

303.02 Service Connections: Polyvinyl chloride (PVC) sewer pipe conforming to ASTM Designation D 1599 and AWWA C-900; or schedule 40 PVC pipe conforming to ASTM Designation 178-76 shall be used between the sewer main and the building. The PVC joints shall be made with integral rubber ring wall with bonded-in-bell elastomeric seal. The schedule 40 PVC joints shall be made with a solvent weld bell and spigot joint using PVC pipe glue as supplied by the manufacturer. " No-hub" pipe shall not be permitted.

304.00 CONSTRUCTION STANDARDS

304.01 General Requirements: All construction of public and private sanitary sewer mains and appurtenances in the City of Manassas Park shall be in accordance with plans and specifications approved by the Director. Prior to the construction of the approved sanitary sewer, the developer's engineer or surveyor shall place adequate line and grade stakes in order that the sanitary sewer appurtenances may be constructed in accordance with the approved plans.

The engineer or surveyor shall then prepare legible cut sheets at fifty (50) foot stations indicating all pertinent construction data to include sewer service connection locations, concrete encasement or cradle, and finish grades of manhole rims. Five (5) sets of all cut sheets shall be submitted to the Director for review and approval.

If any deviation is contemplated in the location of line or grade of any sewer, structure or appurtenance from the approved plans, a revision to the plans showing the proposed deviation must be submitted to the Director for review and approval before the changes are constructed.

304.02 Excavation: Excavation shall conform to the lines and grades shown on the plans and cut sheets. Excavation shall not be carried below the established grades and any excavation below the required level shall be backfilled with granular material and thoroughly tamped, all at the contractor's expense. The contractor shall do all sheeting, bracing, and shoring, necessary to perform the work, to protect existing structures and to protect all excavations as required under Virginia OSHA Regulations.

Dewatering equipment shall be sized to maintain the trench in a satisfactory condition for pipe laying. Pipe laying will be permitted only where the depth of water is maintained below the surface of the pipe joint.

Not more than one hundred and fifty feet (150') of trench shall be opened in advance of the completed pipe laying. The trench walls shall be kept vertical whenever possible but the trench walls may be sloped above the top of the pipe for safety reasons. Excavation at manholes and similar structures shall be sufficient to have a minimum of twelve inches (12") clearance between their outer surface and the embankment or sheeting.

All blasting operations must be in accordance with existing ordinances and regulations. After blasting or other approved methods of removal, no projection of rock shall remain nearer than six inches (6") of any part of the sewer pipe when laid, nor shall project beyond the lines and grades of masonry structures. No blasting shall be done within twenty-five feet (25') of a tested or completed sewer. The ends of sewers adjacent to blasting shall be covered to avoid receiving debris.

Wherever the foundation material is unsuitable, it shall be excavated to a stable foundation and granular material with a maximum size of two inches (2") shall be placed in six-inch (6") layers until the trench bottom has been stabilized. Then, the standard granular bedding material shall be placed as specified in Section 304.03.

304.03 Bedding: All pipe up to and including eighteen inch (18") except ductile iron shall be bedded in compacted granular material placed on cradle or arch bedding. Pipe shall be placed on compacted granular bedding by having a minimum thickness of one-fourth (1/4) of the outside pipe diameter (4" minimum), and the granular bedding shall extend to a depth of four inches (4") over the crown of pipe, completely wrapping the pipe barrel. The granular material shall be well-graded crushed stone meeting the requirements of Virginia Department of Transportation (VDOT) Gradation 57 or 78. Ductile iron pipe shall have a minimum of four inches (4") of granular bedding. Bedding for pipe larger than eighteen inches (18") shall be designed on an individual basis and approved by the Director.

304.04 Backfill: Backfill in areas subjected to vehicular traffic shall begin at the top of the standard granular bedding and shall be placed in six-inch layers to a point at least twenty four inches above the top of pipe. It shall be thoroughly tamped to ninety-five percent (95%) compaction. Above this point, backfill shall be deposited in layers of a thickness which will facilitate 95% compaction. Backfill material shall be free of perishable material, frozen clods, sticky masses of clay, and other unsuitable material. Rock pieces larger

than four inches shall not be used in the backfill which is within 12 inches of the installed pipe in any direction. Backfill and replacement in existing or proposed roads to be accepted into the state highway system shall be executed in full accordance with the requirements of VDOT.

Backfill in areas not subjected to vehicular traffic shall be compacted to a (90%) ninety percent compaction. All surplus materials shall be disposed of in approved areas.

304.05 Pipe Installation: All pipe and fittings shall be carefully handled with slings or other devices to prevent damage to protective coatings or joints. Lifting equipment shall be satisfactorily rated to handle the pipe sizes used. Each section of pipe shall be thoroughly inspected for defects before being lowered into the trench. Pipe shall be laid true to line and grade with bells upstream and shall be jointed together such that the completed pipe will have a smooth invert. The standard bedding shall be shaped to the curvature of both the bell and barrel of the pipe. The trench shall be kept free of water while the work is in progress. The ends of the pipe shall be brushed so that proper joints can be made. As the work progresses, the interior of the pipe shall be cleared of dirt, cement, or other superfluous material. The exposed end of all pipe and fittings shall be fully closed to prevent earth, water or other substances from entering the pipe. During the winter season, or during periods of inclement weather, the trench shall be completely backfilled at the end of each work day.

304.06 Service Connections: C-900 PVC or Schedule 40 PVC, as approved by the Director, pipe connections to the sewer main shall be made by means of a commercially manufactured tee or wye branch, or approved saddle.

A four-inch (4") sewer clean-out shall be installed at the property line on all service lines. In addition, clean-outs shall be installed at 50-foot (50') intervals on long service lines and at bends in the service line greater than and including 45° (1/8) bends. Saddles used for making the sewer service connection to the sewer main shall be of the strap-on type with an "O" Ring seal and stainless steel strap. Saddles shall be specifically designed to adapt to the type of pipe used.

The saddle shall be secured to the pipe with a twenty-four (24) gauge stainless steel strap and two and three-eighth inch (2 3/8") by

three and one-eighth (3 1/8") by two and one eighth inch (2 1/8") Nickel-Bronze T Bolts. When a saddle is installed on an existing line, it shall be subjected to a ten-foot hydrostatic head (4.3 psi) prior to cutting the main with a tapping machine.

Sewer service connections shall be plugged with a pipe stopper manufactured for such service. The stopper shall be capable of sustaining ,without failure or leakage, an internal pressure head of ten feet (10') (4.3 psi).

Sewer service connections from the sewer main to the building shall be installed with the same care as the sewer main. Proper excavation, slope of pipe and standard granular bedding shall be provided throughout. All soil pipe joints shall be capable of resisting a hydrostatic pressure of fifteen (15) psi.

304.07 Manholes (Precast): Precast concrete manholes shall consist of precast reinforced concrete sections, an eccentric conical section and an expanded base section, extending a minimum of four inches (4") and a maximum of eight inches (8") beyond the outside vertical wall (riser section) of the manhole.

The precast base section shall be installed on a compacted stabilized foundation prepared similar to that required for the proper installation of the adjacent sewer as described elsewhere in this Manual.

The precast manhole sections shall be manufactured in accordance with ASTM Designation C-478, latest revision. Each section shall have lifting lugs or keyways. No lifting holes through the manhole wall are permitted. Joints shall be of the "O" Ring rubber gasket type and shall conform to the ASTM Designation C-361, latest revision. The joints shall be formed entirely of concrete employing a round rubber gasket and when assembled shall be self-centering and make a uniform water-tight joint. The gasket shall be the sole element utilized in sealing the joint from either internal or external hydrostatic pressure. In addition, a cold applied joint sealer may also be used in addition to the "O" Ring. No mortar joints are permitted.

The invert channels of the manhole shall be smooth and semi-circular in shape conforming to the inside of the adjacent sewer section. Changes in direction of flow shall be made with a smooth

curve of as large a radius as the size of the manhole will permit. Changes in size and grade of the channels shall be made gradually. The invert channels shall be brought to grade and formed with brick and mortar.

The invert channel shall be at least 0.8 times the diameter of the pipe in depth for pipe 8" to 12" in diameter. The minimum difference in elevation of inverts of incoming and outgoing pipes shall be 0.10 feet.

Standard manhole drop connections shall be installed where indicated on the drawings. Drop connections shall conform to the details shown in this Manual. The drop pipe and fitting shall be the same type as the main sewer pipe and shall meet the same specifications as the sewer pipe. The entire drop connection shall be encased with Class A3 concrete as shown on the detail drawing in this Manual.

Manholes shall be constructed with manhole frames, covers and steps. The frames and covers shall be of the type and duty shown in this Manual. Where the frames and covers will be subjected to traffic loading, they shall be heavy-weight, 350 pounds. Where there will be no traffic loading, the frames and covers shall be light-loading, 290 pounds.

Casting shall be best quality tough, gray iron, free from cold shuts, blow holes, and other imperfections and shall meet the requirements of ASTM Designation A-48, Class 20. The castings shall be sound, true to form and thickness, cleaned by means of sand blast and neatly finished.

The material bearing surfaces shall be machine ground and finished to ensure satisfactory seating. Covers shall have the letter "S" cast into the top. Castings shall receive one coat of black asphaltum paint at the factory.

Covers shall be furnished with two (2) pick holes and two (2) center lifting holes. Covers shall be of the bolt-down type, if so required, for use in easements and remote locations. The plan sheet shall indicate manholes that require bolt-down, water-tight lids, and waterproof manhole inserts.

Steps for manholes shall be made of fiberglass construction, cast iron, or steel and shall have a plastic coating.

304.08 Pipe Connections At Manholes: All manholes for service with twenty-inch (20") diameter main line pipe or smaller shall be supplied with an approved flexible pipe connection suitable for specified pipe and manhole. Twenty-inch (20") and larger pipe connections shall have the first joint located four feet (4') from the inside face of the manhole. Plans shall indicate any and all bearings and/or angles of deflection of all mains connecting to manholes as to ensure proper location of boot connection to manhole.

Precast manholes shall be manufactured for the specified number of connections required. Manholes with more connections than needed can not be bricked or otherwise changed in configuration and are not acceptable. Connections to existing manholes, when approved by the Director of Public Works, shall be made by coring the manhole and installing a rubber boot.

304.09 Acceptance Tests: Sewers will be inspected to determine if any deviation from line and grade has occurred. The pipe alignment shall be checked with a GO-NO-GO Mandrel and incidental equipment. If the pipe shows poor alignment, displaced pipe, or any other defect, including a visible leak, the defect shall be corrected before acceptance.

An acceptance test shall be specified for all gravity sewer lines. The test may be either a water test or an air test. Where water testing is specified (exfiltration), the leakage toward shall not exceed one hundred (100) gallons per inch of nominal pipe diameter per mile per day (4,800 gpd/mi) maximum for any section of the system including manholes. Where the exfiltration test is employed, a minimum of four feet (4') of head at any point in the line and a maximum head of not more than ten feet (10') shall be required.

Where air testing is specified, test methods and acceptability criteria shall be in accordance with the appropriate ASTM Specifications. Air testing of gravity lines shall generally be acceptable for all types of pipe materials. If air testing is employed, the manholes shall be tested by exfiltration. Inflatable stoppers shall be used to plug all lines into and out of the manhole being tested. The stoppers shall be positioned in the lines far enough from the manhole to ensure testing to those portions of the lines not air tested. The manhole shall then be filled to the top with water. A twenty-four (24) soak shall be allowed. Leakage shall not exceed 1/4 gallon per hour for a four (4) hour test period.

The Contractors will furnish weirs, stand pipes, pipe plugs, water, pressure gauges, stop watches, air compressor, hose and such materials and assistance as required to perform these tests. All acceptance tests shall be conducted by the contractor in the presence of a City inspector.

Acceptance tests shall not be made until the sanitary sewer, manholes and required sewer service connections, as shown on the approved street plans, have been installed, and the sewer trenches have been backfilled and compacted to finished subgrade.

All sanitary sewers, including manholes, shall be inspected prior to acceptance testing, and any water leakage into the system sufficient to constitute any noticeable trickle or dribble, first shall be corrected and eliminated prior to undertaking the acceptance test.

Whenever it has been necessary to construct underdrains or place gravel under pipe lines in order to dewater the trench during construction of the sewers, the acceptance test will not be made until any pumps (which have been used in the dewatering process) have been disconnected. The contractor shall schedule all acceptance tests with the City inspector at least forty-eight (48) hours in advance. Each section of completed sewer shall be tested. Generally, the sewers will be tested from manhole to manhole. No sewers or sewer service connection are to be excluded from this testing procedure.

The test procedure shall be conducted in the following manner:

A. Low Pressure Air Testing Pressure:

1. The contractor shall thoroughly clean and remove all debris, silt, earth or other materials from the sewer prior to acceptance testing. The pipe may be flushed or sprayed with water. None of this water or debris shall be allowed to enter the existing sewer.
2. Test plugs shall be supplied and installed by the contractor within the pipe at each manhole. Each plug shall be securely braced.
3. If the pipe to be tested is expected to be below the ground water table, the contractor shall either: Install a small diameter perforated vertical pipe from the invert elevation of the sewer to the surface prior to backfilling;

or insert a pipe by boring or driving into the backfilling material adjacent to the invert elevation of the pipe, and determine the depth of the ground water level above the pipe invert immediately prior to acceptance testing the sewer.

All gauge pressures in the test shall be increased by the amount of this back pressure due to ground submergence over the end of the probe.

4. The contractor shall add air slowly to the portion of the pipe under test until the internal air pressure is raised to 1.0 psi gauge plus the ground water pressure.
5. As a safety precaution, no one shall be allowed in the manhole after the air pressure is increased in the sewer line. If the City inspector suspects that the test plug may be leaking, the pressure first shall be relieved before any adjustments are made to eliminate air leakage at the plug. The contractor may precoat the plug with a soap solution to check the plugs for leakage.
6. The contractor shall allow the air temperature to stabilize for at least two (2) minutes with the pipe subjected to an internal pressure of 4.0 psi by adding only the amount of air to maintain the pressure.
7. If the internal air pressure decreases, the time required for the pressure to drop from 3.5 to 2.5 psi gauge will be observed and recorded. The time interval shall be compared with the established standards in accordance with Table 3-6.
8. Pipe which fails to maintain the stipulated pressure for a period equal to or greater than the holding time shown in Table 3-6 shall be deemed not to have passed the low pressure air test and is unsatisfactory for acceptance by the City inspector. Any sewer or house connection that fails to pass this test shall be replaced by the contractor. A single repair clamp shall be allowed between manholes to facilitate the replacement of defective materials of workmanship.

TABLE 3-6

AIR TEST TABLES

Minimum holding time in seconds required for pressure to drop from 3-1/2 to 2 1/2 PSIG.

Pipe Diameter

	4"	6"	8"	10"	12"	15"	18"	21"	24"
25	4	10	18	28	40	62	89	121	158
50	9	20	35	55	79	124	178	243	317
75	13	30	53	83	119	186	267	364	475
100	18	40	70	110	158	248	356	485	634
125	22	50	88	138	198	309	446	595	680
150	26	59	106	165	238	371	510		
175	31	69	123	193	277	425			
200	35	79	141	220	317				
225	40	89	158	248	340				
250	44	99	176	275					
275	48	109	194	283					
300	53	119	211						
350	62	139	227						
400	70	158							
450	79	170							
500	88								
550	97								
600	106								
650	113	170	227	283	340	425	510	595	680

Note: To be used when testing one diameter only.

B. Exfiltration Testing:

1. All service laterals, stub and fittings into the sewer lines being tested should be properly capped or plugged, and carefully braced to resist the thrust actions developed by the internal water pressure. In preparing the blocking of plugs or end caps, it is extremely important to recognize that the 5 to 10 feet of head in the standpipe will exert considerable thrusts against the plugs or caps. For example, a 10' head will generate a total force of two hundred and fifteen (215) pounds against an eight inch (8") plug. Further consideration must be given to the fact that greater pressures will be developed in the downstream portion of the line, due to lower elevations, than in the upper reaches of the sewer line.
2. A tapped, plumber's type plug is inserted and tightened in the inlet pipe of the downstream manhole to which the water supply connection is made for filling the pipe. (See Figure 3-1).
3. The upper manhole is plugged and securely tightened for connection to the standpipe. The standpipe is then placed in this manhole and connected to the tapped plug. The standpipe must be capable of handling from five (5) to ten (10) feet of water head to determine the tightness and soundness of the sewer line, as specified and directed by the inspector (See Figure 3-1).
4. Water is introduced into the line at the downstream (lower) manhole until the standpipe in the upstream manhole has been completely filled. By filling the line from the lowest level, the air in the line is easily pushed ahead and, finally expelled through the standpipe at the upper end of the test section.

Care should be taken to minimize entrapped air which will give distorted test results. The rate of drop in the standpipe may be quite rapid until the air has been expelled.
5. After filling with water, the line must be allowed to stand for at least several hours before beginning the test. During this time, some water absorption into the

manhole structures and asbestos cement sewer pipe will take place. After the water absorption has been stabilized, the water level in the standpipe is checked and water added if necessary.

6. The test is now ready to begin. The drop in the standpipe is measured and recorded over a ten (10) minute period. To verify the first results, a second ten (10) minute test is suggested. This will also verify whether a stable condition exists in the line.
 7. The measured drops in the standpipe are converted to leakage in terms of gallons per inch diameter per mile per day, the acceptable method of recording leakage. Caution should be taken about conducting exfiltration tests on sewer lines laid on steep grades. Consideration must be given to the downstream portion of the system to prevent excessive pressures in these lower lines. For these installations and where the upstream manholes are very deep, it is not advisable to fill the standpipe or manholes to the top when performing the test.
 8. Any sewer or house connection that fails to pass this test shall be replaced by the contractor. A single clamp shall be allowed between manholes to facilitate the replacement of defective materials or workmanship.
- C. Manholes will be tested by the air vacuum system as stipulated below:
1. This test method is only applicable to precast concrete manholes.
 2. Manholes should be tested after assembly and prior to backfilling.
 3. Stubouts, manhole boots and pipe plugs shall be secured to prevent movement while the vacuum is drawn.
 4. Installation and operation of vacuum equipment and indicating devices shall be in accordance with equipment specifications for which performance information has been provided by the manufacturer.
 5. A measured vacuum of 10 inches of mercury shall be

established in the manhole. The time for the vacuum to drop to nine inches of mercury shall be recorded.

6. Acceptance standards for leakage shall be established from the elapsed time for a negative pressure change from 10 inches of mercury shall be established in the manhole. The time for the vacuum to drop to nine inches of mercury shall be recorded.

Manhole Depth	Minimum Elapsed Time for a Pressure Change of 1 inch Hg
10 ft. or less	60 seconds
>10 ft. but <15 ft.	75 seconds
>15 ft. but <25 ft.	90 seconds

For manholes five feet in diameter, add an additional 15 seconds; for manholes six feet in diameter, add an additional 30 seconds to the time requirements for four-foot diameter manholes.

7. If the manhole fails the test, necessary repairs shall be made and the vacuum test and repairs shall be repeated until the manhole passes the test or the manhole shall be tested in accordance with the standard exfiltration test and rated accordingly.
8. If a manhole joint mastic is completely pulled out during the vacuum test, the manhole shall be disassembled and the mastic replaced and test repeated.

305.00 ON-SITE WASTEWATER DISPOSAL SYSTEMS

On-site wastewater disposal systems will be considered only in those cases where public sewer is not feasible. Each case will be considered on its own merit and is subject to approval by the Director and designed and constructed in accordance with VDH regulations.