

**CITY OF MONROE PUBLIC WORKS
DESIGN, CONSTRUCTION AND OPERATIONS STANDARDS**

**SECTION 6
SANITARY SEWERS**

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CITY OF MONROE PUBLIC WORKS DESIGN, CONSTRUCTION AND OPERATIONS STANDARDS

SECTION 6 SANITARY SEWERS

6.1 GENERAL

Construction of all sanitary sewer shall be in accordance with the State of Washington's (WSDOT) Standard Specifications for Road, Bridge and Municipal Construction, Criteria for Sewage Works Design prepared by the Department of Ecology, American Water Works Association (AWWA) guidelines, and these Standards. If any inconsistencies occur these Standards shall have precedence.

Sanitary sewer design and construction shall be in conformance to these Standards and Title 23 of the Monroe Municipal Code (MMC).

6-2 DESIGN STANDARDS

6.2.1 Sewer Main Line Design Standards

New sanitary sewers shall be designed in anticipation of future development or redevelopment beyond the boundaries of the proposed project.

The minimum size sewer main shall be 8 inches in diameter, except a 6-inch diameter dead end line can be installed if all of the following requirements are met:

1. The maximum number of residential units is eight.
2. The 6-inch line is no longer than 150 feet.
3. A manhole is installed where the 6-inch connects to the main line.
4. The minimum slope is one foot per 100 feet.

Sewers shall have straight alignment between manholes. Maximum length of run between manholes shall be 400 feet.

Sewers on 20% slope or greater must be anchored securely with concrete anchors or equal. Thirty-six foot spacing on grades 20% to 35%. Twenty-four foot spacing on grades 35% to 50 %. Sixteen-foot spacing on grades over 50%.

Sewer mains outside public right-of-way shall be in a 20-foot-wide easement. Provide vehicle access to all manholes located in easements.

Sewer mains shall be laid below water mains at crossings to provide a vertical separation of 18 inches between the invert of the water pipe and the crown of the sewer pipe. If local conditions prevent the minimum vertical separation see Chapter 2C of the DOE Criteria for Sewage Works Design Manual for exceptions.

New gravity sewer systems shall be designed on the basis of an average daily per capita flow of sewage found in Table G2-2 of the Criteria for Sewage Works Design. In

general, sewers should be designed with a peaking factor of 4 to be applied to the average daily per capita flow rate. Other flow rates may be proposed and be based on flow rates from the Criteria for Sewage work Design as published by the Washington State Department of Ecology.

Pipe diameter, slope and flow velocity shall collectively be considered in the design of the sewer main. The Criteria for Sewage Works Design provides guidelines on minimum slopes for pipe diameters. Larger pipe diameters shall not be selected solely to achieve lesser slopes without regard to the required flow velocity. If the sewer main terminal run is not expected to be extended in the future, said terminal run slope shall be not less than 1%.

Design depth of sewer main shall be a minimum of 3 feet from finish grade to top of pipe.

An "n" value of .013 shall be used in Manning's Formula for the design of all sewer facilities (regardless of the pipe material). Inverted siphons can use an "n" value of up to .015.

6.2.2 Side Sewer Design Standards

All connections to public sewer shall be by a gravity connection unless approved otherwise by the Director. The connection shall be made using a gasketed wye if associated with a new sewer main construction.

Each single-family residential lot shall be serviced by a single side sewer connection to the public sewer main. Each commercial building shall be serviced by at least one separate side sewer connecting to the public main. Sharing of side sewers between separate properties is not allowed.

Side sewers shall be sized in accordance with MMC 23.60.010(C) and be extended to the property line/edge of easement or the dry utilities, whichever is farthest. The depth of the side sewer stub shall be indicated in the field by the developer using a 2-inch black stenciled numeral on a white 2x4 marker post along with the word "sewer" and the depth of bury noted.

In general, side sewers shall be a minimum depth of 6 feet at the property line.

Cleanouts are required every 100 feet and at the building connection, at 90-degree bends, or combinations of bends greater than 45 degrees.

The minimum slope for 4" and 6" diameter side sewers shall be 2%.

Connection to an existing main line must be core drilled. See Standard Plan No. 611.

Ten gauge insulated locator wire or approved tracer tape manufactured for such purpose must run along the side sewer without break and terminate at the sewer stub marker or clean out at the building. The wire must extend up the sewer marker board to a height of 3 feet for new construction.

Measurement from the downstream manhole to each side sewer lateral shall be accurately shown on the record drawings.

6.2.3 Manhole Design Standards

Manholes shall not be located in curbs or low points, nor located in sidewalks or crosswalks unless approved by the City. Manholes placed in unpaved areas shall have a 12-inch wide by 2-inch minimum depth asphaltic ring around the external casting. Asphalt shall be placed on a firm and unyielding base.

Manholes are required at changes in pipe slope, alignment, or size. A manhole is required at the end of all sewer mains, provided that a cleanout may be installed at the end of sewer runs less than 200 feet and having a minimum slope of 1%, and that will be extended in the future.

The channel drop within manholes must be 0.1 foot from inflow to outflow.

The minimum inside diameter of manholes shall be 48 inches. A 54-inch manhole is required for pipe connections larger than 24 inches in diameter, or if an inside drop manhole is proposed. Manholes deeper than 19 feet shall be a minimum of 60 inches in diameter.

6.2.4 Lift Stations

The inclusion of lift stations in the design of new plats is strongly discouraged. Unless physically impossible or exorbitantly expensive, new subdivisions shall provide gravity sewer to the City's existing sewer system.

The Director will approve plans for public and private pump stations on an individual basis.

Private pressure lines are not permitted on public right-of-way. Pressure lines are to become gravity at the side sewer connection at the edge of right-of-way.

6.2.5 Septic Tank Systems

Septic tank systems are generally not allowed. Exceptions can be found in MMC 13.08.030.

6.2.6 Grease Traps and Interceptors

If it is determined by the Director the building will be preparing food or otherwise generating fats, oils and grease, the customer shall be required to install a city approved grease interceptor per MMC 13.10.140B and MMC 13.10.140C. The applicant shall submit a plan indicating the type, size and location of the grease interceptor and install it as part of the building plumbing permit. If a hydromechanical grease interceptor (HGI) is allowed instead of a gravity grease interceptor (GCI), it shall be sized and installed as per the current edition of the Uniform Plumbing Code (UPC) and approved by the Director prior to installation.

A grease interception device and/or other biological, chemical, or other pretreatment approved by the Director, must be installed by the owner at their expense. Effluent discharged from any grease interceptor must not contain a visible sheen or accumulations of fats, oils, and grease (FOG), and must be in compliance with the City of Monroe regulations for discharge to the sanitary sewer.

1. Design of the grease interceptor will be subject to approval by the Director. Size must be determined by the Uniform Plumbing Code as adopted by the City, and manufacturer's recommendations.
2. Fixtures in the kitchen area which discharge wastewater containing grease are to be connected to the grease interceptor. Such fixtures include pot sinks, range woks, janitor's sink, floor sinks, and rotoclones. Toilets, urinals, and wash basins must not flow through any interceptor. Note: All full-service kitchens with dishwashers must discharge to a GCI.
3. If the interceptor is located outside the building within twenty feet of a driveway for access by maintenance vehicles.
4. The interceptor must be filled with clean water prior to start-up of system.
5. Access to the interceptor must be available for inspection and compliance determination sampling at all times.
6. When pre-treatment is no longer required, the inlet and outlet pipes must be permanently plugged, the separation chambers pumped out, and the vault removed, or filled with compacted crushed rock or controlled density fill.

6.2.7 Oil/Water Separators

Whenever an industrial or commercial business generates mineral /petroleum /non-biodegradable cutting oils exceeding 100 milligrams per liter to be discharged to the sanitary sewer, pre-treatment is required. An oil/water separation device must be installed by the property owner at their expense as specified on Standard Details. Selection and sizing of an oil/water separator must be subject to approval of the Director. Water discharged from any oil/water separator to the sanitary sewer system must not contain in excess of 100 milligrams per liter of petroleum oil, non-biodegradable cutting oil and mineral products, and must be in compliance with the City of Monroe regulations MMC 13.10.050 for discharge to the sanitary sewer.

1. Sizing of a separator facility must be based upon maximum available flow to the separator and provision of a forty-five-minute retention time in the separator at that flow, with a minimum capacity of at least 100 gallons.
2. The oil/water separator must be covered with removable sections. Access and inspection covers, weighing not more than 30 lbs. and with suitable hand holds, are to be provided directly above inspection "tee" and oil/grit collection compartments.
3. Only wastewater from floor drains and covered parking areas must drain to the separator. The location and design must minimize or eliminate the possibility of stormwater reaching the separator -- areas over two hundred square feet open to rainfall must not drain to the separator. Sewage from restrooms and shower facilities must not drain to the separator.
4. The separator must be located within 20 feet of a driveway for access by

- a maintenance vehicle.
5. A sampling tee must be located on the outlet as shown on the Standard Details. Access to the separator must be maintained free for inspection and compliance determination sampling at all times.
 6. The effluent discharged from any oil/water separator to the sanitary sewer must not exceed 100 parts per million total oil.
 7. When pre-treatment is no longer required, the inlet and outlet pipes must be permanently plugged, the separation chambers pumped out, and the vault removed, or filled with compacted crushed rock or controlled density fill.

6.3 CONSTRUCTION PLANS

Sanitary sewer plans shall show both plan and profile views. Other utilities are to be shown in plan view and profile view, including crossing pipe approximate locations and depths graphically depicted on the profile along with the diameter and service called out.

Provide notes and on plans that refer to specific City Standard Details such as manholes, drop connections, side sewers, etc. All referenced standard details shall be included in the plans.

Plan and profile drawings shall show invert elevations of the main at the outlet and all inlets of each manhole, slope of the main and surface elevations of the manhole lid. In the profile view, the finish ground elevation over the pipe shall be shown. Stationing of side sewers from the downhill manhole is required.

In all cases where a line is to be placed in an easement, the easement is to be shown with measurement information to accurately lay it out prior to constructing the pipeline.

Upon completion of construction, the original plan shall be used to prepare a record drawing, certified by the design engineer and turned into the city inspector for review and approval. Prior to recording, proposed easements shall be adjusted to match any field changes occurred during construction to ensure that the easements are approximately centered over the pipeline.

The plans shall include Sewer Construction Notes. Refer to Appendix A of this Section.

6.4 CONSTRUCTION REQUIREMENTS

6.4.1 Survey Staking

Survey line and grade shall be required to establish correct horizontal and vertical placement of the sewer line. At a minimum, manholes and cleanouts shall be staked under the supervision of a professional land surveyor, as well as intermediate main line locations not to exceed 50 feet between surveyed points. Side sewer connection points to the main line sewer shall also be staked.

6.4.2 Trench Excavation

The maximum trench width between the foundation level and 12 inches above the pipe shall be 40 inches for pipe 15 inches or smaller inside diameter. For pipe 18 inches or larger the width shall be 1 1/2 times the inside diameter plus 18 inches. If the maximum trench width is exceeded the developer will be required to provide higher strength pipe or higher class of bedding as determined by the project engineer.

The trench shall be kept free of water during pipe installation. Pump down the static water level to one foot below the excavation.

Trenching shall not exceed 100 feet in advance of pipe laying.

6.4.3 Pipe Bedding

Bedding for sewer main and side sewer pipe shall be pea gravel or washed sand. Install bedding to 6 inches below the bottom of the pipe and to 12 inches above the pipe.

Manholes shall be placed on a 6-inch to 12-inch bed of pea gravel.

6.4.3 Laying Sewer Pipe

Immediately upon beginning pipe installation, the developer shall place and secure a heavy-duty watertight plug in the sewer main at the new or existing manhole as directed by the inspector. The plug shall be secured with a chain and attached to the ladder inside the manhole. The plug shall remain in place throughout the project until such time as the sewer system is accepted by the city inspector. The Developer shall ensure watertight seal between the plug and pipe for the duration of the plug requirement. Should the plug become dislodged, the developer may be required to clean the sewer main and manholes downstream as determined by the City inspector. Developer is responsible to remove plug upon final acceptance of the sewer.

Pipe shall be laid with bells upslope and shall start from the lowest point. 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. The pipe shall be secured in place with pipe bedding tamped under it.

Every precaution must be taken to ensure foreign material does not enter the pipe. When pipe laying is not in progress, the open ends of the pipe must be closed by a watertight plug or other means approved by the City construction inspector. If water is in the trench when work resumes, the seal on the pipe must remain in place until the trench is completely pumped dry. No pipe may be laid in water, or when, in the opinion of the City construction inspector, trench conditions are unsuitable.

Installing sewer main pipe in fill areas may require additional treatment. The treatment may consist of the following: Compacting the backfill in six-inch layers, careful choice of backfill material, ductile iron pipe with locking mechanical joints, or other reasonable methods. Geotechnical evaluation of trench zone will be required to analyze the underlying soil conditions and make necessary recommendations.

Under no circumstances shall the developer be allowed to discharge flows from the new sewer main into the sewer system until or unless approved by the Director. The developer shall remove foreign material and any water within the new sewer before discharge is allowed to the existing sewer system.

6.4.4 Alignment Tolerance

Maximum deviation from planned grade shall not exceed a total of ½ inch. The developer shall make every effort to avoid bellies in the sewer pipe. Any inadvertent belly shall not exceed ½ inch, provided that it falls within a localized area not to exceed one pipe length.

Gravity pipe shall be installed in a straight alignment with uniform grade and pipe type between manholes. Variance from established alignment can be up to one inch per 100 lineal feet of pipe. Variation in the invert elevation between adjoining ends of pipe due to non-concentricity of joining surface shall not exceed one inch, with drop in the direction of flow only.

6.4.5 Connections to Existing

Connection of a new sewer main to an existing main shall be accomplished by pouring a concrete base and setting manhole sections. Refer to saddle manhole Standard Detail 612. The existing pipe shall not be cut until approval is received from the city inspector.

If connecting to an existing manhole, the Developer must carefully excavate adjacent to the existing manhole to prevent unbalanced loading. The manhole must be kept in operation at all times and the necessary precautions must be taken to prevent debris or other material from entering the sewer, including a tight pipeline bypass through the existing channel, if required by the city inspector.

The developer shall core drill an opening to match the size of pipe to be inserted. All connections to manholes shall be made with Kor-N-Seal boot or approved equal manhole adapters providing a transition from the manhole to pipe material and providing a watertight leak proof seal. All voids around manhole adapters shall be thoroughly grouted and sealed inside and outside of the manhole walls and installed in accordance with manufacturer recommendations.

Match manhole channels height to crown elevation of pipe. The concrete shelf shall be smoothly finished and warped evenly with a 2% slope to drain.

No pipe joint in PVC shall be placed within 10 feet of the outside face of the manhole.

Completed joints shall show no visible leakage and shall conform to the dimensional requirements of ASTM 478.

6.4.6 Manhole Installation

Manhole installation shall be as detailed on the construction drawings and in accordance

with the standard details. Precast section with damaged joint surfaces, cracks, or damage shall not be installed.

Precast base sections shall be set on a 6-inch to 12-inch thickness bed of pea gravel. Before the precast base is set in place, the bedding material shall be carefully leveled to provide full bearing for the entire base section.

Precast riser and cone sections shall be set using the specified joint sealant or gasket. Joints between riser sections must be rubber gasket and mortared inside. Priming and preparation of surfaces and installation of jointing material shall be in strict conformance with the manufacturer's instructions.

Standard precast cones must provide eccentric reduction from 48 inches to 24 inches with a height not less than 18 inches and from 54 to 24 inches with a height not less than 24 inches.

Cone sections shall be rotated as necessary to position the access outside of the tire tracks of a traveled lane.

Grade rings shall be set in a full bed of cement grout. Grade ring thickness shall be 2-inches to 18-inches max. If set in paved areas, the casting shall be tilted to match the slope of the paved surface. Wood or deleterious material will not be allowed for adjustments.

Manholes placed in unpaved areas shall have a 12-inch wide by 2-inch minimum depth asphaltic ring around the external casting. Asphalt shall be placed on a firm and unyielding base.

Minimum fall across the manhole channel shall be 0.10 foot.

Channels shall be given a smooth finish, and channel landings shall be sloped to drain into the channels. Bottom and sides shall be given a trowels finish. Benches shall receive a light broom finish. Unless precast channel bases are used, notify the city inspector when channeling is scheduled and provide a copy of the concrete mix ticket.

Ladders shall be installed in base sections. Steps shall be installed in riser and taper section. The completed manhole shall have a continuous vertical ladder with equally spaced rungs.

6.4.7 Side Sewer Installation

Side sewer installation shall be in accordance with the Uniform Plumbing Code as adopted by the City of Monroe and these specifications and details. Only properly insured general developers or utility contractors licensed and bonded with the State of Washington shall perform side sewer installations within the public right-of-way or within easements.

The minimum grade shall be 2% and the maximum grade 100% (45 degrees), unless otherwise approved by the Director.

Taps shall not protrude into the main.

No connections from downspouts, gutters, footing drains, yard drains, or any other feature receiving or exposed to rain or groundwater shall be allowed to sewers.

All side sewers shall be pressure tested and inspected prior to backfilling. Any work that has been covered without inspection shall be uncovered to allow for inspection and testing at the developer's own expense.

If a side sewer does not successfully pass an initial and subsequent re-test, the applicant may be subject to payment of an additional side sewer re-inspection fee per the City's Fees Resolution table.

6.4.8 Trenchless Installation

The use of trenchless methods for sewer pipe installations may be allowed. The use of trenchless methods will require special approval of the Director. Trenchless methods shall only be considered when other standard methods of construction are unnecessarily difficult or expensive. Any use of trenchless methods shall be at the developer's complete risk as to the ability to satisfactorily complete the utility installation in compliance with City standards. Methods that will be allowed include:

1. Horizontal Directional Drilling (HDD)
2. Microtunneling
3. Pipe Jacking
4. Pipe Bursting
5. Auger Boring
6. Pipe Ramming
7. Cured in Place Pipe (CIPP) for rehabilitation
8. Sliplining for rehabilitation

Casing pipe is used in microtunneling, pipe jacking, auger boring and pipe ramming applications and shall conform to all industry standards. Casing pipe that may be considered for Director review includes steel, High Density Polyethylene Pipe (HDPE) or Ductile Iron (DI). In addition, all DI pipe shall be restrained joint. Gasket restrained joints are not acceptable in boring, casing, or carrier pipe installations.

Casing spacers shall be used to support the carrier pipe inside the casing pipe. Casing spacers shall be equally spaced within the casing and shall be sized to center the carrier pipe within the casing pipe or as necessary to achieve desired slope. Casing spacers shall be as manufactured by Advanced Products and Systems Stainless Steel Band Casing Spacers, Model SSI, or Cascade Waterworks Manufacturing Company Stainless Steel Casing Spacer or approved equal.

The annular space between the carrier pipe and casing pipe shall be filled with sand that conforms with Section 9-03.1 (2)B of the WSDOT Specifications for Class 2 Fine Aggregated gradations. Other materials shall be approved by the Director prior to installation.

For Horizontal Directional Drilling (HDD) applications the carrier pipe is typically installed without a casing pipe. For HDD installations the carrier pipe shall be high density polyethylene pipe (HDPE).

All HDPE pipe shall have butt-fused joints completed in accordance with the manufacturer's recommendations as to equipment and technique by workers who are certified in the fusion process. HDPE pipe shall be butt-fused into the maximum available lengths prior to pulling the pipe into the directional drill hole. All interior butt welds shall be reamed to provide the full unobstructed inside diameter of the HDPE pipe for sewer installations.

Pipe shall be installed to the lines and grades as shown on the plans and profiles. Because of the minimum pipe slopes and easement width, installation of the pipe shall be closely monitored to maintain the proper alignment.

The equipment used during the drilling operation shall be determined by the Developer for the approved trenchless method and meeting the requirements of the plans or specifications of this project.

Developer shall provide portable fluid (mud) tanks at both entry and exit points to contain all drilling fluids resulting from the drilling operation and is responsible for proper disposal of all drilling fluids and waste tailings offsite unless a suitable location is approved by the Director.

The entire length of the trenchless installation shall have a recorded profile upon completion. Developer shall furnish this information to the Director upon completion of the trenchless method operation.

6.5 MATERIALS

6.5.1 Sewer Pipe

The following material shall be used for mainline installation:

Sewer Material	Standard
Polyvinyl Chloride (PVC)	ASTM D 3034 SDR 35
Ductile Iron	ANSI/AWWA C151/A21.51, AWWA C116 ceramic epoxy lined Class 50
High Density Polyethylene Pipe (HDPE)	ASTM D3350 SDR 9 Force Mains ASTM D3350 SDR 11 Gravity Sewer
Cast in Place Pipe (CIPP)	ASTM F1216 or ASTM F1743
Polyvinyl Chloride (PVC) pressure pipe C-900 (4" – 12" diameter) C-905 (12" – 24" diameter)	ANSI/AWWA C-900 & C-905, DR 18

In general, ductile iron shall be used:

1. When cover is less than 3 feet
2. When depth exceeds 16 feet
3. Through casing pipes

C900 or C905 may be used at depths between 3.0' and 16' of cover.

HDPE pipe may be used:

1. In areas of fill
2. For sewer force mains
3. Steep slopes
4. Stream crossings
5. Within casings

CIPP may be used for rehabilitating existing sewer lines if the sewer line will not be upsized in the future and upon approval by the Director.

Force mains shall be lined with Protecto 401 ceramic epoxy or an approved equal lining, restrained joint Ductile Iron (Class 53), or High Density Polyethylene (HDPE) SDR 9. Testing of force mains shall be in accordance with pressure testing for water mains.

6.5.2 Manholes

Manholes shall be constructed of pre-cast units, in accordance with Standard Plans.

Joints between pre-cast manhole sections shall be rubber gasketed conforming to ASTM C443.

All pre-cast concrete shall be Class 4000. Manhole channels shall be Class 3000 concrete. Concrete blocks or concrete (masonry) rings may be used for adjustment of the casting to final street grade. No wood or other deleterious material shall be used for permanent casting adjustment.

Standard precast riser sections shall consist of circular sections in standard nominal inside diameter of 48 inches and shall be in accordance with ASTM C478. Minimum height of a riser section shall be 1 foot. The base sections and risers shall be arranged so no pipes pass through manhole joints.

Standard precast cones shall provide reduction from 48 inches to 24 inches with height of not less than 18 inches and from 54 inches to 24 inches with height of not less than 24 inches.

Use of standard flat slab covers is discouraged.

All manholes over three feet in height shall be provided with steps as specified in Standard Plan No. 606. Polypropylene steps shall be made of copolymer polypropylene superior in its resistance to corrosiveness meeting the requirements of ASTM D4101

and shall completely encapsulate a deformed 1/2-inch steel reinforcing rod, conforming to ASTM A615, Grade 60. Steps shall be Lane International Corporation Manhole Step, or approved equal. Polypropylene steps shall be factory installed in complete accordance with the manufacturer's instructions. This shall be accomplished by pre-drilling two parallel 1-inch holes, 3-3/4 inch deep and 12 inches on center in the cured concrete base, riser and taper sections of the manhole. The insertion ends of the step shall be fully coated with non-shrink epoxy grout then driven into the holes to the prescribed depth. In no case shall the pre-driven hole be allowed to penetrate through the wall of the manhole section.

6.5.3 Cleanouts (Standard Plan No. 611)

Cleanouts, their pipe and fittings shall be the same gasketed material as the sewer pipe.

Cleanout frame and cover shall be locking type and made of superior quality cast iron. The iron shall be of such character as to make castings that will be tough, strong, sound and of even grain and shall conform to the requirements of ASTM Designation A48, Class 30. Cleanout frames and covers shall be of uniform quality, free from blow holes, porosity shrinkage, distortion, cavities, cracks or other defects. They shall be smooth and well cleaned and continuously machined to prevent rocking and rattling. Welded or caulked repairs shall not be permitted. Covers shall be easily removable.

6.5.4 Joints

Joint material shall meet the recommendations of the pipe or manhole manufacturer.

Where joints must be made between pipes with a mismatched wall thickness, the developer shall use flexible gasketed coupling, adapter or coupling-adapter to make a watertight joint. Couplings shall be those manufactured by "Romac", "Smith Blair", or approved equal for reinforced pipes and strongback "Fernco" or approved equal for non-reinforced pipes.

Flexible pipe-to-manhole connectors shall conform to the requirements of ASTM C923.

6.6 SEWER ACCEPTANCE

6.6.1 Cleaning

The developer is required to clean and flush the new sewer prior to testing. The flushing shall be accomplished using a jetting device sufficient to develop cleansing velocities in the pipe barrel. The flushing water shall not be allowed to enter the existing sewer system and shall be removed from the new sewer by vacuum-type equipment.

6.6.2 Testing

All sanitary sewer main installations shall be tested in accordance with Section 7-17.3(2) of the WSDOT Standard Specifications. An infiltration test is required for sewer pipe installed within the ground water table.

All side sewer installations shall be tested using either air or water for a 15-minute duration with no loss. An inflatable rubber ball shall be installed at the test tee or property line clean out. If water is used, the line shall be filled with clean water to the building clean out and achieve a hydrostatic head of at least 6 feet above the side sewer pipe.

6.6.3 Television Inspection

Final acceptance of the project or release maintenance and performance bonds will not be issued until sewer is inspected by Closed Circuit Television (CCTV) camera and footage is provided to the Director in DVD or other approved electronic media format.

The CCTV camera must have zoom capability and a swivel head lens capable of turning and rotating 180 degrees to provide inspection of lateral connections. Each individual sewer main inspection, from manhole to manhole, must be recorded on one digital file. The Director will accept multiple digital files for a single pipe only when the pipe reach cannot be recorded to one digital file due to extreme pipe length or obstructions in the pipe. The Director will not accept multiple storm main inspections recorded on a single digital file.

Dirty, blurry, foggy, submerged, or otherwise non-viewable inspections will not be accepted.

Prior to performing CCTV inspection, the Developer must have completed the manhole channeling, grouting, and trench backfill.

At least two days prior to the inspection, the Developer must contact the city inspector when and which lines will be inspected. Immediately preceding the CCTV inspection, water with dye must be poured into the system until visually seen discharging from the lowest point to be inspected.

The information listed below must be electronically generated and displayed on the CCTV footage at the beginning of each inspection. This data must be continuously updated and displayed on the CCTV footage during the inspection.

1. Date of inspection
2. Construction company name
3. Operator name
4. Upstream catch basin number to downstream catch basin number
5. Direction of inspection (upstream or downstream)
6. Pipe material and size

A 1-inch ball must be placed immediately in front of the camera, mounted such that the ball is visible and contacts the pipe bottom at all times. CCTV inspection cannot be paused once it begins. Only continuous inspections are acceptable. Pipe joints, manholes, and side sewer connections must be thoroughly inspected by panning the entire connection, including manhole risers. Zooming inspection of all side sewer connections is required.

The Developer must bear all costs incurred in correcting any deficiencies found during the CCTV inspection, including the cost of any additional CCTV inspections that may be required to verify that deficiencies have been corrected.

6.6.4 Required Documentation

The following steps must be completed before the improvements will be accepted and performance bond released:

1. All easements must be reviewed, approved, and recorded.
2. The City construction inspector must have received, reviewed, and approved the record drawings.
3. The City construction inspector must have received, reviewed, and approved the sanitary sewer Closed Circuit Television Inspection.
4. Receipt of a satisfactory maintenance bond.
5. Bill of Sale

Upon completion of the work, the developer shall be required to furnish the Director with a written guarantee (financial security) covering all materials and workmanship for a period of two years after the date of final acceptance, or recording of the final plat, whichever comes later, and the developer shall make all necessary repairs during that period at his own expense if such repairs are necessitated as the result of furnishing poor materials and/or workmanship.

The Developer shall provide the City with a Bill of Sale for all portions of the system that will become the property of the City.

APPENDIX A – SEWER CONSTRUCTION NOTES

The following standard notes are required on all Sanitary Sewer Plans:

- A. All work and materials shall conform to the City of Monroe Public Works Design, Construction and Operations Standards, and the Washington State Standard Specifications for Road, Bridge, and Municipal Construction, and the latest issue or revision of the Criteria for Sewage Work Design (Orange Book) published by the Washington State Department of Ecology.
- B. All approvals and permits required shall be obtained by the developer prior to the start of construction.
- C. A preconstruction meeting shall be held with the City of Monroe Public Works Department prior to the start of construction.
- D. It is the responsibility of the developer to have a copy of the approved plans at the construction site at all times.
- E. Any changes to the design shall first be reviewed and approved by the Director.
- F. All sewer mains shall be staked in the field under the supervision of a licensed land surveyor.
- G. Approximate locations of existing utilities have been obtained from available records and are shown for convenience. The developer shall be responsible for verification of locations and to avoid damage to any additional utilities not shown. If conflicts with existing utilities arise during construction, the developer shall notify the public works inspector and any changes required shall be approved by the Director prior to commencement of related construction on the project.
- H. Sewer main crossings with other utilities must be installed to provide a minimum of one (1) foot separation, measured at the two closest edges of the pipes, unless otherwise approved by the Director. For crossings with potable water lines, the sewer crossing shall conform to the requirements found in the Criteria for Sewage Works Design, Section C1-9.
- I. The city inspector shall be contacted a minimum of 48 hours to schedule a tap or connection to an existing sanitary sewer main. The inspector shall be present at the time of the tap or connection.
- J. Precast manholes shall meet the requirements of ASTM C 478, and shall be Type I – 48” nominal inside diameter unless otherwise noted on the plans. Joints shall be rubber gasketed conforming to ASTM C 443 and shall be grouted from the inside. Lift holes shall be grouted from the outside and inside of the manhole.
- K. The manhole ladder and cone must be rotated so the lid is outside of the roadway wheel path and the ladder is not over manhole channel.
- L. Side sewer pipe shall be PVC ASTM 3034 SDR 35 with flexible gasketed joints. Side sewer connections shall be made by a tap to an existing main per the Standard Details, or a wye tee from a new main connected above the springline of the pipe. Straight tees are not permitted in new sewer main construction. Taps shall not protrude into the sewer main.
- M. No part of the sanitary sewer system shall be covered, concealed, or put into use until it has been tested, inspected, and approved by the city inspector.
- N. Side sewers shall be extended to the property line, or beyond the utility easement line, whichever is farther. Each side sewer shall have a 2” x 4” wood marker at the termination of the stub. The marker shall extend above the finish

grade, painted white and stenciled SEWER with 2" high lettering. Depth of bury shall be noted.

- O. All sewer main and laterals shall be cleaned and free from all silt, debris and staining prior to final inspection and pressure testing.
- P. Pre air pressure testing may be conducted as the developer desires, but final air pressure testing acceptance will not be approved until all dry utilities have been installed and backfilled. The sewer final inspection pressure test shall be conducted and approved prior to any street restoration.
- Q. Visual inspection shall include closed circuit television (CCTV). Prior to videoing of the main, water shall be flowed until it comes out the lowest portion of the system being videoed. A copy of the video shall be provided to the inspector in an approved media format. A paper copy of the video inspection noting any pipe bellies, joint deficiencies will also be required. The CCTV report and video must be reviewed and approved by the inspector before acceptance of the new sewer is given.

6.7 STANDARD SANITARY SEWER DRAWINGS

Drawing #	Description
601	Side Sewer
602	Gravity Sewer
603	Clean Out
604	Type I Manhole
605	Type II Manhole
606	Type III Manhole
607	Steps Ladder
608	Manhole Ring Cover
609	Inside Drop
610	Casing
611	Connection to Main
612	Saddle Manhole