the District.
 - g. Service laterals shall be laid at a minimum of 1% slope.
 - h. Service laterals will be required to enter through the basement side wall. **NO BASEMENT FLOOR TAPS ARE PERMITTED UNDER ANY CIRCUMSTANCE.**

3.0 SANITARY SEWER FORCE MAINS AND FITTINGS

3.1 Pressure Pipe

- A. **OPEN CUT:** For sewers 1-1/2" thru 16" in diameter, pipe shall be ASTM D-2241, SDR 21 Class200 with ASTM D-3139 joints and ANSI A21.10 fittings.
- B. **DRILLED PIPE:** Shall be PE3408 high density polyethylene meeting ASTM D3350 cell classification 345464C for black and 345464E for color identification stripes; manufactured in accordance with ASTM F714 for 4" diameter DIPS and larger; DR11, 160 psi pressure rating.
- C. Pipe larger than 16" in diameter will be addressed on an individual basis. The District reserves the right to change the pressure rating requirement for HDPE Pipe based on hydraulic conditions of the pipe line. In such a case the change will be addressed in the technical section of the specifications book for the particular job.
- D. A detectable tracer of # 12 gauge wire shall be installed directly over and on the center of the PVC main for its entire length to provide a reflective (inductive) path to determine pipe alignment and location after installation. A detectable tracer tape shall be installed directly over the main 24-36" below grade and have the word SEWER written on it. For drilled pipe see Section 5.6.

3.2 Pressure Pipe Fittings

- A. **FITTINGS:** AWWA C110 or C153 DI, AWWA C111 rubber gasket joints, with C153 fittings to be polyethylene encased when buried.
- B. **JOINTS:** Butt fusion between plain ends of polyethylene pipes: Use restrained mechanical joints with HDPE to DI adapters for transitioning between HDPE and PVC pipes, valves, etc, Electro Fusion is acceptable.

3.3 Service Connections

- A. **TAPPING SADDLES:** For PVC pipe, tapping saddles shall be Stainless Steel Type 306 double studded saddles by Romac Industries.
- B. **TAPPING SADDLES:** For HDPE pipe, tapping saddles shall be Stainless Steel Type 306-H double studded saddles with spring washers by Romac Industries.

4.0 LOW PRESSURE SEWERS

4.1 Grinder Pumps

- A. Grinder Pumps shall be manufactured by Environmental One (E-One) model DH071 Extreme Simplex Grinder Pump unless specifically stated otherwise.
- B. Grinder Pumps shall be installed according to manufacturer recommendation.

4.2 Fittings curb stops, etc

- A. Fittings shall be brass compression style fittings
- B. Curb stop assembly by E-One or all brass fittings matching configuration.

4.3 Electrical

- A. Electrical conduit may be run through soffit, crawls, basements, or underground to comply with manufacturer requirements.
- B. Alarm box must be installed so that a clear line of sight can be seen from it to the grinder pump. Alarm box also must be clearly visible from the road.

4.4 Property Coordination

- A. Contractor shall coordinate with the property owner for installation and verification of existing conditions.
- B. Property owner is not authorized to direct changes in the work as called out on the drawings.

5.0 INSTALLATION OF GRAVITY AND PRESSURE SEWERS

5.1 Excavation

- A. Excavations shall be made to the outside dimensions and to the depths shown or as specified. Topsoil which is suitable for finish grading shall first be carefully removed, stored separately and replaced, after backfilling and rough grading are complete.

5.2 Bedding and Cover Material

- A. Pipe shall be laid on a properly shaped and firm subgrade of the type specified meeting the requirements of ODOT Item 603.05. Where conditions warrant, unsuitable material shall be removed and replaced with granular material per ODOT Item 603.05.
- B. Bedding and cover shall consist of a bed of granular stone with a thickness of at least 6-inches below the bottom of the pipe and extending to a plane of 12" above the pipe. Granular material shall be No. 67 or No. 8 stone.

5.3 Installation of Pipe

- A. Pipe and appurtenances shall be installed true to line, grade and locations shown on the design drawings with joints centered, spigots home and proper support and blocking provided. Care shall be used in the laying of pipe to ensure the pipe is supported for the entire length of the pipe barrel.

5.4 Backfill Material

- A. Backfill shall be to the limits shown on the drawings and according to the compaction requirements of this section.
- B. Trenches and excavations shall be backfilled immediately after the pipe is laid therein. No material shall be used for backfilling that contains stones, rock or pieces of masonry, frozen earth, debris or earth with a high void content.
- C. Backfill not under structures shall be compacted in twelve-inch layers to 90% of Standard Proctor or as directed by the Engineer for the entire width, length, and vertical distance of the trench.
- D. Fill under structures shall be a premium material of ODOT Type 304 or 411 and compacted in 6" lifts to 95% of Standard Proctor. Backfill material shall be placed and compacted for the entire width, length and vertical distance of the trench.
- E. Structures include of MH's, pump stations, grinder pumps, roads, drives, sidewalks, and any other miscellaneous items called out on the drawings.
- F. Trenches within 5-feet of the edge of the pavement or back of curb of existing or proposed pavement shall be backfilled with granular material within the 45 degree angle of repose meeting ODOT Item 411 or 304. The backfill shall be compacted to 95% Standard Proctor. Water should 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.
- G. In areas where granular material is not acceptable for use as backfill, provide Controlled Density Fill (CDF). CDF shall meet ODOT Item 613, Low Strength Mortar Backfill
- H. Excess excavated material stockpiled at the work site, and not be used for backfill or other fill purposes, must be removed from the project area within (2) two weeks of disturbance.
- I. Stockpiles of all excavated material and all construction material shall be of limited size and shall be neatly maintained or removed from the project site so as not to block existing drainage or impede pedestrian or vehicular traffic in any way.
- J. The limits relative to the stockpiling of all excavated material and all construction material shall be controlled by the Owner and the Engineer.
- K. If the Contractor fails to remove excess excavated material, or fails to satisfactorily modify his operations relative to the stockpiling of excavated or construction materials upon order of the Inspector, the Owner/Engineer will direct all work except cleanup operations be stopped, and remain stopped, until all issues are resolved to the satisfaction of the Owner/Engineer.
- L. The removal and disposal of surplus excavated material shall be the responsibility of the Contractor.

5.5 Connections to Existing Mains

- A. New mains shall be connected to existing mains or services, using solid PVC fittings, the use of furn-cos (flexible couplings) are prohibited.
- B. All other main lines not of PVC material will require prior approval from NWSO as to the materials used in making a solid, water tight connection.
- C. No cut-ins or connections to existing mains shall be made unless at least forty-eight (48) hours notice of cut-in or connections is given to the NWSO.
- D. Contractor shall be prepared to work weekends and/or evenings so as to minimize disruptions. Schedule of work is to be first approved by NWSO

5.6 Sanitary Sewer Forcemain Construction by Directional Drilling

A. Drilling Fluid:

- a. Mixture shall consist of clean water, premium Wyoming Bentonite, an allowance is allowed for polymer and detergent.
- b. All mixtures shall meet the requirements of the most current environmental regulations.
- c. If drilling fluid enters into the pipe the pipe will be flushed and cleaned to the acceptance of the Owner/Engineers representative.

B. Tracer Wire:

- a. 316 Stainless Steel alloy, 49 strands, annealed
- b. Tracer wires shall surface at all MH's or mainline valves, in the event that the distance between MH's or appurtenances is greater than 450LF the Owner/Engineer's representative reserves the right to require the tracer wire to surface and tied off to a line marker.
- c. After installation tracer wire shall be tested for continuity. Tracer wire shall be acceptable when one continuous non-interrupted read is obtained for the entire length of the pipe line.
- d. In the event the tracer wire doesn't have one continuous read, contractor shall locate defect, repair, and re-test until approved by the NWSO.

C. Pilot Hole:

- a. Drill pilot holes within the following tolerances:
- b. For mainlines, maintain drill within ± 2 feet both horizontally and vertically
- c. For pipe sewers, ± 2 feet horizontally and ± 50% of pipe diameter for vertical. Any corrections in vertical up to 50% require approval by Engineer to verify pipe velocities aren't compromised.
- d. Radii are to be within the manufacturer's recommendations for the pipe being installed.
- e. At no time shall the pipe leave the road right of way or permanent easement
- f. In the case that the pilot hole must be abandoned and is under or within the influence of the road or other structures requiring bearing capacity of the soil shall be filled, grouted, or secured within a manner approved by the Engineer.
- g. Any re-drilling is the responsibility of the Contractor.

D. Reaming and Pipe Installation:

- a. Pre-ream as necessary for the type of soil and ground conditions.
- b. While pulling pipe assure that the pipe is supported properly and is not dragged over areas that may weaken the integrity of the pipe by gouging the pipe.
- c. Pipe shall be pulled in one continuous operation.
- d. Pipe connections shall be made after pipe has had adequate time to adjust to environmental conditions, i.e. temperature

E. Quality Control:

- a. Contractor shall locate pilot hole every 25' and maintain accurate locations of the pilot hole for both horizontal and vertical locations, with an approved device such as an Eclipse unit.
- b. Drilling logs are the responsibility of the Contractor and are to be kept up to date with the following information, date, times, soil conditions, depth of bury and horizontal alignment with reference to the R/W or permanent easement line.
- c. Potholing shall be performed before drillin activities beging to verify location of all existing utilities as required.

6.0 SANITARY SEWER INSPECTIONS

- A. All work is subject to inspection and approval of the NWSO or the Engineer of Record for the project.
- B. No work is permitted without a designated representative of the District on-site.
- C. The sanitary sewer shall be visually inspected from manhole to manhole to insure correct alignment and the absence of leaks.
- D. Sewer pipe invert elevations will be checked at manholes to ensure proper grade.
- E. Sewers with grades less than the design grades shall be rejected. Rejected sewers shall be replaced at no additional cost to the NWSO.
- F. The following table outlines the maximum allowable deviation of the constructed sanitary sewer from the straight line design between two manholes.

	Pipe Inside Diameter	Maximum Allowable Deviation from Center of Pipe
	8-inch	2 inches
	10 - 12-inch	3 inches
	15-inch	4 inches
	18 - 24-inch	5 inches

- G. Pipe larger than 24-inches in diameter will be addressed on an individual basis.

NORTHWESTERN WATER & SEWER DISTRICT

SANITARY SEWER GENERAL NOTES AND SPECIFICATIONS



NORTHWESTERN WATER & SEWER DISTRICT
12560 MIDDLETON PIKE, BOWLING GREEN, OH 43402
PHONE NUMBER: (419) 354-9090



SANITARY SEWER
GENERAL NOTES AND SPECIFICATIONS
LAST UPDATED: 10/2011

DRAWN BY:	CHECKED BY:
#	#
DATE	REVISION
6/7/15/DRM	SECTION 6 TESTING- SEC. 8 DRILLING
MM/YY	UPDATE ALL SECTION (Temp)

FILENAME: P:\Engineering\ACAD\District Specifications and Details\Sanitary Specs 2011

6.1 Video Record of Existing Conditions

- A. Video records shall be performed in the presence of a representative of the District unless otherwise directed in writing by the District.
- B. Prior to the commencement of construction the contractor shall provide the District with a digitally recorded video record of the site conditions of the construction area. The preconstruction video record shall be of sufficient detail to describe all existing site features and conditions including, but not limited to: roadway, sidewalk and driveway pavement, curbs, gutters, ditches, bridges, culverts, headwalls, landscaping, trees, signs, utility poles, mailboxes, street lights, catch basins, manholes, valve boxes, fire hydrants, fences and any other feature that may be affected by the WORK. Buildings shall be located by street address.
- C. The contractor shall provide two (2) copies of the video record in DVD format to the District at minimum of five (5) days prior to the commencement of construction. The DVD copies shall be provided in a format that can be read by current standard DVD players. All discs and cases provided to the District shall bear the following information; NAME OF PROJECT, DISTRICT PROJECT NO (SS-XX), NAME OF CONTRACTOR, NAME OF VIDEO RECORDING SERVICE, DATE OF RECORDING.
- D. A continuously, running time digital stamp shall be provided on the video record to prevent tampering. The digital stamp shall indicate the date, time (hh:mm:ss), direction of travel and stationing (xx+xx) of the recording. The digital stamp shall be recorded simultaneously with the video and audio tracks of the video record. The video record shall consist of one (1) video track and two (2) audio tracks. One audio track shall be recorded by the camera operator describing the features being recorded. The other audio track shall describe features not readily visible to the camera operator such as the relative elevation of objects being recorded.
- E. The contractor shall utilize a professional video recording service specializing in the preparation of municipal project preconstruction video records. The contractor shall provide five (5) references of the recording service indicating satisfactory completion of prior preconstruction videos. When filming from a wheeled vehicle, the distance from the lens to the surface shall not be less than 12 feet to insure adequate perspective.

7.0 SANITARY SEWER TESTING REQUIREMENTS

7.1 Requirements of Testing:

- A. Perform all leakage testing after deflection testing has been done and accepted by Owner Representative. If leakage testing is performed before deflection and a section of the sewer fails deflection testing, Contractor will be responsible to re-test section for leakage.
- B. Perform tests with an approved representative of the Owner/Engineer on-site.

7.2 Quality Control

- A. Perform leakage testing to meet the following ASTM Standards.
- B. Air Testing:
 1. PVC Pipe: ASTM F147
 2. Vitrified Pipe: ASTM C828
 3. Concrete Pipe: ASTM C924
- C. Manhole Testing: ASTM C1244
- D. Individual joint Testing: ASTM C1103

7.3 DEFLECTION TESTING:

- A. Conduct tests by pulling an approved deflection probe, having a diameter not less than 95% of the internal diameter of the pipe being tested. Contractor shall provide a proving ring at the time of testing to verify that probe is within the tolerances called out in this section.
- B. Tests shall not be performed until section of pipe has been installed, backfilled, and in the ground for not less than 30 days.
- C. Any section failing to meet the standards outlined in this section shall be remedied in the following manner.
- D. Determine reason of failure
- E. Present plan for fixing to approved representative of the Owner/Engineer.
- F. Fix in accordance with approved method until satisfactory test results have been achieved.

7.4 AIR TESTING:

- A. Air tests are to be performed after backfilling has occurred
- B. If air tests are performed before deflection testing any section failing deflection testing will be subjected to another air test.

MINIMUM HOLDING TIME IN MINUTES: SECONDS REQUIRED FOR 1.0 PSI PRESSURE DROP								
PIPE DIAMETER	LENGTH OF MAINLINE BEING TESTED							
	100'	150'	200'	250'	300'	350'	400'	450'
4"	3:46	3:46	3:46	3:46	3:46	3:46	3:41	3:46
6"	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8"	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10"	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12"	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38:00
15"	14:10	14:10	17:48	22:15	26:42:00	31:09:00	35:36:00	40:04:00
18"	17:00	19:13	25:38:00	32:03:00	38:27:00	44:52:00	51:16:00	57:41:00

7.5 Performance:

- A. Air tests are to be performed between two consecutive manholes and are not to exceed 450LF unless otherwise approved by Engineer.
- B. A well point shall be installed at the lowest manhole on the job to determine ground water elevation.
- C. Air Pressure for testing shall be 4.0psi with an adjustment of 0.433psi for each foot of groundwater above the crown of the pipe being tested. Internal adjustments shall not exceed 5.0psi.
- D. Tests shall be conducted based on the diameter of the pipe being tested. The test will be acceptable if the time elapsed for the 1psi drop is equal to or greater than what is outlined on above chart. The test will not be acceptable if the time elapsed for the 1psi drop is less than that outlined on above chart.

7.6 MANHOLE TESTING:

- A. Manholes shall be tested by drawing a vacuum on the manhole using equipment approved to conduct such testing.
- B. 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. Draw a vacuum of 10 inches of mercury and then shut the pump off.
- D. With all valves closed measure the time for the vacuum to drop to 9 inches. The test will be successful if the time elapsed meets or exceeds the times outlined in the corresponding chart.
- E. 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. If the manhole fails the contractor will be permitted to apply soap, detergent, or a similar agent to the joints and re-test to determine the location of the leak. This re-test shall not be considered passing if the time elapsed meets the spec. This is only for the purpose of locating the leaks.

MINIMUM TEST IN TIMES IN SECONDS				
MANHOLE	MANHOLE DIAMETER			
	48"	60"	72"	84"
10'	20	26	41	50
12'	25	33	49	59
14'	30	39	57	68
16'	35	46	65	77
18'	40	52	73	87
20'	45	59	81	97
22'	50	65	89	106
24'	55	72	97	116

7.7 REPAIRS:

- A. For any section failing to meet the limits of these specifications, locate and remedy the defects, re-test, and continue to fix and re-test until standards are met.
- B. When leakage is caused by a leaking joint the joint may be chemically grouted.
- C. The use of "Ferncos" (flexible couplings) are prohibited.
- D. Mainline and lateral repairs are to be made using solid pipe couplers of SDR-35 for depths less than 18'.

7.8 Sanitary Sewer Cleaning and Television Inspection

- A. The Contractor shall clean and televise all sections of the new sanitary sewer as directed by the Northwestern Water and Sewer District Engineer. Cleaning and television inspection shall be performed after successful deflection and air testing of the sanitary sewers. The internal condition of all sanitary sewer facilities shall be assessed by closed circuit television (CCTV) as follows:
 - B. CLEANING - Prior to televising sanitary sewer facilities, the Contractor shall utilize high velocity water jet equipment to remove any soil, rock, stone, sand or any other deleterious material from the sanitary sewer facilities. Any debris removed from the sanitary sewer shall be disposed of under the direction of the Northwestern Water and Sewer District Engineer. Water for the first cleaning of the sanitary sewer shall be provided by the District. If additional cleaning is required following the Television Inspection, water required for additional cleaning shall be provided by the District at the Contractor's cost.
 - C. TELEVISION INSPECTION - The Contractor shall utilize CCTV equipment to visually assess the condition of the sanitary sewers. All sanitary sewers constructed under this project shall be visually inspected and provide a picture quality acceptable to the NWSO. The Contractor shall re-inspect the sanitary sewer if the inspection is determined to be unsatisfactory in the opinion of the NWSO.
 - D. The camera shall be moved through the line in either direction at a uniform rate not to exceed three (3.0) 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.
 - E. CAMERA - The television camera shall be specifically designed and constructed for sanitary sewer television inspection. The camera shall be capable of operating in 100% humidity conditions and of viewing the entire inside circumference the sanitary sewer pipe. Lateral connections shall be inspected by looking down the lateral from the sewer main. The camera shall be self propelled or mounted on adjustable skids. 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 have a minimum of 650 lines of resolution and tested to a minimum of 400 psi. The camera view shall be transmitted to a monitor at a minimum of 17-inches.
 - F. INSPECTION LOGS - 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, infiltration points, lateral locations or any other unusual conditions. This log shall be submitted to NWSO for review.
 - G. VIDEO RECORD - The Contractor shall submit 2 copies of the video record in DVD format to the Northwestern Water and Sewer District. 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, sanitary sewer number and section, date, current distance along reach, descriptive printed labels on 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.
 - H. The District Engineer reserves the right to require television inspection on any public or private sanitary sewer installation at the expense of the installing contractor or the owner of a private line.

8.0 SITE RESTORATION

- A. All areas shall be returned to the grade and condition existing prior to the sewer installation within 30 days of disturbance of the area unless approved otherwise by NWSO. This includes pavement replacement.

8.1 Seeding, Mulching, and Fertilizing

- A. All areas disturbed by construction and not paved with some other material shall be seeded, mulched, and fertilized according to Item 659 of the ODOT Construction and Material Specifications, latest edition.
- B. All areas disturbed by construction between March 15 and October 15 shall be permanently seeded within thirty (30) days of disturbance, but no later than October 15 unless otherwise approved by the Engineer and Owner.
- C. All areas disturbed by construction between September 16 and March 14 shall be stabilized and permanently seeded after March 15 or as soon as weather permits.
- D. All seeded areas shall have a minimum of 4" of topsoil as specified and prepared in accordance with ODOT Item 653. In no case shall the restored seed bed topsoil be of less than was present prior to construction depth. All topsoil and seed must be approved by the owner prior to placement.
- E. The Contractor shall be responsible for backfilling and reseeded or re-fertilizing any trench areas that may settle after the permanent seeding is completed for the warranty time period specified in the general conditions of these contract documents.
- F. Urban lawn areas and roadside areas shall be designated by the Owner prior to seeding and the appropriate grass mixture, as specified in ODOT 659 shall be used for each area.
- G. Lawns that are of better quality than the seed specified will be identified and the seed mixture approved by the Owner prior to actual seeding.
- H. The Contractor will furnish the approved seed mixture and any additional compensation will be limited to the difference in material cost only. The additional compensation will be determined by the actual invoice price paid for the high quality seed mixture versus that specified for urban lawns in ODOT Item 659. The Contractor shall also be responsible for "Repair Seeding and Mulching" as specified under Item 659, the cost of which shall be included in his bid price for seeding, mulching, and fertilizing.

- I. Seeding and mulching shall be sown hydraulically by "hydro-seeding" techniques. The seeded slurry shall be applied with a hydraulic seeder at a rate of 3 lbs. per 1,000 square feet in two intersecting directions.
- J. Hydromulch with a tackifier shall consist of 2/3 wood and 1/3 paper fibers and shall be applied to a minimum thickness of 1/8".
- K. The Contractor shall be responsible for reseeding areas as necessary at time intervals appropriate for the ground and weather conditions until a dense stand of grass is obtained. Seeded areas shall be maintained and watered by the Contractor in accordance with ODOT Item 659 and other applicable specifications.
- L. The cost for seeding, mulching, and fertilizing shall be paid per lump sum. Partial payments for seeding and mulching will be made as a percentage of the sewer main installed to date and seeding completed to the total sewerline proposed.
- M. Topsoil shall be placed and tested per ODOT Item 659 of the ODOT Construction and Material Specifications, latest edition.
- N. Topsoil shall be raked free of rocks and clods and reseeded. Other areas shall be restored as required.

8.2 Trees, Bushes and Shrubs

- A. Trees and bushes which are to near the construction to avoid destruction, despite extreme care on the part of the Contractor shall be removed and disposed of by the Contractor to the satisfaction of the Engineer.
- B. The Engineer's permission shall be obtained prior to the removal of any tree or bush.
- C. Other trees, tree limbs and bushes that are so located that equipment of the Contractor will damage them during construction, shall be carefully trimmed and shaped by workmen skilled in the trimming. All limbs and branches shall be flushed out. All exposed surfaces in excess of one inch diameter shall be immediately painted with an approved pruning compound.
- D. Trees and bushes, other than those whose removal as approved by the Engineer, which are destroyed or damaged to the extent that their continued life is impaired, shall be replaced by the Contractor at his expense and to the satisfaction of the Owner.
- E. No payment will be made for tree trimming. The cost of said trimming shall be included in the per foot cost of the sewer installed.

9.0 PAVEMENTS, SIDEWALKS, DRIVEWAYS

9.1 Pavement Removal

- A. Pavement removal shall be in accordance with ODOT Item 202.
- B. All edges of existing pavement shall be saw-cut.

9.2 Concrete Pavement Replacement

- A. All surplus material must be removed and disposed of at the Contractor's expense.
- B. After the sewers have been installed and the backfilling complete as previously specified, the concrete pavement shall be replaced with Class I concrete.
- C. All concrete & reinforcing steel materials shall be approved by the Engineer.
- D. The price bid for driveway replacement shall include the removal and replacement of existing driveway culverts equal to existing conditions. All other requirements of this section apply to driveway replacement.

9.3 Asphalt Pavement Replacement

- A. For asphalt or macadam non-State highway pavement replacement, there shall be laid six (6) inches of 304 aggregate base with proper compaction.
- B. Apply ODOT Item 408 Prime Coat at a rate of 0.40 gallons per square yard to the aggregate base.
- C. Place 2.5" inches of ODOT Item 446 Intermediate Type 2 Asphalt Concrete.
- D. Apply ODOT Item 407 Tack Coat at a rate of 0.75 gallons per square yard to the intermediate course before placing surface course.
- E. Place 1.5" inches of ODOT Item 446 Surface Type 1 Asphalt Concrete.
- F. All pavement removal shall be saw cut. Asphalt driveway or sidewalk replacement shall have the same amount of aggregate base and prime coat as specified previously for asphalt non-State highway pavement replacement.
- G. All cold joints shall be sealed by coating the joint with bitumastic material ODOT 702.01, 702.02, or 702.04 applied at a rate of 0.25 gallons per square yard.
- H. For asphalt or macadam State Highway pavement replacement, Contractor shall be required to meet the specifications for that Highway as determined by the Ohio Department of Transportation and identified on the drawings.
- I. In no instances on any pavement replacement shall the thickness in the repair be of less thickness and of an inferior mix design than what is in place.

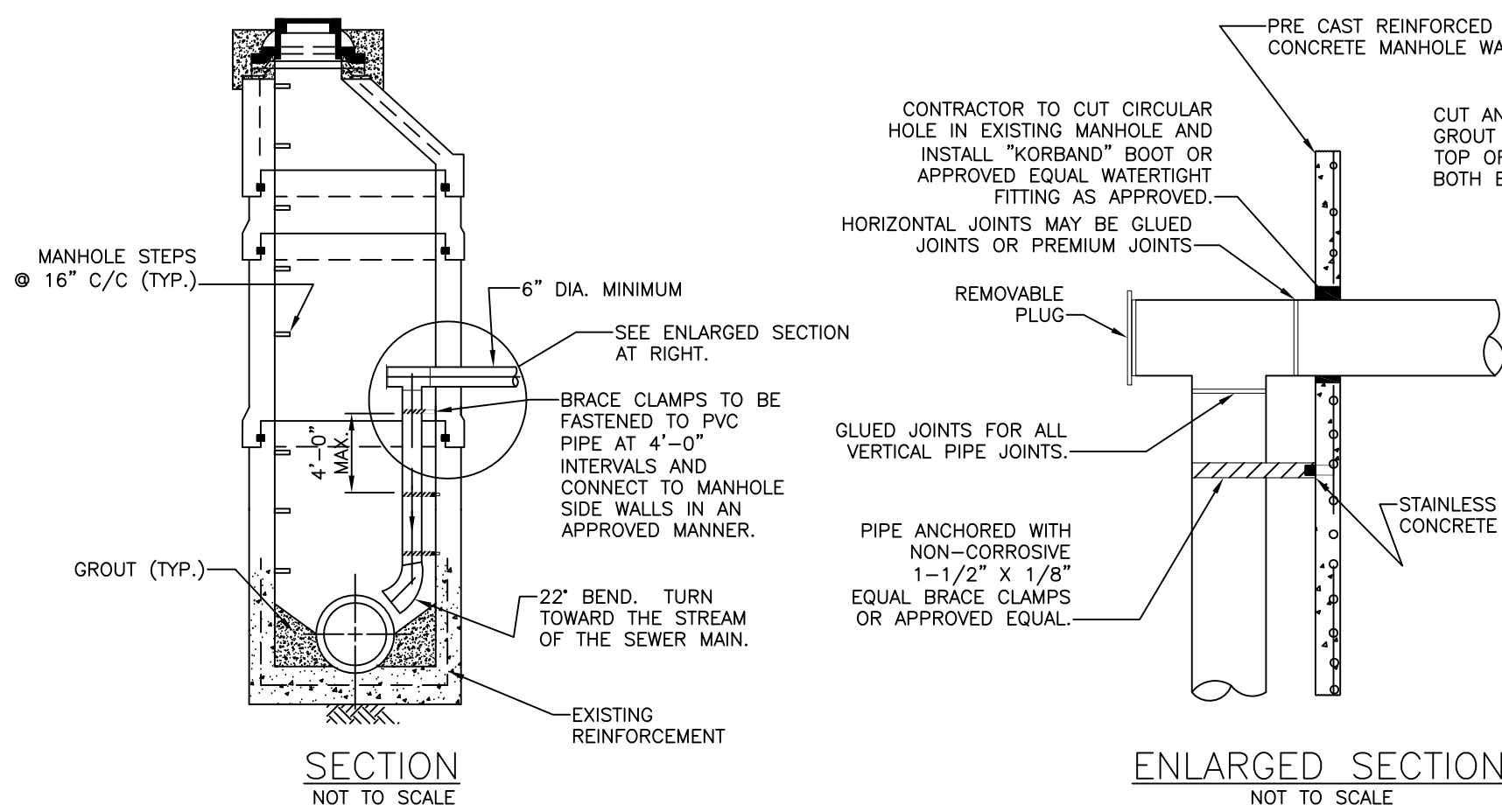
9.4 Temporary Pavement

- A. No asphalt concrete pavement shall be placed before May 1 or after October 31, except by specific permission of the Engineer.
- B. Should pavement replacement not be completed within these dates a temporary wearing course meeting the requirements of 405 of the State of Ohio Department of Transportation Construction and Material Specifications shall be provided.
- C. This temporary pavement shall be replaced in the spring as soon as weather permits.
- D. No payment will be allowed to the Contractor for this temporary pavement.

9.5 Concrete Sidewalks

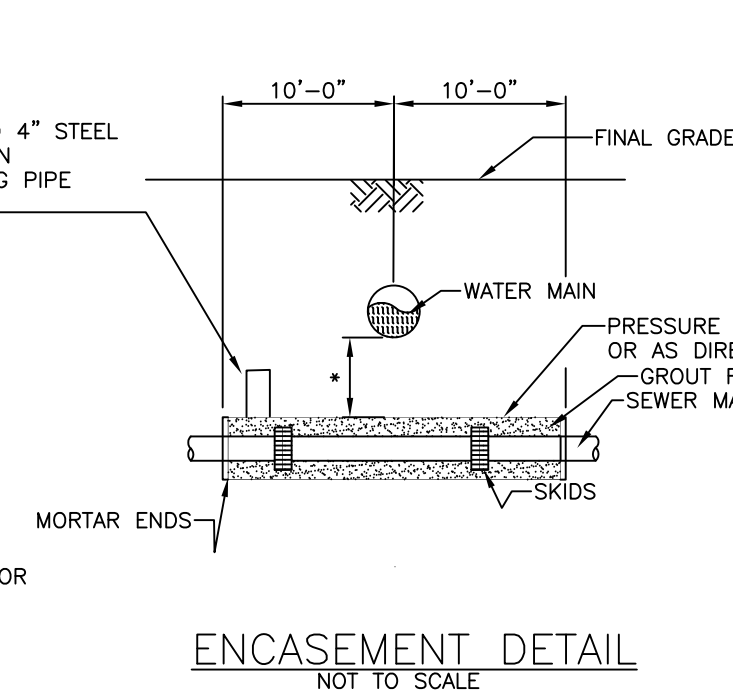
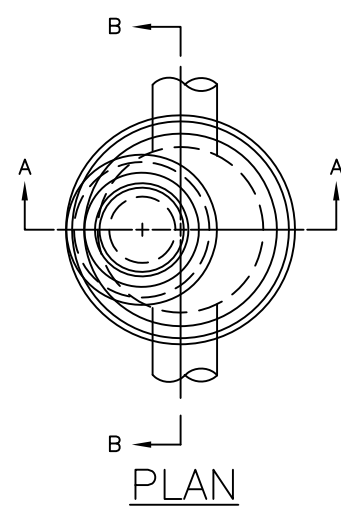
- A. Existing concrete which must be removed to permit installation of the sewer or which are damaged in connection with the work shall be replaced upon completion of the pipe laying and granular backfilling the full depth under the sidewalks.
- B. New concrete sidewalks shall be of the same width as the original. New sidewalks shall be 4 inches in thickness, except at driveways where they shall be 6 inches thick and shall be laid to the established sidewalk grade, and laid on 4" of compacted sand fill.
- C. All concrete shall be a 4000 psi air-entrained mix. All material shall be approved by the Engineer.
- D. The concrete shall be thoroughly spaded into place and struck even with the top of the forms after which it shall be wood floated to a smooth, level skid-resistant broom surface.
- E. Provide 1/2 inch mastic expansion joints at intervals of 25 feet and at junctions with other walls or structures. Sidewalks other than concrete or brick shall be classified as pavement and shall be replaced as previously specified for the appropriate type of pavement.
- F. If this work is not itemized on the Unit Price Schedule, include with the cost of installation of the sewer.
- G. Any curb, curb drain or curb and gutter which are damaged or removed must be replaced in their original condition as found.

NORTHWESTERN WATER & SEWER DISTRICT SANITARY SEWER DETAILS

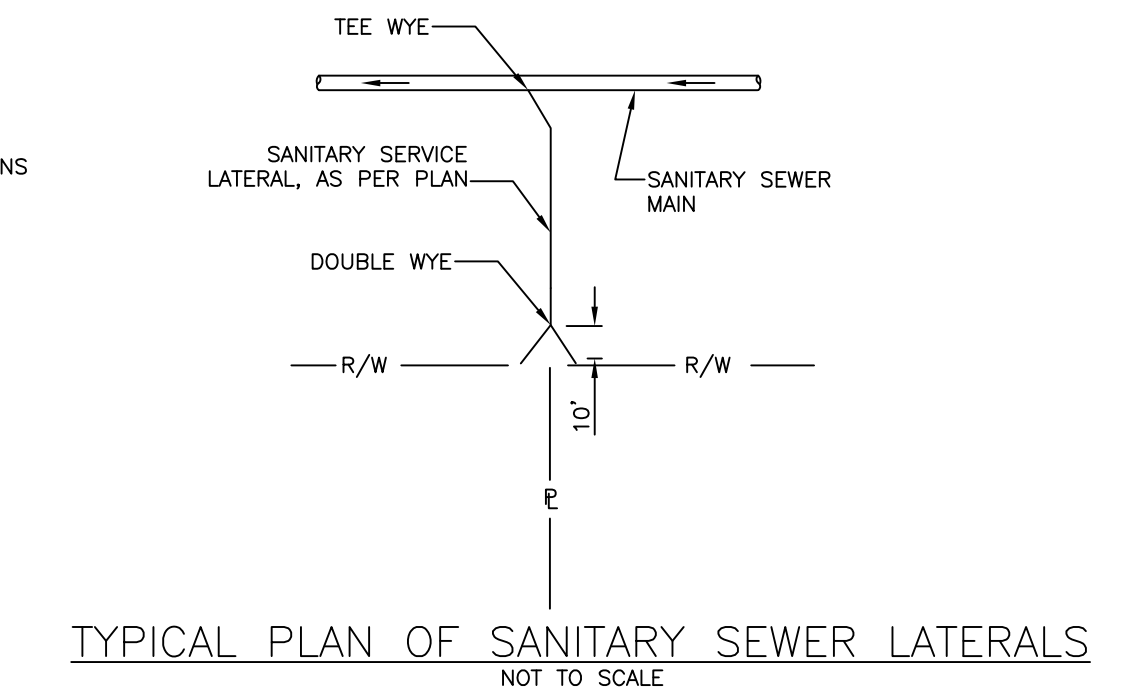
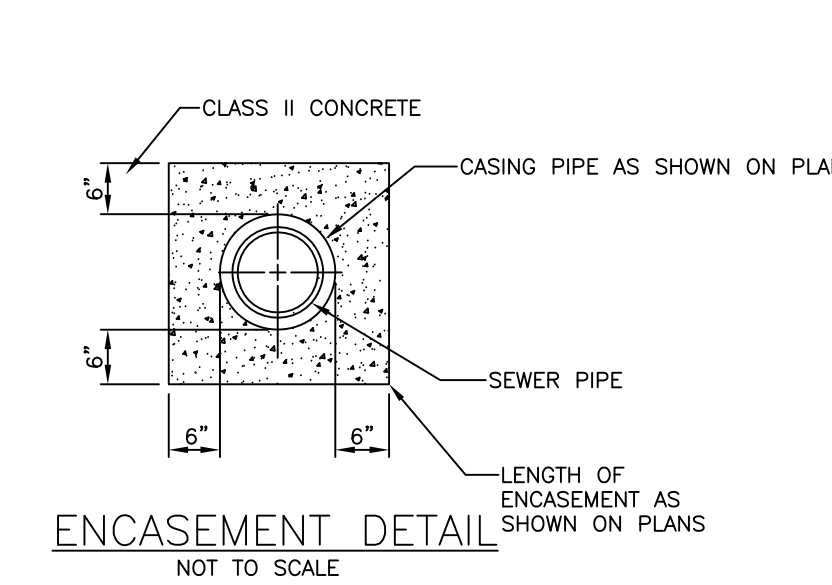
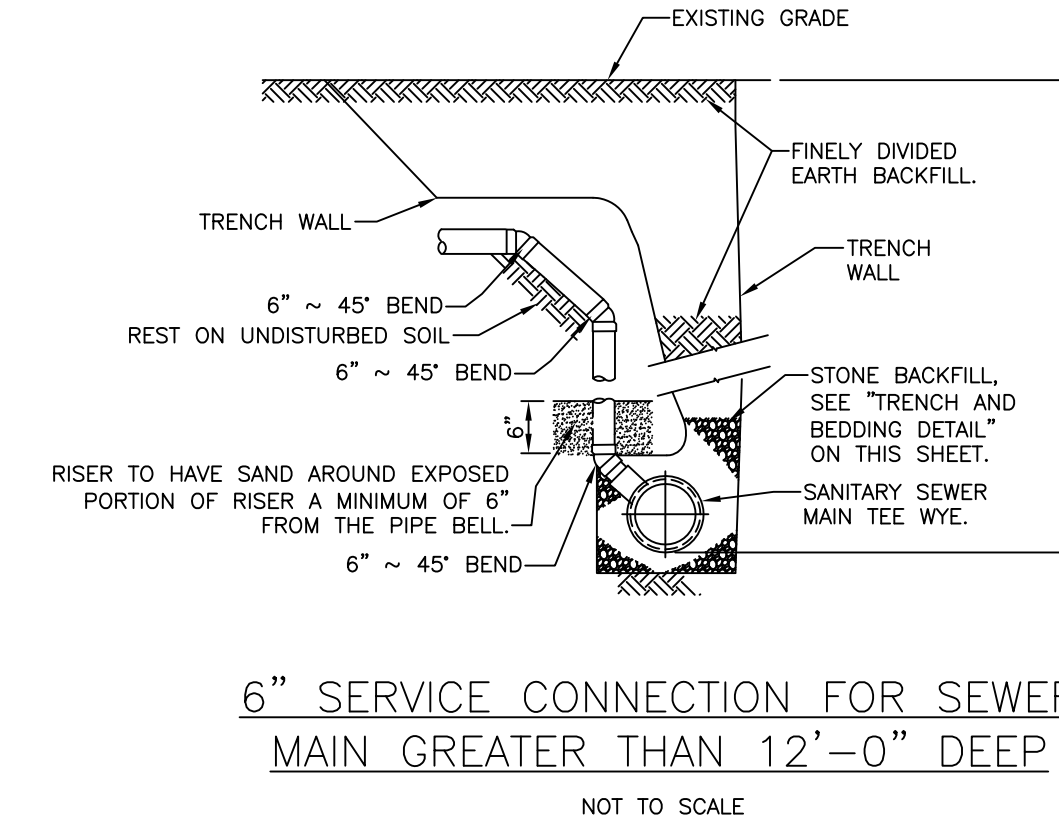
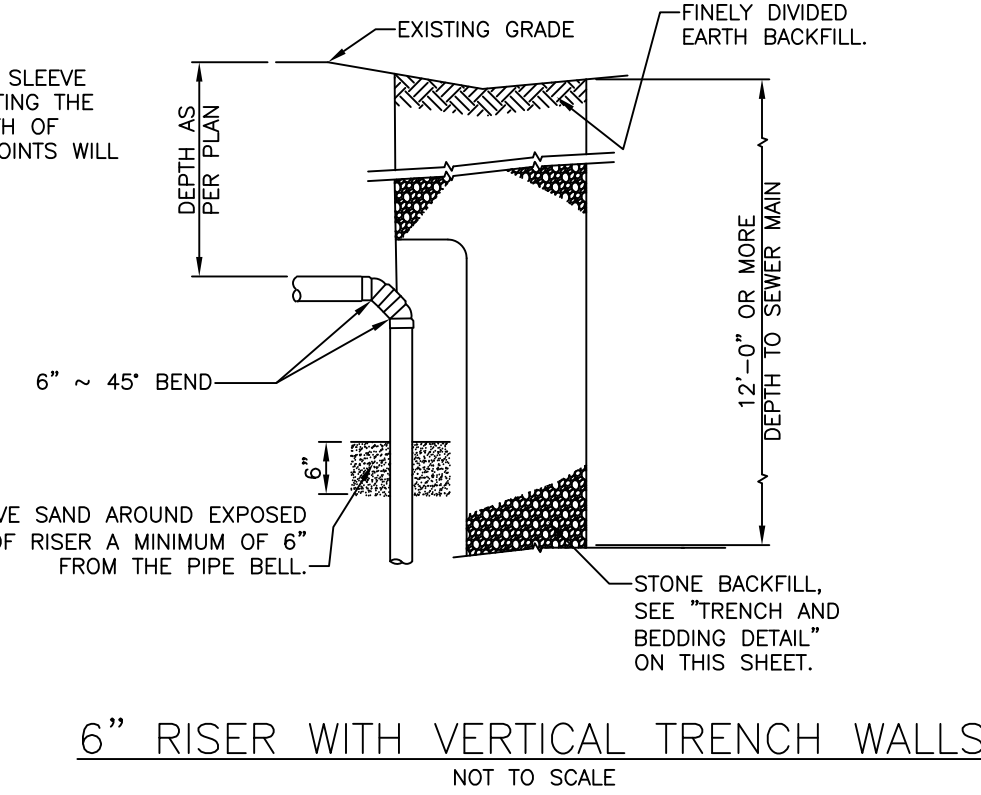
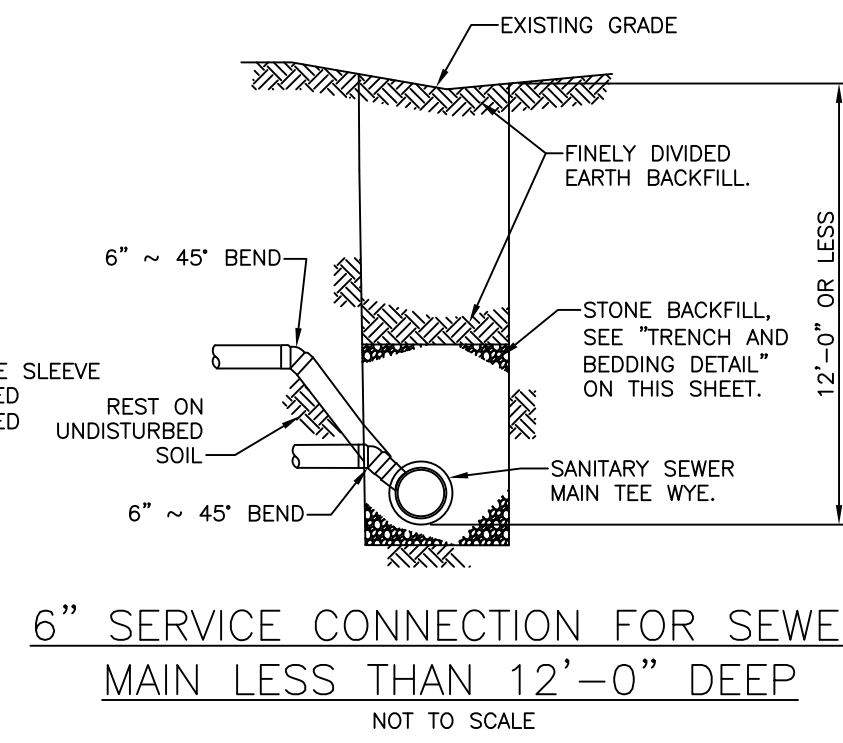


INSIDE DROP MANHOLE DETAILS

- NOTES:
1. THE INSIDE DROP MUST BE A COMFORTABLE DISTANCE FROM THE MANHOLE STEPS.

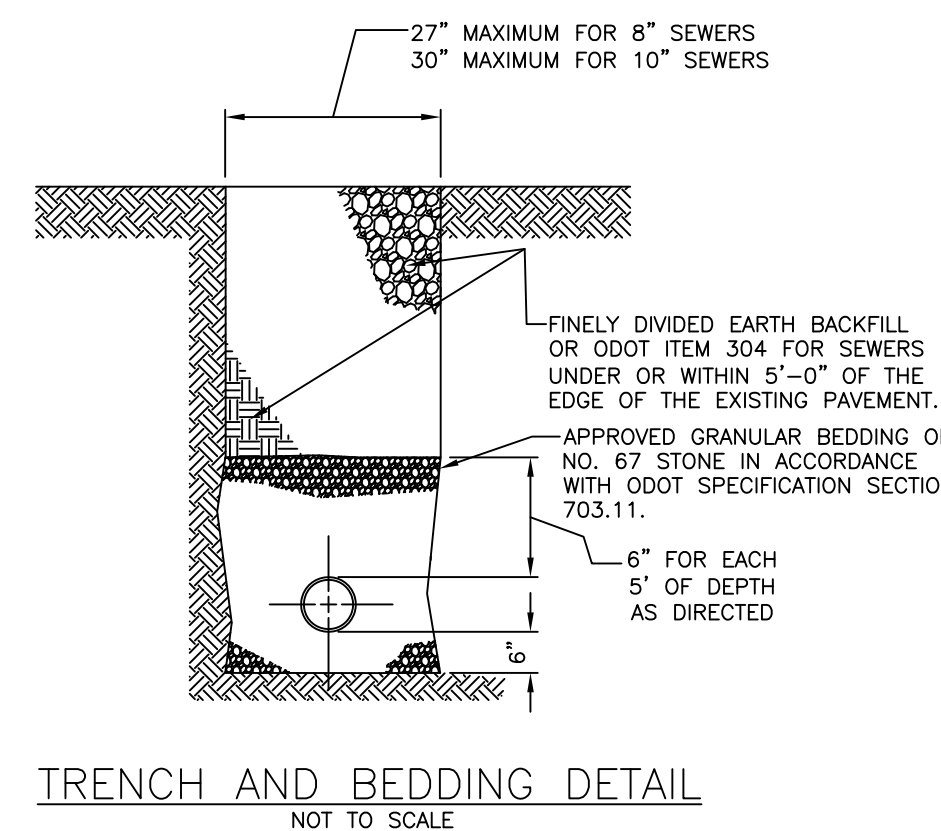


- NOTES:
1. WHERE "A" IS LESS THAN 18" A PRESSURE PIPE SLEEVE ON THE SEWER LINE IS REQUIRED. WHEN DIVERTING THE WATER MAIN OR PROVIDING SLEEVING, ONE LENGTH OF WATER PIPE IS TO BE LOCATED SO THAT BOTH JOINTS WILL BE AS FAR FROM THE SEWER AS POSSIBLE.



SANITARY SERVICE CONNECTION DETAILS

- NOTES:
1. PIPE FOR SANITARY SEWER SERVICE LATERAL PIPE SHALL BE ASTM D3034 SDR 35 PVC.



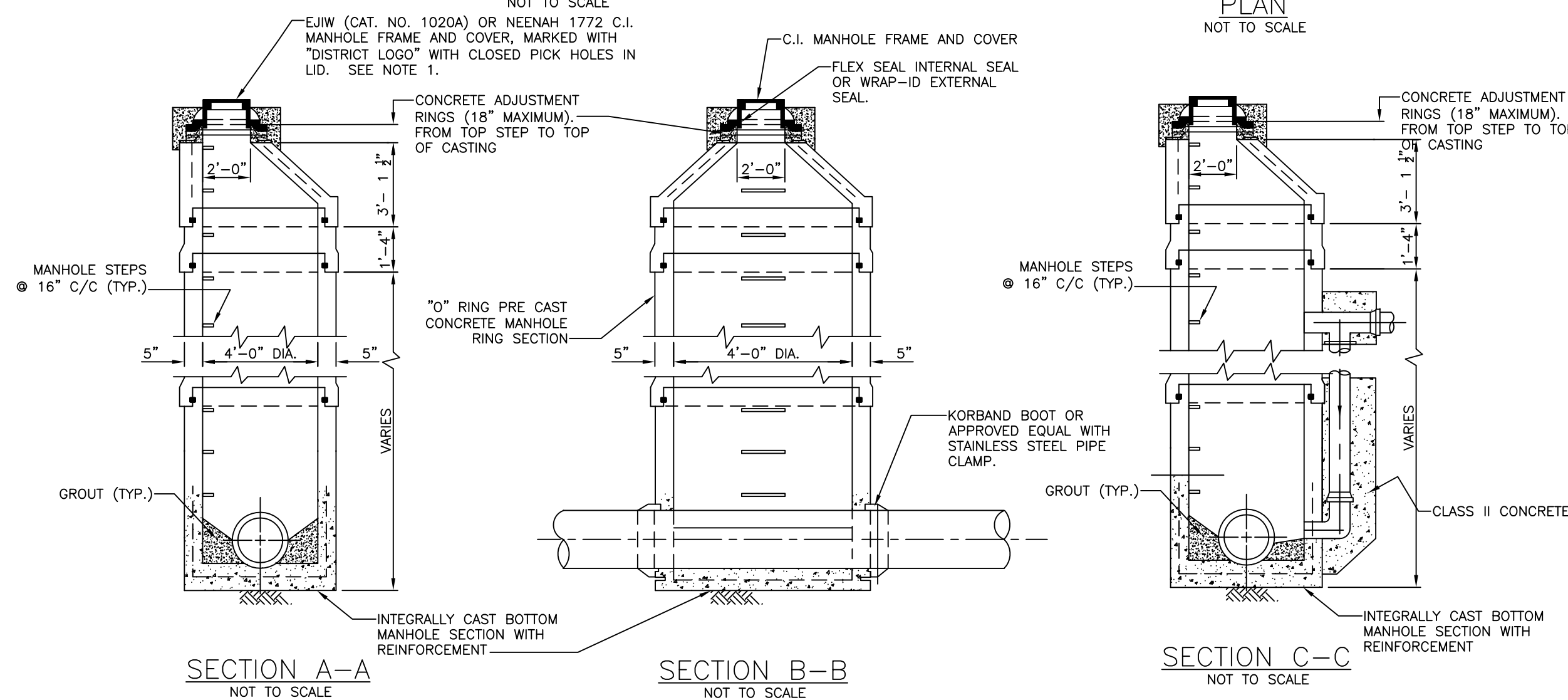
MH DEPTH	MANHOLE DIAMETER			
	48"	60"	72"	84"
8' OR LESS	20	26	33	40
10'	25	33	41	50
12'	30	39	49	59
14'	35	46	57	68
16'	40	52	65	77
18'	45	59	73	87
20'	50	65	81	97
22'	55	72	89	106
24'	59	78	97	116
26'	64	85	105	125

SANITARY MANHOLE TESTING

Pipe Diameter	Specified Minimum for Length (L) Shown (min:sec)							
	100'	150'	200'	250'	300'	350'	400'	450'
8"	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10"	9:26	9:26	9:53	9:53	11:52	13:51	15:49	17:48
12"	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15"	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18"	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21"	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31

- NOTES:
- ALL SANITARY SEWER LINES SHALL BE AIR TESTED ACCORDING TO THE ABOVE TABLE. SECTIONS OF SANITARY SEWER PIPE EXHIBITING A PRESSURE LOSS OF LESS THAN OR EQUAL TO 1 PSI OVER THE ABOVE NOTED DURATION SHALL BE CONSIDERED ACCEPTABLE. SECTIONS OF SANITARY SEWER PIPE NOT PASSING THIS TEST SHALL NOT BE PLACED INTO SERVICE UNTIL THIS TEST HAS BEEN PASSED.

SANITARY SEWER MAIN LINE TESTING



ECCENTRIC MANHOLE FOR SEWERS 33" DIAMETER AND SMALLER

- NOTES:
1. "HEAVY DUTY" MANHOLE FRAME AND COVER SHALL BE USED FOR STRUCTURES IN PAVEMENT AREAS. PRIVATE SANITARY SEWERS SHALL HAVE COVERS MARKED "SANITARY."

OUTSIDE DROP MANHOLE DETAIL

Disclaimer: The content of this document is intended for illustrative purposes only and is not complete. The Northwestern Water and Sewer District expressly disclaims any and all liability for any and all reliance thereon. All uses, other than personally, are strictly prohibited.



DRAWN BY: HB, JS	CHECKED BY: HB, BC
#	REVISION
A	12/02/05 SECTION 8.3 BACKFILL
B	07/02/06 SECTION 6 TESTING
C	09/06/06 SECTION 6 TESTING
DATE	FILENAME: