

CONSTRUCTION SPECIFICATIONS FOR SANITARY SEWER LINE EXTENSIONS

3-201 General

This section describes WMU policy relating to sanitary sewer construction.

3-202 Types of Sanitary Sewer Pipe

Polyvinyl Chloride (PVC) pipe, standard dimension ratio (SDR) 35 is required and shall conform to ASTM D3034, latest revision. PVC fittings must be compatible with SDR 35 pipe in accordance with the latest ASTM standards.

Ductile Iron (DI) pipe, see section 3-~~2~~³03.1 for specifications.

Sanitary sewers exceeding 8 ft. in depth or less than 3 ft. of cover shall be Class 51 Ductile Iron pipe or approved equal.

Any pipe found defective, not meeting the specifications or improperly installed shall not be accepted and shall be replaced by pipe meeting these specifications at no additional cost to WMU.

3-203 Types of Force Main Pipe

3-203.1 Ductile Iron Pipe

Ductile Iron pipe shall be designed in accordance with ANSI/AWWA C151/A21.50 -81, and shall be centrifugally cast in accordance with ANSI/AWWA C151/A21.51 -81 for "Ductile Iron Pipe Centrifugally Cast in Metal Molds or Sand Lined Molds for Water or Other Liquids". The grade of iron shall be 60-42-10.

Ductile Iron pipe shall be of the bell and spigot push-on, single rubber gasket type with standard thickness class 51 for the corresponding pipe size.

Ductile iron pipe shall be lined with cement mortar and coated with bituminous material, both inside and outside in accordance with the requirements as set forth in the ANSI/AWWA C104/A21.4-85 for "Cement Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings for Water". Only a coal tar outside coating, or other compatible coating, shall be applied to pipe which is to receive a bitumastic finish coat.

Ductile iron sanitary sewer pipe shall be lined by the manufacturer with a polyethylene lining complying with ANSI/ASTM D1248. Lining shall be American Ductile Iron Pipe Polybond, US Pipe Polylined, Protecto 401 or approved equal.

3-203.2 Polyethylene Pipe

Polyethylene pipe shall be a high density, high molecular weight polyethylene pipe having a cell classification of PE 345434C, conforming to ASTM D3350-84, latest revision, "Polyethylene Plastic Pipe and Fittings Material". The dimensions and workmanship are specified by ASTM F-714, latest revision, "Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter".

The pipe shall be an SDR-11, 160-psi total dynamic working pressure, minimum. The pipe shall be laid in 40'-0" sections and installed in accordance with these specifications and ASTM D2321, latest revision, "Underground Installation of Flexible Thermoplastic Sewer Pipe".

All jointing of polyethylene pipe shall be accomplished by the butt fusion technique.

3-203.3 Encasement Pipe

Casing pipe shall conform to AWWA C200-86 and AWWA M11 latest revision, and shall be placed at the location shown on the plans in accordance with the noted size, length, and type of material. The steel casing pipe shall have a minimum wall thickness of 1/4" for new casing pipe or 3/8" for salvaged casing pipe.

PVC casing pipe will be approved on a case by case basis by WMU.

For existing pipe installations, split steel casing pipe shall conform to the above specifications except that it shall be in two (2) semi-circular sections joined by a continuous weld from one end to the other without any traceable voids. All casing pipes shall be sealed at each end with a rubber Fernco end seal.

The casing pipe should be 6-8 inches larger than the outside diameter of the carrier pipe bells. The carrier pipe may be pushed or pulled through the completed casing pipe.

Casing spacers should be placed around the carrier pipe to ensure approximate centering within the casing pipe to prevent damage during installation. Casing spacers shall have a bolt on shell made in two (2) sections. All metal components shall be Type 304 (18-8) Stainless Steel. It shall have an elastomeric liner to isolate the shell from the carrier pipe. It shall have runners attached to the shell and be designed to provide a minimum of .75 inches between the carrier pipes greatest outside diameter and the casing pipes inside diameter. The chock runners shall be beveled with high abrasion resistance and a low friction coefficient.

Care must be exercised in order to avoid contact between the carrier and casing pipes. In order to avoid the transfer of earth and live loads to the carrier pipe, the space between the carrier and casing pipes should not be filled completely.

3-204 Watertight Joint Materials

All sewer line compression joints for SDR 35 PVC pipe, bell and spigot pipe shall conform to ASTM, designated C425-74.

All ductile iron pipe as specified herein shall have rubber gasket joints and will be either the mechanical or the push-on joint type. In all respects this pipe must conform to ANSI/AWWA C111/A21.11-80, "Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings." DI Fittings must be Class 125, cement lined with asphalt coating.

Water stops as required shall be as manufactured by Indiana Seal or approved equal.

3-205 Manholes

Manholes shall conform to ASTM C 478, Standard Specification for Precast Reinforced Concrete Manhole Sections, and shall be located at each vertical or lateral change of direction, at the beginning and end of every line, and at any intersection of lines.

Manholes shall be a maximum of 300 feet apart and shall be to the elevations shown on the drawings. To reduce infiltration into the sewer through the manholes and to provide substantially watertight manholes, the manhole barrels shall be jointed with an approved sealant such as manufactured by Con-Seal or approved equal. The ends of the barrels shall be formed by the manufacturer to permit the proper use of such sealants.

Unless precast inverts are used where the sewer pipe is 24 inches in diameter or smaller, both the pipe within the limits of the manhole base and the precast manhole barrel shall be supported on concrete blocks or saddles in an acceptable manner to support the manhole prior to placing Class "A" concrete and rebar for the manhole base. The invert of the sewer barrel within the manhole shall be constructed to the shape and slope as shown on the drawings. The invert shall be a smooth trowelled surface and the table shall be brushed finished. See WMU standard detail drawings.

3-205.1 Castings

Manhole castings shall consist of cast iron frames, 22 3/4" diameter covers, weighing not less than 460 pounds per cover and lid and in special conditions, 510 pounds per cover and lid with 28" diameter cover will be used. Manhole casting shall be 310 lbs., J.R. Hoe MF-310 or approved equal. Manhole lid shall be 150 lbs., J.R. Hoe ML-150 or approved equal.

Manhole frames and lids shall be bolted to the manhole cone section with no less than four (4) 3/4-inch, stainless steel, expansion bolts. Bolts, washers and nuts shall be Hilti or approved equal.

Manhole castings requiring grade adjustment shall be raised with precast concrete grade rings. No bricks, wood shims or blocks shall be used to adjust or reset the frame height.

3-205.2 Drop Inlets

Drop inlets shall be provided at manholes where indicated on the plans and at all manholes that have a difference between the inlet and outlet elevations of one foot or greater. Manhole barrel sections shall be supplied with openings for upper and lower inlet pipes. The annular spaces between the inlet pipes and the manhole walls shall be filled with non-shrink grout. Grout shall be finished smooth and flush with the adjoining interior and exterior manhole wall surfaces. Encasement of the outside drop pipe shall be with Class C (2000 psi) concrete, shall be doweled with reinforcing steel and shall extend a minimum of two linear feet, or to the undisturbed soil, whichever is greater. In the case where precast drop manholes are furnished, the encasement shall be integral with the base and riser sections.

All drop connections to existing manholes shall be constructed with an inside drop configuration using pre-manufactured fiberglass, PVC and stainless steel components as manufactured by Duran, Inc.; Lyme, CT (800-434-0277) or approved equal. Each drop connection shall include inside drop bowl, pipe coupler, drop pipe, and drop end. The system shall be secured to the manhole with stainless steel straps and fasteners as recommended by the manufacturer.

3-205.3 Stubs

Stubs for future sewer pipe shall be installed as indicated by the drawings, with a minimum length set at one (1) foot. The stub is to be grouted in place to match the invert inside of the manhole. Existing sewer pipe stubs shall be removed as required.

3-206 Sanitary Sewer Appurtenances

3-206.1 Branches and Fittings

Tee branches and wye branches shall be placed in the sewer for individual property service connections as shown on the drawings. Service connection laterals shall be 6" PVC, SDR 35 bell and spigot pipe, with a cleanout at the point of connection at the property line.

Manufactured wye and tee fittings shall be used with Polyvinyl Chloride Pipe (PVC) in accordance with ASTM's standard D3034, latest revision.

3-206.2 Detectable Mylar Tape

All sewer lines must be marked with a 2-inch printed Mylar detectable tape labeled "Sanitary Sewer", as manufactured by Lifeguard or approved equal. The tape shall be installed 18" below finished grade and directly over the sewer line. See WMU standard detail drawings.

3-206.3 Plugs

During construction, all unattended sewer lines and appurtenances must be plugged with a watertight plug at the end of each working session. The plugs must be compatible with the pipe being installed to allow ease of attachment and be removable without harm to the pipe.

3-206.4 Combination Sewage Air and Vacuum Valve

The sewage air and vacuum valve shall permit unrestricted passage of air during filling of the force main and unrestricted entry of air into the force main under vacuum conditions due to main break or draining of main to prevent column separation and pipeline collapse due to vacuum. After main is filled the S.A.V.V. will incorporate two (2) stainless steel floats having a common stainless steel float guide to maintain an air gap between the bottom float and top shut-off float to retard the waste solids from clogging the shut-off float. The internal baffle will protect the shut-off float from direct airflow and shall retain the buna-n seat in place without distortion for tight shut-off but easy removal. Both floats shall withstand 1000 psi or more. The S.A.V.V. shall include quick disconnect hose and blow off valves to permit flushing without dismantling.

Body, Cover & Baffle Cast Iron	ASTM A48 Class 30
Internal Bronze Parts	ASTM B143
Stainless Steel Floats	ASTM A240
Buna-n	ASTM SB800
Internal Delrin Parts	ASTM D2133
Exterior Paint <i>Red Lead</i>	TTP86 B Type IV

The sewage air and vacuum valve shall be an APCO valve model 401WA, valve height 25-1/2" with flushing attachments 33-1/2" or approved equal. The sewage air and vacuum valve shall include an odor control system as shown in the standard details for sewers.

3-207 Installation

All sewer lines will be installed in accordance with ASTM specifications designated C12-74.

The pipe laid in non-traffic areas shall be encased in #9 crushed stone from 6 inches below the outer diameter of the pipe to 12 inches above the outer diameter of the pipe for the full width of the trench.

Pipe laid in traffic areas will be installed as non-traffic areas including backfilling the entire trench to the top of the ditch with #9 crushed stone.

The designated class and required pipe size shall be laid to form a closed joint with the next adjoining pipe, bringing the inverts continuously to the required line and grade shown on the drawings. The pipe shall be laid in an upstream direction, with the bells upstream.

In no case shall water be allowed to rise in or above the pipe before the pipe is properly installed. No walking on or working over the pipes after they are laid, except as may be necessary in placing and compacting the backfill, will be permitted until the pipes are covered with backfill to the proper depth.

3-207.1 Concrete Cap

A concrete cap is required where the sewer pipe to be laid will have less than two feet of final cover. The concrete cap is to be installed as shown on the drawings and in accordance with the standard detail drawings.

The sewer pipe shall be laid in a crushed stone cradle and wrapped in heavy plastic four (4) mils (minimum). The concrete shall be placed around the pipe to the required width and depth to a plane six (6) inches (minimum) above the top of the sewer pipe for the full trench width. Also, the concrete cap must extend beyond the point where the sewer pipe attains thirty (30) inches of cover. Proper bracing shall be provided to prevent possible floating of the sewer pipe. Construction joints will be required every ten (10) feet.

3-208 Testing (General)

Winchester Municipal Utilities representative must witness each satisfactory air test before it will be accepted as fulfilling requirements of these specifications.

Twenty-four hour notice to Winchester Municipal Utilities is required prior to testing. Contractor shall furnish all necessary equipment, materials, and trained or knowledgeable personnel required to conduct tests.

Equipment must be accurate and approved by Winchester Municipal Utilities.

All defective work, as so proven by the tests, shall be immediately repaired and retested until proven to be satisfactory.

Testing shall in no way relieve the contractor of the responsibility for correcting poor workmanship. All visible defects must be repaired regardless of test results.

During testing Winchester Municipal Utilities reserves the right to inspect each individual line, from manhole to manhole, either by use of smoke testing, lights, mirrors, televising, or other means to determine if construction is in accordance with Winchester Municipal Utilities specifications.

3-208.1 Low Pressure Air Test For Sanitary Sewers

Air testing shall be required on all sewer lines less than thirty (30) inches nominal diameter.

The maximum length of line to be air tested at any one time shall be from manhole to manhole.

Tees and service laterals shall be considered as part of the line being tested. All plugs shall be firmly blocked to insure that they will not be displaced during testing.

Sanitary sewer line to be tested shall be flushed and cleaned prior to test as required.

Clean pipe to be tested by propelling snug fitting inflated rubber ball through the pipe with water as required.

Dirt, debris and trash shall be collected at existing manhole and disposed of properly. Dirt, debris and trash shall not be permitted to enter the flow in the existing sanitary sewer.

A small screen with ¼ inch (minimum) square openings shall be used to collect debris.

Minimum holding time limit for each pipe size shall be determined from the following table:

6"	8"	10"	12"	Pipe Size
3	4	5	6	Minutes

Add air slowly to portion of sewer line installation under test until internal pressure is raised to four (4) psi.

After an internal pressure of four (4) psi is obtained, allow at least two (2) minutes for air temperature to stabilize, adding only amount of air required to maintain pressure.

At end of stabilization period with the line pressure being four (4) psi, the minimum allowable time for one (1) psi pressure drop is listed in table No. 8.

If sewer line to be tested is submerged in ground water, insert a pipe probe (by boring or jetting) into backfill material adjacent to center of pipe, determine pressure in probe when air passes slowly through it. This is backpressure due to ground water submergence over the end of the probe. All gauge pressures in test shall be increased by this amount.

3-208.2 Manhole Air Vacuum Test

Vacuum testing will be required on all sanitary sewer manholes. All plugs, stub-outs, and boots shall be secured to prevent movement while the vacuum is being drawn.

Manholes to be tested shall be cleaned and flushed prior to testing. Listed below are the specifications required for Manhole Air Vacuum Testing.

1. Testing shall include the joint between the concrete cone section and the manhole frame.

2. A measured vacuum of 10 inches of mercury shall be established in the manhole.
3. The time for the vacuum drop to nine inches shall be recorded. Acceptance standards for leakage shall be established from the elapsed time for a negative pressure change from 10 inches to 9 inches of mercury.
4. Minimum holding times for each manhole shall be determined from Table 1.
5. If the manhole fails the vacuum test, necessary repairs shall be made and the vacuum test shall be repeated until the manhole passes the test.
6. If the manhole joint mastic is pulled out during the vacuum test, the manhole shall be disassembled and the mastic replaced. The test shall then be repeated as specified above.
7. Minimum test times for various manhole diameters (ASTM C1244 - 93).

(Table 1)

Depth (ft.)	Diameter (in.)								
	30	33	36	42	48	54	60	66	72
	Time (sec.)								
8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	31	34	40	46	51	58	67
18	25	27	31	38	45	51	59	65	73
20	26	30	35	42	50	53	65	71	81
22	31	33	39	46	55	64	71	79	89
24	33	36	41	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	41	49	59	69	81	91	101	113
30	41	45	53	65	74	87	98	106	121

3-209 Safety Precautions

Air/vacuum tests may be dangerous if, because of lack of knowledge and training, or carelessness, a line or manhole is improperly prepared. It is extremely important that various plugs be installed and braced in such a way as to prevent blowouts. Since an internal pressure of five (5) psi exerts a force of two hundred and fifty (250) pounds on an eight (8) inch plug, it should be realized that sudden expulsion of a poorly installed plug or of a plug that is partially deflated before pipe pressure is released can be very dangerous. WMU recommends that no one should be allowed in manholes of section being tested at time of test or until after lines have been depressurized. Pressurizing equipment shall include a regulator set at ten (10) psi to avoid over pressurizing and damaging an otherwise acceptable line.