

Index

SEWER SPECIFICATIONS-CONSTRUCTION		PAGE
CS-1	TRENCH EXCAVATION AND BACKFILL	1
CS-2	INSTALLATION OF SEWER MAINS	4
CS-3	SIDE SEWERS	6
CS-4	SIDE SEWER SADDLE TEES	7
CS-5	CLEANOUTS	7
CS-6	MANHOLES	8
CS-7	GREASE TRAPS AND INTERCEPTORS	9
CS-8	SIDE SEWER CONNECTION TO THE EXISTING MAIN	10
CS-9	CONSTRUCTION ON STEEP SLOPES	10
CS-10	AUGERED OR BORED CASINGS	11
CS-11	TESTING AND FLUSHING	12
CS-12	CONNECTIONS TO EXISTING MANHOLES AND SEWER LINES	15

Sewer Specifications

Construction

CS-1 TRENCH EXCAVATION AND BACKFILL

Trench excavation shall be unclassified. The terms earthwork or excavation include all materials excavated or removed regardless of material characteristics. The Developer shall estimate the kind and extent of materials which will be encountered in the excavation.

All trenches shall be dug to true line and smooth bottom grades. Surface grading, including cut, fill and compaction, shall be accomplished prior to trench excavation. In pavement sections, grading to subgrade may be sufficient for areas to be newly paved. The trench width from the bottom of the trench to the crown of the pipe shall not exceed 40 inches for 15-inch-diameter and smaller pipe. For 18-inch- diameter or larger pipe, the trench width from the bottom of the trench to the crown of the pipe shall not exceed 1.5 times the inside diameter plus 18 inches. If these widths are exceeded, a stronger grade of pipe and/or a higher classification and amount of bedding material shall be furnished, as directed by the District.

All materials excavated from trenches, and piled adjacent to the trench, shall be placed and maintained so that the top of the material is at least two (2) feet from the edge of the trench. Excavated material shall be located so that free access is provided to all fire hydrants, water valves and meters and other utilities, and clearance shall be left to enable free flow of storm water in all gutters, conduits and natural water courses.

Where it is necessary to cross water or storm sewer trenches, all trench backfill shall be removed and replaced with mechanically compacted granular material to provide a uniform support for the full length of the pipe.

The Washington State Department of Health and the Washington State Department of Ecology require a 10-foot horizontal separation between all sanitary sewer lines and potable water lines. Sanitary sewer mains shall be installed a minimum of 18-inches below the water mains. Section C1-9 of the Washington State Department of Ecology Criteria for Sewage Works Design Manual (the "Orange Manual") identifies specific horizontal and vertical separation for construction of water and sewer mains. If unusual circumstances preclude construction within the above-stated minimum separation criteria, the latest edition of the Orange Manual specifies special requirements for construction of water and sewer mains.

A five-foot minimum horizontal separation shall be maintained between all sewer facilities and underground power, gas, telephone facilities, and storm drains, unless otherwise approved. 12" min. vertical separation and compaction by hand between crossing utilities is required.

Power, telephone or other utility poles shall have a min. separation of 8' with bases of the poles 2' lower than the proposed water or sewer. The developer shall inform the District if these criteria cannot be met.

The root systems of all trees not to be removed which are located on or near the easements and right-of-way shall not be cut or disturbed but shall be tunneled or otherwise protected by the Developer to ensure that no damage is done. Low pressure vactoring may be required. No roots larger than 1" shall be cut without approval from the agency in charge.

During trenching, installing of pipelines and appurtenances, and the placing of backfill, trenches shall be kept free of water. The Developer shall furnish all equipment necessary to dewater the trench and shall dispose of the water in such a manner as not to cause a nuisance or menace to the public. All turbid trench water shall be handled using Best Management Practices (BMPs) per requirements set by the Local Jurisdictional Authority. All sewer lines, new or existing, shall be protected against the intrusion of foreign material.

When so directed by the District, the trench shall be extended below the pipeline grades to permit the placing of foundation gravel. All areas of over-excavation, to remove unsuitable material, or for any other reason, shall be brought to grade with approved foundation material, and compacted.

Maximum amount of open trench on streets shall be 200 linear feet unless otherwise directed by the road agency. At the end of each day all ditches must be backfilled or covered with steel plates and barricaded with flashing warning lights to prevent people or animals from falling into the trench.

In traffic areas, steel plating must be pinned to prevent movement and edges ramped with cold mix asphalt. The contractor shall anticipate materials for steel plating and bracing to create a smooth and safe ride. On more complex steel plating layouts, the District reserves the right to request the design be done by a structural engineer. Shoring shall be placed if the excavation is not backfilled. "Steel plates on Roadway" signing and lighted flashing barricades to warn traffic shall be provided. Steel plates shall have a non-skid coating. These requirements shall be modified as necessary to conform to local jurisdictions and/or MUTCD.

All shoring and bracing or sheeting required to perform and protect the trench and to safeguard the employees, shall be designed and furnished by the Developer, and shall meet all requirements as specified by OSHA and WISHA. No timber bracing, lagging, sheathing or other lumber shall be left in any excavation except with the permission of the District. Removal of shoring or moveable trench shields or boxes shall be accomplished so that the bedding material placement is not disturbed.

Pipe bedding and initial backfill to 12 inches over the top of the pipe shall be completed before subsequent backfilling operations are started.

The Developer shall take all necessary precautions to protect the pipe from any damage, movement or shifting. In general, backfilling shall be performed by placing the material so as not to damage the pipe.

The backfill material to be used in the trench section shall be free draining granular material free of debris and clay. See Sewer Standard Plans 8, 8A and 9. When working in a Public Right of Way backfill shall be as required by the Jurisdictional Authority. This material shall be compacted by mechanical compaction to 95% of maximum density, ASTM D-1557, to finished grade in all locations, and shall be in accordance with County requirements in all County rights-of-way. Provisions shall be made to obtain soil samples for proctor tests prior to construction if native soils are intended to be re-used.

The Developer shall be responsible for providing the proper size and type of compaction equipment and selecting the proper method of utilizing said equipment to attain the required compaction density. In all cases, equipment shall be selected and used to not damage the pipe or other utilities and structures.

Compaction testing will be required for all backfilled trenches. A minimum of one testing location shall be chosen for each 100 feet of sewer main installed, unless the local jurisdictional authority requires more frequent testing. A separate test shall be performed for each two (2) feet of depth. Perpendicular trenching in the roadway shall require one test per each or as requested by the local jurisdictional authority. The Developer or the Contractor shall contract the services of a qualified and approved geotechnical consultant to perform the compaction testing. All testing (and retesting) shall be at the Developer's expense. Testing locations shall be chosen by the field inspector. Compaction results shall be furnished daily during construction and all testing completed prior to paving. Recompact and retesting will be required for any tests which do not pass the compaction testing. Test locations shall be identified by station, offset and depth for easy field verification. Larger projects shall include a map of testing locations. Satisfactory compaction tests do not relieve the Contractor of the responsibility to provide trenches which will not fail. Subsurface settlements within the warrantee period will remain the responsibility of the Contractor.

Materials excavated from trenches are not guaranteed to be suitable to meet the standards for trench backfill. Where original excavated material is unsuitable for trench backfill, imported gravel backfill shall be placed. The unsuitable material shall be removed by the Developer to a disposal area, in accordance with Jurisdictional requirements.

CS-2 INSTALLATION OF SEWER MAINS AND FITTINGS

The trench shall be excavated to the depth and grade required per "Approved for Construction" drawings. Pipe bedding shall be placed to provide a uniform and continuous bearing and support for the entire length of the pipe. Pipe shall be placed on solid and undisturbed ground at every point between bell joints.

All pipe and appurtenances shall be carefully lowered into the trench in such a way as to prevent damage to materials. Under no circumstances shall materials be dropped or dumped into trench. Broken or otherwise defective pipe shall be removed and replaced.

At times when pipe laying is not in progress, the open ends of pipe shall be closed by a water-tight plug or other means approved by the District. If water is in the trench when work resumes, the seal shall remain in place until the trench is pumped completely dry. No pipe shall be laid in water or when, in the opinion of the District, trench conditions are unsuitable. Broken or otherwise defective pipe shall be removed and replaced. Repair bands or clamps or concrete collars shall not be used to repair defective pipe unless specifically authorized by the Engineer.

Water accumulating in the new sewers shall not be permitted to enter the existing system.

Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line.

All sewer pipes shall be laid up grade from the point of connection on the existing sewer or from a designated starting point, as approved by the District. The sewer pipe shall be installed with the bell end forward or upgrade. After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. During jointing the pipe shall be partially supported to minimize unequal lateral pressure and to maintain concentricity. Pipe handling after the gasket has been affixed shall be carefully controlled to avoid disturbing the gasket and knocking it out of position or loading it with dirt or other foreign material. Any gaskets so disturbed shall be removed, cleaned, replaced, and re-lubricated before joining the sections. The pipe shall be secured in place with bedding material tamped under it. Sufficient pressure shall be maintained until bedding material is placed and compacted. At the end of the workday, the last pipe shall be blocked sufficiently to prevent creep.

SEWER MAIN MINIMUM SIZE

All sewer mains shall be a minimum of 8-inches in diameter. Any change in pipe material or size shall only be done at manholes.

HIGH VELOCITY PROTECTION

Where velocities greater than 15 feet per second (FPS) are anticipated, special provisions shall be made to protect against internal erosion or displacement by shock.

SEWER MAIN SLOPE

All sewers shall be designed and constructed to result in mean velocities, when flowing full, of not less than 2.0 feet per second (fps). Self-cleaning velocity shall be provided and demonstrated by the design engineer to the District to accept the problem caused by a lack of sufficient flow. Table CS2.1 below lists the minimum slopes that shall be provided.

Sewer Size (inches)	Minimum Slope (feet per 100 feet)
8	0.40
10	0.28
12	0.22
14	0.17
15	0.15
16	0.14
18	0.12
21	0.10
24	0.08
27	0.07
30	0.06
36	0.05

The developer/contractor shall be aware that no ponding is allowed. Portions of sewer showing ponding in the required video recording shall be re-laid and re-recorded until ponding has been eliminated. Slopes greater than those listed in this table are desirable under low flow conditions. Slopes equal to or greater than 20% shall be anchored per criteria established in the Washington Department of Ecology Orange Manual. If a structure is determined by the District to be dead-ended and will not be connected in the future, the minimum slope shall be 2% from the dead-end manhole to the next structure downstream.

ALIGNMENT AND DEPTH

Generally, gravity sewers shall be designed with straight alignment between manholes. However, curved sewers may be approved by the District Engineer on a case-by-case basis, where circumstances warrant. Sewer mains within public right-of-ways shall be installed at a depth of not less than 8 feet.

CHANGE IN SEWER MAIN SIZE

Where a smaller diameter sewer joins a larger diameter sewer, the invert of the larger sewer shall be lowered sufficiently to maintain the same energy gradient. A method for approximating these results is to place the 0.8 depth point of both sewers at the same elevation. Pipeline sizes or pipeline material shall only be changed at manholes.

CS-3 SIDE SEWERS

All side sewers shall be constructed in accordance with the specifications and resolutions of the District which are incorporated herein by this reference. Side sewer construction shall follow the installation of mainlines as closely as practical in the opinion of the District.

The Developer shall install as part of the contract, all side sewers from the connection on the main line to the margin of the public right-of-ways or easement for all existing houses, all vacant lots, and all equivalent buildable lots as determined by the District and shown on the Drawings. Installation shall be per Standard Plan 15 AND 15A. A cleanout shall be installed on the ROW or Easement Line per Sewer Standard Plan 14.

Private Side sewers shall not be installed until after acceptance of the Developer Extension Project as complete, and the Side Sewer Permit has been obtained.

Private Side sewers shall be installed per Standard Plan 24 AND 24A. The Contractor shall as-built the installation per Standard Plan 25. As-built drawings shall be completed on a scalable site plot plan, at a scale of 1"=20' maximum.

Private Side Sewer stubs for commercial properties shall be connected to a manhole. Commercial side sewers and Multifamily side sewers shall connect to a manhole. Single family side sewers shall tee off the mainline unless at the end of a main where they shall connect to a Manhole.

Oil-water separators and/or grease interceptors shall be installed on all commercial applications as required by the authorized Jurisdiction. See CS-7 for more information. See Sewer Standard Plan 24A Note 16 for connection information.

All side sewers shall be tested for acceptance at the same time the mainline sewer is tested for acceptance. Minimum slope for side sewer stubs shall be 2 percent. All minimum slope side sewers shall be verified for grade prior to backfill.

The Contractor shall install the pipe to a minimum depth at the property line of five feet below the floor to be served, or six feet below the street, whichever is deeper. In cases of vacant properties, the side sewer shall be constructed on a slope of 2 percent from the tee, unless approved otherwise by the District.

All ends of side sewers shall be sealed with watertight plugs and marked by a No. 12-gauge galvanized wire and a two-inch by four-inch timber, extended vertically to the surface and marked with the side sewer identification. Neither the wire nor 2-inch by four-inch timber shall be secured or attached to the sewer pipe in accordance with the Standard Plans.

Side sewer tees shall be plant fabricated and installed along with the mainline sewer. No field cut-in tees shall be allowed. All tees shall be furnished with a gasketed cap or a plug for bell end on pipe. All tees shall be at least equal in class to the sewer pipe being installed.

SIDE SEWER MINIMUM SIZE

All side sewer stubs from the main to the property line or edge of easement shall be at least 6 inches in diameter and have a cleanout installed at the ROW or Easement Line. From the Cleanout, single family residential side sewers shall be at least 4 inches in diameter.

JOINT OR SHARED SIDE SEWERS

If a 6-inch side sewer is directly connected to a manhole, up to two (2) residential properties shall be allowed to connect to the single 6" side sewer with approval of the General manager. Joint side sewers shall be allowed only pursuant to joint side sewer agreement signed by the owners of the benefited properties.

ALTERNATE (VERTICAL STANDING) SIDE SEWERS

This method of side sewer installation may only be used with prior approval from the District and only when the Standard Side Sewer installation per Sewer Standard Plans 14, 15, 24, and 24A are not possible. If this method of side sewer installation is allowed, see Sewer Standard Plan 15A for more information.

SIDE SEWER ALIGNMENT

No vertical or horizontal bends shall be allowed in the public right-of-way or sewer easement without specific authorization by the District.

MAXIMUM SIDE SEWER LENGTH

The maximum allowable length of any side sewer shall be 150 feet. Cleanouts are required at the Property or Easement lines, at spacings of 100 feet, at each 110° of accumulated horizontal bends, or as directed by the District.

SEWER BACKFLOW PROTECTION REQUIRED

Backwater valves may be required per the Uniform Plumbing Code. Jurisdictional requirements may override backwater valve size, type, and location.

CS-4 SIDE SEWER SADDLE TEES

Saddle tees shall only be used with District approval on a case-by-case basis, with an engineering review of proposed materials and methods.

CS-5 CLEANOUTS

Cleanouts shall be installed at the locations shown on the drawings, at the ROW or Easement line, at change of direction of a side sewer, or as required by the District in accordance with Sewer Standard Plan 14. Cleanout material and size shall match side sewer size and material.

CS-6 MANHOLES

Manholes (MH) shall be constructed as per Standard Plans and as noted and shown on the drawings. Sewer main extensions shall end with a manhole unless approved by the District.

All lift holes and the inside face of rubber gasket joints between precast sections shall be thoroughly wetted, filled with mortar, and smoothed with a brush finish. All joints shall be air/watertight. Lift holes shall be grouted from the outside as well as inside the manhole.

Precast sections shall be placed and aligned to provide vertical sides and vertical alignment of ladder rungs over the largest portion of the structures bench. Eccentric cone shall be positioned to allow vertical access to the ladder. The completed manhole shall be vertical, rigid, true to dimension and watertight.

The contractor shall install external joint wrap on MH riser joints, pick holes, and riser rings of the MH, after external seam grouting but before backfilling.

Manholes eight (8) feet and less in depth shall have cones a maximum of two (2) feet in height.

The Developer shall provide paved access for the District's Vector Truck to all manholes, either within the public right-of-way, or within easements.

Maximum road grade shall be 12%. Minimum inside turn radius shall be fifty (50) feet. A District approved turnaround shall be provided on dead end access roads. Manholes set in paved streets or other paved areas shall be set flush with finished grade of the paving and when required, the manhole frame shall be tilted to conform to the grade on the paved surface.

Manholes set in gravel shoulders or other nonpaved improved areas shall be set flush with the finished grade and with an asphalt apron six (6) feet square. The manhole frame shall be tilted to conform to the grade of the finished surface.

Manholes not set in paved areas shall be set in a collar per Standard Plan No. 21 to prevent surface water infiltration into the system, unless plans specify otherwise.

The contractor shall furnish watertight manhole lids per Standard Plan 20. Manhole joints and pipe entry points shall be watertight.

Manhole channels shall be made to conform to the sewer grade and shall be brought together with well-rounded junctions. Channel sides shall be carried up vertically to 3/4 of the largest pipe's diameter and rounded to the shelf at the largest pipe's crown elevation. The existing concrete shelf shall be smoothly finished with slopes to drain. Channeling shall be performed by a pre-qualified specialist well experienced with District requirements. The District, at its sole discretion, may require a demonstration on a test manhole to establish pre-qualification. New sewer manholes shall have fiberglass channels. Connections into an existing fiberglass base, shall replace the base section or have the channel re-glassed by a certified service technician to accommodate the new connection.

As indicated on the Standard Plans and drawings, channels with cored knockouts shall be provided to facilitate connecting future incoming sewers. Connection and knockouts shall provide for matching pipe crown elevations, with 0.10-foot drop to discharge pipe.

Kor-N-Seal boots shall be used provided the manhole penetrations are cored to provide the proper pipe orientation and allowance for fall across the manhole (.1 foot minimum). Special attention needs to be given to steep runs to ensure the minimum fall across channel. Maximum fall across the Manhole shall be 3 tenths of a foot. Channel mix shall have a minimum compressive strength of 3000 psi.

Where the manhole is located in streets or other areas which have not been brought to grade, the top of cone shall be constructed so as to provide clearance not less than 12 inches or more than 22 inches below the surface to be restored, unless otherwise directed by the District.

Manholes shall not be located in sidewalks or curb and gutter line.

MH ladder orientation shall generally be centered over the widest bench with special attention given to future connection points and wheel tracking. In no case may any portion of the ladder align with the channel.

Maximum spacing between manholes on sanitary sewer main runs shall be 400 feet.

The minimum inner diameter of manholes shall be 48 inches. For incoming pipes larger than 24 inches in diameter, the manhole shall be 54 inches or greater. Manholes are mandatory when connecting significant commercial or industrial facilities to the sanitary sewer system and shall be of adequate size to provide for monitoring and sampling equipment. Manholes with invert elevations greater than or equal to 15 feet below finished grade shall be minimum 54 inches in diameter.

Platform manholes shall be required when the invert elevation is greater than or equal to 20 feet below finished surface grade and shall be minimum 60 inches in diameter. See Sewer Standard Plan 5A.

CS-7 GREASE TRAPS AND INTERCEPTORS

All commercial applications may have Grease Traps or Interceptors. Grease traps and interceptors shall be sized and installed according to the criteria in the Uniform Plumbing Code (UPC) and shall limit emissions to a max. 100 parts per million (ppm). Grease traps and interceptors shall be located on private property, outside the building, and they shall remain privately owned and maintained at the owner's or occupant's expense. These facilities shall be available for the inspection/sampling by District personnel with a minimum 24-hour verbal notification to the occupant or property owner. All new installations of Grease Traps or Interceptors shall be run into a manhole on the sewer mainline unless special permission from the District is given. If a manhole is not installed, a Schier SV24 sampling port will be installed behind the District Clean-out at the edge of ROW, property, or easement line.

CS-8 SIDE SEWER CONNECTION TO EXISTING MAIN

GRAVITY SIDE SEWER CONNECTIONS

Side sewer connections to an existing main shall be per Standard Plan 17. Existing flow in the sewer main must not be interrupted. The Developer is responsible to determine existing flows and plan and coordinate bypass pumping as necessary. Developer shall not cut into the main until authorized by the District's inspector.

ALTERNATIVES TO GRAVITY SIDE SEWER CONNECTIONS

Except as authorized by the Board of Commissioners, private pumps shall not be allowed and only properties that can be served by gravity side sewers will be permitted to connect to the District's sanitary sewer system. Under extreme conditions, the Board may authorize the use of private pumps to provide service to individual properties in accordance with Washington State DOE rules and regulations and the District's rules and regulations governing private pumps.

If private Grinder Pumps are allowed:

1. The served property owner shall be responsible for operating and maintaining the grinder pump. A grinder pump service agreement shall be completed, signed by the property owner and the District, and recorded with the King County Recorder's Office.
2. The Grinder Pump and force main shall not become a part of the District's public sewer system.
3. Grinder Pump shall be E-One Extreme WH231 with a 237gallon storage capacity. Grinder Pumps shall be internal to the structure.

CS-9 CONSTRUCTION ON STEEP SLOPES

Where construction occurs on slopes 20% or greater, the developer shall install concrete pipe anchors and slope retainers, or other approved slope retainers as shown on Standard Plan 12.

All sewer mains installed on slopes of 20% or greater, or within fill slopes shall be restrained joint Class 52 ductile iron pipe Protecto 401 Lined.

For sanitary sewer mains, the following concrete pipe anchor spacing, as specified in the Washington Department of Ecology Criteria for Sewage Works Design, Chapter C1, Paragraph C1-4.4, shall apply:

SLOPE	ANCHOR SPACING
20% up to 35%	36 feet center to center, maximum
35% up to 50%	24 feet center to center, maximum
50% and greater	16 feet center to center, maximum

CS-10 AUGERED OR BORED CASINGS

If sewer mains are required to be installed in casings, the sewer pipe shall be Class 52 ductile iron pipe, Protecto 401 Lined with restrained joints. Sewer mains installed in casings shall have a minimum slope of 1%.

Sewer mains installed in casing pipe shall be made by jacking, driving, or augering a steel casing pipe beneath the surface. No open excavation shall be made closer than six feet from the edge of pavement. The diameter of the casing shall be sufficient to allow installation of the sewer main and to provide allowance for adjustment of the sewer pipe to proper line and grade. Wall thickness shall be sufficient to withstand installation force and highway loading and shall not be less than 3/8-inch.

Provisions shall be made to monitor possible cave-ins outside the casing. The voids shall be filled by pumping grout at low pressure. The cutter head shall not protrude more than 1/3rd the diameter of the casing or max 8" to prevent or minimize cave-ins.

The sewer pipe may be pushed or pulled into the casing pipe. Casing insulators shall be centered restraint type (Cascade Water Works Manufacturing, Advanced Products & Systems, or District approved equal) and shall be used to protect the pipe and adjust it to proper grade. See Sewer Standard Plan 13 for more information. After the sewer pipe has been adjusted to line and grade, the casing shall be sealed with rubber end seals and stainless-steel clamps. A temporary blow-off shall be placed at each end of the casing to verify and facilitate sand placement.

After installation, air testing, and TV inspection of the sewer main, and with the approval from the District Inspector, dry sand shall be placed in the casing pipe so that all voids will be filled. Calculations shall be performed to show the amount of material installed has filled the interstitial void between the installed sewer main and the casing. Prior to placement of sand, the sewer pipe shall be permanently anchored or blocked inside the casing in such a manner as to prevent flotation under all conditions. Details as to the method and materials used are to be submitted and approved before installation of the sewer pipe occurs. In short or large diameter casings the sand may be tamped in place or alternatively it may be placed by air blowing. Care shall be used to completely fill all voids and to prevent flotation or displacement of the pipe.

All bore pits or related excavations shall be closed at the end of each day. Ditches must be backfilled or covered with steel sheets and, within public or private rights- of-way, barricaded with minimum 5-feet high chain link fencing and flashing warning lights to prevent people or animals from falling into the trench.

The requirements of the roadway agency as contained in the construction permit, or as issued by oral instructions of the authorized representative of the roadway agency shall be followed by the Developer.

CS-11 TESTING AND FLUSHING

Pressure testing and flushing shall conform to the requirements of Section 7-17.3(2)E and 7-17.3(2)F, WSDOT/APWA as modified by the following.

Sewer Mains, Manholes, and Side Sewers shall be tested after installation of all other utilities or trenching is completed on the project. All manholes shall be subject to an acceptance test at the request of the Owner. Pre-testing by the contractor is highly recommended. All necessary safety precautions regarding air testing and confined space entry shall be observed.

Any safety concerns during sewer testing will constitute a "Test Fail" and the testing will be rescheduled once proper safety measures are put into place and followed.

SEWER AIR TESTING

Sewer mains shall be air tested in maximum 400-foot lengths. No infiltration is acceptable. Testing shall be at 4 pounds per square inch gauge (PSIG) for the length of time determined by the District's Inspector on a case-by-case basis. Above ground side sewer caps shall be braced/secured to allow for the test to achieve the full pressure/time. At no time shall any person enter the structure while testing is underway. To ensure personnel safety, gauges and air chucks used for the testing should be mounted on extension whips.

Side sewers shall be water tested with fittings visible, or air tested with pipe and fittings backfilled sufficiently to withstand test pressure. Test pressure shall be 3.5 PSIG, for four (4) minutes with no pressure loss.

No infiltration is acceptable. The District may require an infiltration test if it appears that there is infiltration after air tests are completed. The District shall also be the sole judge of whether or not this test is required. Failure to pass the infiltration test shall be cause for rejection.

MANDREL TESTING

If deemed necessary by the District, sanitary sewers constructed of flexible pipe shall be deflection tested not less than 30 days after the trench backfill and compaction has been completed. The test shall be conducted by pulling a solid pointed mandrel with a diameter equal to 95 percent of the pipe diameter through the completed pipeline. Testing shall be conducted on a manhole-to-manhole basis and shall be done after the line has been completely flushed with water. The developer will be required, at his expense, to locate and repair any sections failing to pass the test and to retest the section.

VACUUM TESTING

The vacuum test shall be performed prior to acceptance of project. Vacuum testing shall be in accordance with the latest edition of ASTM C1244/C1244M-20.

All lift holes shall be plugged. All pipes entering the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.

Vacuum testing requires a minimum six (6) foot whip from the test gauge to the testing apparatus to prevent injury during the testing process.

The test head shall be placed at the top of the manhole in accordance with the manufacturer's recommendations. A vacuum of 10 inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 inches of mercury. The manhole shall pass if the time it takes the mercury to drop from 10 inches of mercury to 9 inches of mercury meets or exceeds the values indicated in the Table below.

If the manhole fails the initial test, necessary repairs shall be made by an approved method. The manhole shall then be retested until a satisfactory test is obtained.

Depth (FT)	Diameter (in.)				
	48	54	60	66	72
	Time (s)				
8	20	23	26	29	33
10	25	29	33	36	41
12	30	35	39	43	49
14	35	41	45	51	57
16	40	46	52	58	67
18	45	52	59	65	73
20	50	53	65	72	81

TV INSPECTION

All sewer runs shall be inspected using a television camera prior to final acceptance.

Manhole channeling shall be completed prior to the television inspection. The sewer mains shall be Jetted clean prior to video recording. Sewer mains which are not clean shall be re-video inspected after additional cleaning.

It is the Developers responsibility to coordinate a precon meeting with the TV operator and the Districts Inspector. TV inspection requires scheduling 48 hours in advance. All video inspections and reports shall follow the NASCO formatting.

Prior to video inspection, 5 gallons of water with Purple Dye (PVC Pipe) or Green Dye (DI/HDPE Pipe) mixed in, shall be placed into the uphill manhole in view of the camera. The video shall include audio narratives describing events, direction of camera travel, Manhole Number and side sewer tee locations, wide joints, cracked liner, ponding etc. Cameras shall be equipped to rotate and view side sewer stubs. The costs of video inspection shall be borne by the Developer. Copies of the video inspection and report shall be provided to the inspector prior to project acceptance. The video inspection recording shall be furnished in flash drive format.

No ponding is allowed. If a section of the sewer system is found to have deficiencies, the repaired/corrected section of the sewer system shall be subject to re-test and video, at the District's sole discretion, to include any or all the tests previously described. All re-testing shall be at the Developer's expense.

In the event that evidence indicates that the sewer mains or side sewers have been compromised by debris, gravel, or mud following the initial inspection, the entire system shall be re-video recorded either post-paving or immediately prior to final acceptance, as determined by the District

CS-12 CONNECTIONS TO EXISTING MANHOLES AND SEWER LINES

The physical connection to existing manhole or sewer lines shall not be made until so authorized by the District. The connection to an existing manhole or existing sewer shall be plugged and sealed at the commencement of work and shall remain sealed until opening of the line is authorized by the District. This authorization will not be given until all upstream lines have been completely cleaned, tested, and accepted.

The Developer shall notify the District, in writing, of their schedule for making the connection at least seven (7) business days prior to the time of making the connection.

The Developer shall excavate completely around the existing manholes to ensure against unbalanced loading on the manhole. The Developer shall keep the manholes in operation at all times and take all precautions necessary to prevent any debris or other materials from entering the sewer.

The Developer shall be responsible for repairing all damage to the manholes resulting from their operations.

Installation of a new manhole on an existing main shall be per Sewer Standard Plan 3 (Saddle Manhole) or Sewer Standard Plan 4 (Alternative Saddle Manhole). The Alternative Saddle Manhole detail may only be used when the grade of the existing sewer main is 2% or greater.

Connection to an existing manhole shall be cored. A boot connector (Kor-N-Seal or approved equal) shall be used. Prior authorization and approval by the District is required for all other methods when the manhole cannot be cored. The existing manhole cone may need to be rotated, and new steps and ladder installed depending on the location of the new connection with respect to the existing ladder and shelf. Should new steps be required, all steps and ladders shall be updated per the Standard Plans. If the neck of the Existing Manhole is not in conformance with Sewer Standard Plan 2 for neck adjustment, manhole sections will need to be added or deleted to meet the allowable dimensions.

The Developer will be solely responsible to determine existing flows and provide adequate bypass pumping as required to maintain existing flows. The Contractor shall prepare and submit a bypass pumping plan for review and approval by the District prior to construction.

All flushing water, grit and foreign material shall be removed from upstream manholes and not allowed to enter the existing sewer.

All existing sewers shall always remain in service. Adequate provision shall be made for disposal of existing flow if any existing sewers are damaged. Any damage shall be repaired to a condition equal to or better than that existing prior to construction at no cost to the District.