

CHAPTER 6

SANITARY SEWER STANDARDS

6.1 GENERAL

- A. The standards established by this chapter are intended to represent the minimum standards for the design and construction of sanitary sewer facilities. Greater or lesser requirements may be mandated by the City due to localized conditions. Washington State Department of Ecology’s Design Standards shall also be employed by the City in its review and approval of system connections, extensions, and/or modifications.
- B. “Off-site” improvements are improvements to the utility infrastructure that are off the land or lot being developed which may be warranted based on (1) the existing condition and capacity of the existing sanitary infrastructure and, (2) impacts caused by the proposed development. These off-site improvements (in addition to “on-site” improvements as may be warranted) will be as determined by the Public Works Superintendent so as to reasonably mitigate impacts caused by development.
- C. All wastewater mains shall have a capacity at least 150% of the expected maximum size required for the development.
- D. All wastewater systems shall have telemetry satisfactory to the Public Works Superintendent on all associated lines, tanks, reservoirs, pumps, valves, vents, and associated vaults and buildings for sampling and monitoring those items such as essential chemistry, turbidity, pressure, levels, flow, and status, which may be required by the Public Works Superintendent.
- E. If a lot is to have a use on it which requires sewage disposal, the property owner or developer must install a connecting line to the City sewer line. The connecting line may require installation of “off-site” improvements.
- F. A building or structure requiring sewage disposal must be connected to a City sewer line before the completion of the construction of a building or structure.
- G. Each service (primary structure) shall have a separate lateral connecting it to the main and a separate clean out. If more than one primary structure is connected to the public sewer system by a single connection, a mutually beneficial easement must be granted to the respective properties over the shared portions of the connection, thus assuring that all properties involved will have perpetual use of

the side sewer. Provisions must also be made for maintenance and access for repair. The property owner must:

1. Record the easements(s) with the County Auditor; and
2. give a copy to the City.

6.2 DESIGN STANDARDS

The design of sanitary sewer systems shall be dependent on local site conditions. The design elements of sanitary sewer systems shall conform to minimum City Standards set forth in this Chapter.

- A. Detailed plans which provide the location, size, type and direction of flow of the proposed sewers and the connection with existing sewers shall be submitted for the City's review. These plans shall be separate from water plans.
- B. Project plans should have a horizontal scale of not more than 50 feet to the inch and a vertical scale of not more than 5 feet to the inch. Plan views shall be drawn to a corresponding horizontal scale. Plans and profiles shall show:
 1. Locations of streets, right-of-ways, existing utilities, and sewers;
 2. Ground surface, pipe type, class and size, manhole stationing, invert and surface elevation at each manhole, and grade of sewer between adjacent manholes. All manholes shall be numbered on the plans and correspondingly numbered on the profile. Where there is any question of the sewer being sufficiently deep to serve any residence, the elevation and location of the basement floor, if basements are served, shall be plotted on the profile of the sewer, which is to serve the house in question. The Developer shall state that all sewers are sufficiently deep to serve adjacent basements, except where otherwise noted on the plans;
 3. All known existing structures, both above and below ground, which might interfere with the proposed construction, particularly water mains, gas mains, storm drains, overhead and underground power lines, telephones lines, and television cables;
 4. All utility easements, including County recording numbers; and
 5. Details in scale drawings that clearly show special sewer joints and cross-sections, and sewer appurtenances such as manholes and related items and all other items as required by the City to clearly identify construction items, materials, and/or methods.

- C. Construction of new sewer systems or extensions of existing systems will be allowed only if the existing receiving system is capable of supporting the added hydraulic load. Sewers shall be extended to the far property line(s) to facilitate future extensions of same.
- D. Collection and interceptor sewers shall be designed and constructed for the ultimate development of the tributary areas.
- E. Sewer systems shall be designed and constructed to achieve total containment of sanitary wastes and maximum exclusion of infiltration and inflow.
- F. Computations and other data used for design of the sewer system shall be submitted to the City for approval.
- G. The sewage facilities shall be constructed in conformance with the current version of the Washington State Department of Transportation, Standard Specifications for Road, Bridge, & Municipal Construction, and current amendments thereto, State of Washington, revised as to form to make reference to Local Governments, and as modified by any special City requirements and standards.
- H. Material and installation specifications shall contain appropriate requirements that have been established by the industry in its technical publications, such as ASTM, AWWA, WPCF, UPC and APWA standards. Requirements shall be set forth in the specifications for the pipe and methods of bedding and backfilling so as not to damage the pipe or its joints, impede cleaning operations and future tapping, nor create excessive side fill pressure or ovalation of the pipe, nor seriously impair flow capacity.
- I. All sewers shall be designed to prevent damage from superimposed loads. Proper allowance for loads on the sewer because of the width and depth of trench should be made. When standard-strength sewer pipe is not sufficient, extra-strength pipe shall be used.
- J. All pipe shall be laid in straight lines and at uniform rate of grade between manholes. Variance from established line and grade shall not be greater than one-half inch (1/2"), provided that such variation does not result in a level of reverse sloping invert; provided, also, that variation in the invert elevation between adjoining ends of pipe, due to non-concentricity of joining surface and pipe interior surfaces, does not exceed one-sixty-fourth inch (1/64") per inch of pipe diameter, or one-half inch (1/2") maximum. Any corrections required in line and grade shall be reviewed with the City and/or the Public Works Superintendent and shall be made at the expense of the Developer and/or Contractor.

- K. Deflection tests shall be performed on all PVC sewer mains and the deflection test limit shall be 5.0 percent of the base inside diameter of the pipe.
- L. Prior to final inspection, all pipelines shall be tested, flushed and cleaned and all debris removed. A pipeline “cleaning ball” of the proper diameter for each size of pipe shall be flushed through all pipelines prior to final inspection. Hydrant meters shall be acquired (deposit required) from the City and utilized by the Contractor for all water withdrawn from the City of Ilwaco system for flushing purposes.
- M. Before sewer lines are accepted, the Contractor/Developer shall perform a complete televised inspection of the sewer pipe and appurtenances and shall provide to the City an audio-visual tape recording of these inspections. All equipment and materials shall be compatible with existing City equipment. It shall be the Contractor/Developer’s responsibility to confirm equipment compatibility with the City prior to inspection.
- N. At all times during the televised inspection process, the City’s Utility Superintendent and/or his designated representative shall be present. The City’s Public Works Superintendent shall be notified forty-eight (48) hours prior to any televised inspection.
- O. After all other work is completed and before final acceptance, the entire roadway, including the roadbed, planting, sidewalk areas, shoulders, driveways, alley and side street approaches, slopes, ditches, utility trenches, and construction areas shall be neatly finished to the lines, grades and cross sections for a new roadway consistent with the original section.
- P. The Developer shall be required, upon completion of the work and prior to acceptance by the City, to furnish the City with a written guarantee covering all material and workmanship for a period of two years after the date of final acceptance 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 obtain warranties from the contractors, subcontractors and suppliers of material or equipment where such warranties are required, and shall deliver copies to the City upon completion of the work.

6.3 GENERAL REQUIREMENTS

- A. Prior to construction, the sewer plans shall be reviewed and approved by the Department of Ecology and an affidavit stating such be on file at the City’s Public Works Department.

- B. Prior to construction, the Contractor shall notify the City for a pre-construction meeting.
- C. Work shall be performed only by licensed and bonded contractors with a demonstrated experienced in laying public sewer mains of the type being proposed for construction.
- D. Prior to any work being performed, the Contractor shall contact the Public Works Superintendent and provide the Public Works Superintendent with the Contractor's construction schedule. The Contractor will submit changes in the construction schedule to the Public Works Superintendent in a timely manner.
- E. The Contractor shall obtain approval of materials to be used from the City prior to ordering or delivery of materials.
- F. Sewer mains shall be laid only in dedicated street right-of-way or easements shown on preliminary plats or which have been exclusively granted to the City. A street is normally not officially recognized until the plat, which created it has been filed (recorded) with the County Auditor.
- G. Sewer mains shall run parallel to and 5 feet southerly or westerly of street centerline where possible. Sewer mains shall maintain a minimum 10 foot horizontal separation from proposed or existing water mains.
- H. The maximum distance between manholes shall be 400 feet unless specifically approved otherwise by the Public Works Superintendent.
- I. All pipe shall have a minimum of thirty six (36) inches of cover (18" in the case of a side sewer on private property). The City reserves the right to require a minimum of three feet of cover unless topography, existing facilities or other future improvements prohibit this minimum cover for installation.
- J. The minimum slope for 8" gravity mains shall be 0.5% (except the minimum slope for dead end runs shall be 1.0% for 8" gravity mains) and the minimum slope for 6" side sewer laterals shall be 2.0%.
- K. All side sewer laterals, a sewer that has no other common sewers discharging to it, shall be of the same material as the main line. A side sewer lateral will be connected at the downstream end to a City operated sewer main. The side sewer lateral terminates at a private property or easement line. A private side sewer lateral continues from the termination of the side sewer lateral to the point of connection to a single residence or commercial building.

- L. Each side sewer lateral shall be equipped with a 6" x 6" tee, with an approved water-tight cap, located adjacent to, but within, the public right-of-way, to be utilized as a clean-out. When required by either the City's Inspector or Public Works Superintendent, a watertight six-inch capped stub shall be installed which extends vertically from the 6" x 6" tee to within 18 inches of finished grade.
- M. Each side sewer lateral shall have an approved water-tight cap at the termination of the stub. The cap shall be adequately "blocked" to satisfactorily resist air pressure testing.
- N. Each side sewer lateral shall have a twelve (12) foot long 2" x 4" wood "marker" at the termination of the stub. The "marker" shall extend from the bottom of the trench to above finished grade. Above the ground surface, it shall be painted "white" with "S/S" and the depth, in feet, stenciled in black letters 2" high.
- O. Front lot corners shall be staked by a surveyor prior to construction for side sewer tee location(s).
- P. Side sewers shall generally be located at the lowest property corner and located a minimum of 10 feet from the side lot line and extend a minimum of 10 feet past the street right-of-way line (or property line).
- Q. Side sewer connections if allowed directly into manholes shall be constructed to match the sewer main crown (outlet) and the manhole channeled accordingly.
- R. Manholes, where sewer extension may occur, shall be provided with knock-outs and channeled accordingly.
- S. Manholes shall be provided with a 0.10 foot drop across the channel. Pre-channeled manholes are not allowed.
- T. Locking lids shall be provided for all manholes located outside pavement areas and all manhole lids shall have the word "sewer" cast integrally onto its surface. See Standard Details, attached hereto and incorporated herein for all purposes.
- U. Concrete collars shall be placed around all frames per the Standard Details for manholes located in non-paved areas.
- V. Pipe connections to manholes shall be as follows:
 - 1. PVC Pipe - Cast or grout a watertight manhole coupling (see detail) into manhole wall.
 - 2. D.I. Pipe - Both bell and spigot joints and flexible couplings shall be 12"

maximum distance from manhole wall.

3. PVC and D.I. pipe, optional - Core the manhole and connect sewer pipe with a water-tight flexible rubber boot in manhole wall, Kor-N-Seal boot or equal.
- W. Provide the Public Works Superintendent and City Inspector a copy of the cut sheets prior to construction.
- X. Pipe trenches shall not be backfilled until pipe and bedding installation have been inspected and approved by the City's Inspector.
- Y. Final air testing shall not be accepted until after the finished paving is accomplished, all other underground utilities have been installed, and the lines have been flushed, cleaned, and deflection tested.
- Z. Manhole rim and invert elevations shall be field verified after construction by the Developer's engineer(s) and the "record" drawings individually stamped by a Washington State licensed professional engineer or surveyor who shall attest to the fact that the information is correct.
- AA. All commercial, industrial, or school food establishments shall be equipped with an approved grease interceptor. The grease interceptor shall be located to facilitate inspection and maintenance.

6.4 MATERIALS AND TESTING

- A. Sewer Mains, Laterals and Force Mains
 1. Sewer mains to be installed shall be of material noted below:
 - a. Gravity Sewer and Laterals:
 1. PVC Pipe 3'-25' Cover
 2. DI Pipe (Class 52) <3' cover; 25' and over cover or slopes of 18 percent or greater
 3. HDPE - 3' - 25' Cover
 - b. Force Main:
 1. DI Pipe Class 52
 2. HDPE (SDR 9 - minimum)
 2. Gravity PVC pipe (15" diameter and smaller) shall be a minimum Class SDR 35 and be manufactured in accordance with ASTM D3034. The pipe and fittings shall be furnished with bells and spigots, which are integral with the pipe wall. Pipe joints shall use flexible elastomeric gaskets

conforming to ASTM D3212. Nominal laying lengths shall be 20 feet and 13 feet.

4. The ductile iron pipe shall conform to ANSI/AWWA C151/A21.51-91 Standards, and current amendments thereto, except the ductile iron pipe shall be thickness Class 52 for gravity sewers and Class 52 for force mains. Grade of iron shall be a minimum of 60-42-10. The pipe shall be cement lined to a minimum thickness of 1/16", and the exterior shall be coated with an asphaltic coating. Each length shall be plainly marked with the manufacturer's identification, year case, thickness, class of pipe and weight.
5. HDPE pipe shall manufactured in accordance with ASTM D3035 for gravity sewers and AWWA C901/C906 for pressure sewers.
6. Type of joint shall be mechanical joint or push-on type, employing a single gasket, such as "Tyton", except where otherwise calling for flanged ends. Bolts furnished for mechanical joint pipe and fittings shall be high strength ductile iron, with a minimum tensile strength of 50,000 psi.
7. Restrained joint pipe, where required shall be push-on joint pipe with "Fast Tight" gaskets as furnished by U.S. Pipe or equal for 12" diameter and smaller pipe and "TR FLEX" as furnished by U.S. Pipe or equal for 16" and 24" diameter pipes. Mechanical joint pipe with retainer glands (grip rings) as manufactured by "Romac" may also be required at the discretion of the City. The restrained joint pipe shall meet all other requirements of the non-restrained pipe.
8. All pipe shall be jointed by the manufacturer's standard coupling, be all of one manufacturer, be carefully installed in complete compliance with the manufacturer's recommendations.
9. All fittings shall be short-bodied, ductile iron complying with applicable ANSI/AWWA C110 or C153 Standards for 350 psi pressure rating for mechanical joint fittings and 250 psi pressure rating for flanged fittings. All fittings shall be lined and either mechanical joint or flanged, as indicated on the Plans.
10. Fittings in areas shown on the Plans for restrained joints shall be mechanical joint fittings with a mechanical joint restraint device. The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1 and shall be EBAA Iron, Inc., MEGALUG, or ROMAC "Grip Ring", as required and approved by the Public Works Superintendent.

11. All couplings shall be ductile iron mechanical joint sleeves.
12. The sewer pipe, unless otherwise approved by the Public Works Superintendent, shall be laid upgrade from point of connection on the existing sewer or from a designated starting point. The sewer pipe shall be installed with the bell end forward or upgrade. When pipe laying is not in progress, the forward end of the pipe shall be kept tightly closed with an approved temporary plug. Wherever movable shoring (steel box) is used in the ditch, pipe shall be restrained by use of a winch mounted in the downstream manhole and a line of sufficient strength threaded through the pipe and set tight before each move. Any indication that joints are not being held shall be sufficient reason for the City to require restraints, whether or not movable shoring is being used.
13. All pipe shall be laid in straight lines and at uniform rate of grade between manholes. Variance from established line and grade shall not be greater than one-half inch (1/2"), provided that such variation does not result in a level of reverse sloping invert; provided, also, that variation in the invert elevation between adjoining ends of pipe, due to non-concentricity of joining surface and pipe interior surfaces, does not exceed one-sixty-fourth inch (1/64") per inch of pipe diameter, or one-half inch (1/2") maximum. Any corrections required in line and grade shall be reviewed with the Public Works Superintendent and shall be made at the expense of the Developer.
14. All extensions, additions and revisions to the sewer system, unless otherwise indicated, shall be made with sewer pipe jointed by means of a flexible gasket, which shall be fabricated and installed in accordance with the manufacturer's specifications.
15. All joints shall be made up in strict compliance with the manufacturer's recommendations and all sewer pipe manufacture and handling shall meet or exceed the ASTM and CPAW recommended specifications, current revisions.
16. 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, relubricated if required, and replaced before the rejoining is attempted.
17. Care shall be taken to properly align the pipe before joints are entirely forced home. During insertion of the tongue or spigot, the pipe shall be partially

supported by hand, sling or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned. Since most flexible gasketed joints tend to creep apart when the end pipe is deflected and straightened, such movement shall be held to a minimum once the joint is home.

18. Sufficient pressure shall be applied in making the joint to assure that it is home, as described in the installation instructions provided by the pipe manufacturer. Sufficient restraint shall be applied to the line to assure that joints once home are held so, until fill material under and alongside the pipe has been sufficiently compacted. Great care shall be exercised when dragging a trench box up or down trench after backfilling to avoid dragging the pipe. Such dragging can result in joint separation. At the end of the work day, the last pipe laid shall be blocked in an effective way to prevent creep during “down time.”
19. For the joining of dissimilar pipes suitable adapter couplings shall be used which have been approved by the City Inspector and/or the Public Works Superintendent
20. All gravity sewer pipe shall be bedded with pea gravel. The PVC pipe shall be bedded from a depth of four (4) inches below the pipe to eight (8) inches above the pipe and ductile iron gravity sewer pipe shall be bedded from a depth of four (4) inches below the pipe to the springline of the pipe. The bedding material shall extend across the full width of the trench and shall be compacted under the haunches of the pipe.
21. Special concrete bedding shall consist of a pipe cradle constructed of Portland cement concrete containing not less than four (4) sacks of cement per cubic yard. Sand, gravel and water proportions are subject to approval by the Engineer. Maximum aggregate size shall be 1-1/2”. Maximum slump shall be 4”. The bottom of the trench shall be fully compacted before the placement of pipe cradle. The Contractor shall protect pipe against flotation and disturbing the horizontal alignment of the pipe during the pouring of the concrete. (Washington State Department of Transportation Standard Specifications for “Class A” concrete bedding will be acceptable.)
22. Clay or Controlled Density Fill (CDF) dams shall be installed across the trench and to the full depth of the granular material in all areas of steep slopes, stream crossings and wetland to prevent migration of water along the pipeline.

23. All backfill shall be placed and compacted in accordance with City, County, or State requirements as may be applicable and copies of the compaction results shall be provided to the Public Works Superintendent.

B. Manholes

1. Manholes shall be of the offset type and shall be precast concrete sections with either a cast in place base, or a precast base made from a 3,000 psi structural concrete. Joints between precast wall sections shall be confined O-ring or as otherwise specified.
2. For connections to existing systems, a concrete coring machine, suitable for this type of work, shall be utilized in making the connection. The existing manhole shall be rechanneled as required. The new pipe connection shall be plugged (water tight) until the new pipe system has been installed and approved. The Contractor shall be responsible for any existing defects in the existing manhole unless these defects are witnessed by a representative of the City prior to any work being performed to make the connection. The Contractor shall be required to remove any and all deleterious material in the existing manhole and downstream reaches as a result of his/her work.
3. The minimum diameter manhole shall be 48 inches to a depth of 20 feet, and 54 inches for a depth greater than 20 feet. The City may require an increased manhole diameter for future connections.
 - a. Manhole sections shall be placed and aligned so as to provide vertical sides and vertical alignment of the ladder steps. The completed manhole shall be rigid, true to dimension, and be water tight. Rough, uneven surfaces will not be permitted.
 - b. The mortar used between the joints in the precast sections and for laying manhole adjusting bricks shall be composed of epoxy grout. All joints and pick holes shall be wetted and completely filled with grout, smoothed both inside and outside to insure water tightness.
 - c. Masonry units (manhole adjusting brick) shall conform to the ASTM C-32, Grade MA. The outside and inside of manhole adjusting bricks and the joints of precast concrete sections shall be plastered and troweled smooth with 1/2" (minimum) of mortar in order to attain a watertight surface.
 - d. Manhole steps shall be polypropylene, Lane International Corp. No. P13938 or equal. Ladders (maximum 3 foot length) shall be

polypropylene Lane International Corp. or equal, and shall be compatible with steps.

- e. Grade Adjustment. Where work is located in public right of way, not less than 18” or more than 26” shall be provided between the top of the cone or slab and the top of the manhole frame.
- f. Channels shall be field poured and made to conform accurately to the sewer grade and shall be brought together smoothly with well rounded junctions, satisfactory to the City Inspector. The channels shall be field poured after the inlet and outlet pipes have been laid and firmly grouted into place at the proper elevation. Allowances shall be made for a one-tenth foot (0.1’) drop in elevation across the manhole in the direction of flow. Channel sides shall be carried up vertically from the invert to three-quarters of the diameter of the various pipes. The concrete shelf shall be warped evenly and sloped 3/8” per foot to drain. Rough, uneven surfaces will not be permitted. Channels shall be constructed to allow the installation and use of a mechanical plug or flow meter of the appropriate size.
- g. Drop manholes shall, in all respects, be constructed as a standard manhole with the exception of the drop connection as further detailed herein.
- h. All lift holes shall be completely filled with expanding mortar, smoothed both inside and outside, to insure water tightness.
- i. All steel loops shall be removed, flush with the manhole wall. The stubs shall be covered with mortar and smoothed. Rough, uneven surfaces will not be permitted.
- j. Frames and covers shall be ductile iron. Castings shall be free of porosity, shrink cavities, cold shuts or cracks, or any surface defects which would impair serviceability. Repair of defects by welding, or by the use of “smooth-on” or similar material, will not be permitted. Frames and covers shall be machine finished or ground on seating surfaces so as to assure non-rocking fit in any position and interchangeability of covers. Frames and covers shall be provided with three bolt locking lids. Rings and covers shall be positioned so one of the three locking bolts is located over the manhole steps and shall be adjusted to conform to the final finished surface grade of the street or easement to the satisfaction of the City or agent for the City. Manhole frames and covers shall be as

manufactured by “Sather” Manufacturing Company, Model No. 6024-R, or City approved equal.

C. Side Sewer Laterals

1. A side sewer lateral is considered to be that portion of a sewer line that will be constructed between a main sewer line and a property line or easement limit line.
2. All applicable specifications given herein for sewer construction shall be held to apply to side sewer laterals.
3. Side sewers shall be for a single connection only and be a minimum six inch (6”) diameter pipe. Side sewers shall be connected to the tee, provided in the sewer main where such is available, utilizing approved fittings or adapters. The side sewer shall rise at a maximum of 45° and a minimum of 2%, from the sewer main.
4. Where there are no basements, the minimum side sewer depth shall be six (6) feet below existing curb line and five (5) feet below ground at the property line, except where existing improvements, proposed improvements or topography may dictate additional depth. The elevations of the side sewer connections shall be of sufficient depth to serve all existing and potential future basements.
5. The Contractor shall provide for each 6 inch side sewer service a twelve (12) foot long 2 inch x 4 inch wooden post which extends from the invert of the end of the 6 inch pipe to above the existing ground. The exposed area of this post shall be painted white and shall have selected thereon in two inch letters (black paint) “S/S” and shall also indicate the depth of the sewer service stub from finished grade.
6. Where no tee or wye is provided or available, connection shall be made by machine-made tap and saddle, only with specific written authorization of the City. The City shall review the exact location and material, list in its evaluation.
7. The maximum bend permissible at any one fitting shall not exceed forty-five degrees (45°). The maximum bend of any combination of two adjacent fittings shall not exceed 45° unless straight pipe of not less than three (3) feet in length is installed between such adjacent fittings, or unless one of the fittings is a wye branch with a cleanout provided on the straight leg.

D. Private Side Sewers

1. Private side sewers are the extension of side sewer laterals located outside of the public rights-of-way or easements granted to the City of Ilwaco.
2. Side sewer pipe located on private property shall be 4” (larger if specifically approved by the City), ductile iron or PVC ASTM D3034 pipe, and shall be installed at a 2% minimum grade (1/4 inch fall per foot). Construction on private property may be performed by owner, but requires a permit and approval by the City.
3. Pipe shall be bedded with pea gravel or clean free draining sand.
4. Six inch sewer pipe is required in the street right-of-way and shall have a 2% minimum grade. Construction in street rights-of-way shall be performed by a licensed side sewer contractor and requires a permit.
5. Side sewer shall be inspected by the City Inspector and/or Public Works Superintendent prior to backfilling. Side sewer shall be plugged and tested in the presence of the City Inspector by filling with water. Leakage rate shall not exceed 0.31 gal./hr. for 4 inch pipe and 0.47 gal./hr. for 6 inch pipe, per 100 feet of pipe.
6. On private property, minimum cover shall be 18” over top of pipe from the point, which is 30” out from house and continuing to the connection with the City’s sewer system.
7. Parallel water and sewer lines shall be a minimum of 10 feet apart horizontally wherever possible and have a vertical separation of at least 18” if a vertical crossing is necessary.
8. No more than 100 feet is allowed between cleanouts. Cleanouts are required for bends equal to or greater than 45°. Cleanout shall be a watertight plugged gasketed tee or wye lateral.
9. All pipe joints shall be rubber gasket type.
10. Provide “grease trap” of a size and type approved by the City at all such locations as may be deemed necessary by the City.

E. Testing Gravity Sewers for Acceptance

1. The Contractor and/or Developer shall furnish all facilities and personnel for conducting tests under the observation of the Public Works

Superintendent and/or City Inspector. Methods other than Part “B” shall be subject to the approval of the Public Works Superintendent.

2. By way of preparation for testing for leakage, the Contractor and/or Developer shall be required, prior to testing, to clean and flush all gravity sewer lines with an approved cleaning ball and clean water. The completed gravity sewer, including side sewer stubs, after completion of backfill and cleaning shall be televised inspected. This will be permitted prior to paving.
3. The sewer shall then be tested by the low pressure air test method and/or an infiltration test but only after all utilities are installed and the project paved. Except, however, that in certain conditions an exfiltration test may be required by the Public Works Superintendent.
4. The first section of pipe not less than 300’ in length installed by each crew shall be tested, in order to qualify the crew and/or the material. A successful installation of this first section shall be a prerequisite to further pipe installation by the crew. At the Contractor’s option, crew and/or material qualification testing may be performed at any time during the construction process after at least two (2) feet of backfill has been placed over the pipe.
5. Before the test is performed, the pipe installation shall be cleaned. The Contractor shall furnish an inflatable diagonally ribbed rubber ball of a size that will inflate to fit snugly into the pipe to be tested. The ball may, at the option of the Contractor, be used without a tag line, or a rope or cord may be fastened to the ball to enable the Contractor to know and control its position at all times. The ball shall be placed in the last cleanout, or manhole on the pipe to be cleaned, and water shall be introduced behind it.
6. The ball shall pass through the pipe with only the pressure of the water impelling it. All debris flushed out ahead of the ball shall be removed at the first manhole where its presence is noted. In the event cemented or wedged debris or a damaged pipe shall stop the ball, the Contractor and/or Developer shall remove the obstruction, and/or repair any damaged pipe. All visible leaks showing flowing water in pipelines or manholes shall be stopped even if the test results fall within the allowable leakage. The cleaning shall be carried out in such a manner to not infiltrate existing facilities. Precautions shall be taken to prevent any damage caused by cleaning and testing. Any damage resulting shall be repaired by the Contractor and/or Developer at his own expense. The manner and time of testing shall be subject to approval of the Public Works Superintendent.

7. Deflection tests shall be performed on all PVC gravity sewer mains by pulling a mandrel through the pipe and the deflection test limit shall be 5.0 percent of the base inside diameter or for example 7.28 inches for 8-inch diameter pipe. The sewer lines shall be thoroughly cleaned prior to the deflection test.

8. The sewer pipe shall be air tested for leaks in the following manner (unless the method in paragraph 9 and 10 below is approved):
 - a. Immediately following the pipe cleaning and televised inspection, the pipe installation shall be tested with low pressure air. Air shall be slowly supplied to the plugged pipe installation until the internal air pressure reaches 4.0 pounds per square inch greater than the average back pressure of any ground water that may submerge the pipe. At least two minutes shall be allowed for temperature stabilization before proceeding further.

 - b. The rate of air loss shall then be determined by measuring the time interval required for the internal pressure to decrease from 3.5 to 2.5 pounds per square inch greater than the pipe section's average adjacent groundwater back pressure.

 - c. The pipeline shall be considered acceptable, when tested at an average pressure of 3.0 pounds per square inch greater than the pipe section's adjacent groundwater back pressure if the total time of air loss from any section tested in its entirety between manholes, cleanouts or pipe ends does not exceed the following table:

AIR TESTING PERFORMANCE
(Test time in minutes and seconds)

| Length of 8" Pipe (ft) | Length of 6" Pipe (ft) | | | | | | | | |
|------------------------|------------------------|------|------|------|------|------|------|------|------|
| | 0 | 50 | 100 | 150 | 200 | 250 | 300 | 350 | 400 |
| 0 | 0 | 0:40 | 1:20 | 1:58 | 2:38 | 3:18 | 3:58 | 4:38 | 5:16 |
| 50 | 1:10 | 1:50 | 2:30 | 3:10 | 3:48 | 4:28 | 5:08 | 5:48 | 5:56 |
| 100 | 2:20 | 3:00 | 3:40 | 4:20 | 5:00 | 5:38 | 6:14 | 6:12 | 6:08 |
| 150 | 3:32 | 4:10 | 4:50 | 5:30 | 6:10 | 6:30 | 6:26 | 6:22 | 6:18 |
| 200 | 4:42 | 5:22 | 6:00 | 6:40 | 6:44 | 6:38 | 6:34 | 6:30 | 6:26 |
| 250 | 5:52 | 6:32 | 6:48 | 6:58 | 6:50 | 6:44 | 6:40 | 6:36 | 6:32 |
| 300 | 7:02 | 7:20 | 7:10 | 7:02 | 6:56 | 6:50 | 6:44 | 6:40 | 6:36 |
| 350 | 7:34 | 7:22 | 7:14 | 7:06 | 7:00 | 6:54 | 6:50 | 6:44 | 6:42 |
| 400 | 7:34 | 7:24 | 7:16 | 7:08 | 7:02 | 6:58 | 6:52 | 6:48 | 6:44 |

- d. Test times will be provided by the Public Works Superintendent upon request for combinations other than 8-inch mains and 6-inch laterals.
 - e. If the pipe installation fails to meet these requirements, the Developer and/or Contractor shall determine at his own expense the source or sources of leakage, and he shall repair (if the extent and type of repairs proposed by the Developer and/or Contractor appear reasonable to the Public Works Superintendent) or replace all defective materials or workmanship. The completed pipe installation shall meet the requirements of this low pressure air test or the alternative water exfiltration test before being considered for acceptance.
 - f. Plugs used to close the sewer pipe for the air test shall be securely braced to prevent the unintentional release of a plug which can become a high velocity projectile. Gauges, air piping manifolds and valves shall be located at the top of the ground. No one shall be permitted to enter a manhole where a plugged pipe is under pressure. Air testing apparatus shall be equipped with a pressure release device such as a rupture disk or a pressure relief valve designed to relieve pressure on the pipe under test at 6 psi.
9. Exfiltration Test (if approved by City)
- a. All pipe shall be cleaned before the exfiltration test. Prior to making exfiltration leakage tests, the Developer and/or Contractor may fill the pipe with clear water to permit normal absorption into the pipe walls; provided however, that after so filling the pipe he shall complete the leakage test within twenty-four (24) hours after filling.
 - b. Leakage shall be no more than 0.15 gallons per hour per inch of diameter per one hundred (100) feet of sewer pipe, with a minimum test pressure of six (6) feet of water column above the crown at the upper end of the pipe or above the active groundwater table, whichever is higher as determined by the City. The length of pipe tested shall be limited so that the pressure on the invert of the lower end of the section tested shall not exceed sixteen (16) feet of water column. For each increase in pressure of two (2) feet above a basic six (6) feet measured above the crown at the lower end of the test station, the allowable leakage shall be increased by 10 percent.

- c. The Developer and/or Contractor shall furnish all equipment, materials, and labor necessary for making test. The equipment shall be to the approval of the City Public Works Superintendent and/or City Engineer. The manner and time of testing shall be subject to approval of the Public Works Superintendent. It shall be the Developer's and/or Contractor's responsibility to determine the level of the water table at each manhole. If leakage exceeds the allowable amount, corrective measures shall be taken and the line then be retested to the satisfaction of the City's designated inspector.

10. Infiltration Test (if approved by City)

- a. Infiltration testing shall take place during jetting of backfill, except when the natural groundwater table is above the crown of the higher end of the test section.
- b. The maximum allowable limit for infiltration shall be 0.15 gallon per hour per inch of internal diameter per 100 feet of length with no allowance for external hydrostatic head.

F. Testing Force Main

- 1. The Developer and/or Contractor shall conduct preliminary tests to assure the section to be tested is in an acceptable condition before requesting the City Inspector and/or Public Works Superintendent to witness the test.
- 2. Final testing of all force mains shall be done tested prior to acceptance of work. All pumps, gauges, plugs, saddles, corporation stops, miscellaneous hose and piping, and measuring equipment necessary for performing the test shall be furnished, installed and operated by the Contractor. Feed for the pump shall be from a barrel or other container within the actual amount of "makeup" water, so that it can be measured periodically during the test period.
- 3. The pipeline shall be backfilled sufficiently to prevent movement of the pipe under pressure. All thrust blocks shall be in place and time allowed for the concrete to cure before testing. Where permanent blocking is not required, the Contractor shall furnish and install temporary blocking.
- 4. The pipeline shall be subjected to a pressure and leakage test of a minimum of 150 pounds per square inch for a period of not less than one (1) hour. The test pressure shall be applied at the low end of the section tested.

5. The quantity of water lost from the main shall not exceed the number of gallons per hour determined by the formula:

$$L = \frac{ND(P)^{0.5}}{7,400}$$

in which

L = Allowable leakage, gallons/hour

N = Number of joints in the length of pipeline tested

D = Nominal diameter of the pipe in inches

P = Average test pressure during the leakage test, psi

6. Defective materials or workmanship, discovered as a result of the tests, shall be replaced by the Contractor at the Contractor's expense. Whenever it is necessary to replace defective material or correct the workmanship, the tests shall be re-run at the Contractor's expense until a satisfactory test is obtained.
7. All fittings shall be blocked with concrete in order to prevent movement and separation of pipe joints. Timber will not be permitted as permanent blocking. Sufficient time shall be allowed for concrete to set before commencement of pressure tests. The type and size of blocks and anchors shall be in accordance with the standards set forth by the AWWA and designed by the Developer's engineer. **They shall be constructed to the minimum dimensional configuration as shown herein.** A visqueen barrier shall be provided to protect glands, bolts, and other miscellaneous materials required for this type of connection from the concrete.

6.5 VIDEO TAPING

After the gravity sewer lines have been cleaned, flushed and manhole channeled, the Developer shall provide a complete televised inspection.

The Developer shall perform a complete televised inspection of the sewer pipe and appurtenances and shall provide to the City, a DVD color audio-visual recording of the inspections together with a written log of the television inspection. The camera shall be a pan and tilt type equipped with adequate light and focusing to allow inspection of sewer main, side sewers and full circumference inspection of main line joints and fittings. The City shall determine if the quality of the televising is acceptable.

Immediately prior to the televised inspection, the Developer shall run water through each sewer line for 5- to 10-minutes to provide water for detection of any adverse grade sections visible by the presence of ponded water. The camera shall be stopped

periodically at the ponded areas and the depth of water shall be measured with a ball of known diameter on the pull line. During the inspection, all tees and other fittings shall be logged as to exact location within 1 percent maximum error in measurement, wherein accuracy is checked with various fittings and the terminating manhole.

The City shall be notified 48 hours prior to any television inspection and this work shall be performed on a schedule to allow the City to witness the inspection.

Any defects in material or installation identified by the television inspection shall be repaired as required by the City at the Developer's expense.

6.6 STATE HIGHWAY CROSSINGS

All state highway and stream crossings shall be encased with a steel casing or ductile iron or PVC sleeve, as approved by the City and prevailing regulatory agencies. The welded steel casing or sleeve shall be of sufficient diameter, size and strength to enclose the sewer pipe and to withstand maximum highway or railroad loading. Sizing and wall thickness of casing is subject to approval by the Public Works Superintendent. Sand backfill or grout fill between the casing and the sewer pipe shall be required. In order to prevent the sand from being washed from the casing the ends of the casing shall be bricked and cemented after installation, backfill and testing of the pipe are completed. The ductile iron sleeve shall be completed with restrained joints within the casing.

6.7 STAKING

- A. All surveying and staking shall be performed by an engineering or surveying firm employed by the Developer and which firm shall be capable of performing such work. The engineer or surveyor directing or performing such work shall be currently licensed by the State of Washington to perform said tasks.
- B. A preconstruction meeting shall be held with the City prior to commencing staking. All construction staking shall be inspected by the City prior to construction.
- C. The following minimum staking of sanitary sewer systems shall apply:
 - 1. Stake centerline alignment at a minimum of fifty foot intervals unless otherwise approved by the City;
 - 2. Stake location of all manholes and side sewer laterals for grade and alignment;
 - 3. Provide a copy of "cut sheets" to City inspector; and

4. Stake finished manhole rim elevation and invert elevations of all pipes in manholes.

6.8 TRENCH EXCAVATION

- A. Clearing and grubbing where required shall be performed within the easement or public right-of-way as permitted by the City and/or governing agencies. Debris resulting from the clearing and grubbing shall be disposed of by the owner or contractor in accordance with the terms of all applicable permits.
- B. Trenches shall be excavated to the line and depth as shown on the City approved drawings, or as otherwise designated in the field by the City Inspector so as to provide a City approved minimum depth of cover over the pipe. See Construction Details as applicable. Except for unusual circumstances, the trench sides shall be excavated vertically and the trench width shall be excavated only to such widths as are necessary for adequate working space as mandated by the regulatory agency and in compliance with all safety requirements of the prevailing agencies. The trench shall be kept free from water until joining is complete. Surface water shall be diverted so as not to enter the trench. The owner shall maintain sufficient pumping equipment on the job to insure that these provisions are carried out.
- C. The contractor shall perform all excavation of every description and whatever substance encountered and boulders, rocks, roots and other obstructions shall be entirely removed or cut out to the width of the trench and to a depth 6 inches below sewer line grade. Where materials are removed from below pipe grade, the trench shall be backfilled to grade with material satisfactory to the City and thoroughly compacted.
- D. Trenching and shoring operations shall not proceed more than 100 feet in advance of pipe lying without specific written approval of the City, and shall be in conformance with Washington Industrial Safety and Health Administration (WISHA) and Office of Safety and Health Administration (OSHA) Safety Standard.
- E. The bedding course shall be constructed to grade with hand tools in such a manner that the pipe will have bearing along the entire length of the barrel. The bell holes shall be excavated with hand tools to sufficient size to make up the joint.

6.9 BEDDING

- A. Gravel backfill for pipe bedding shall be installed in conformance with Section 2-09 of the Standard Specifications (WSDOT).
- B. Gravel backfill for rigid pipe bedding shall consist of crushed, processed, or naturally occurring granular material. It shall be essentially free from various

types of wood waste or other extraneous or objectionable materials. It shall have such characteristics of size and shape that it will compact readily and shall meet the following specifications for grading and quality:

| <u>Sieve Size</u> | <u>Percent Passing*</u> |
|-------------------|-------------------------|
| 3/4" Square | 100 |
| 3/8" Square | 95-100 |
| U.S. No. 8 | 0-10 |
| U.S. No. 200 | 0-3 |
| Sand Equivalent | 35 MIN. |

*All percentages are by weight.

- C. Gravel backfill for flexible pipe (P.V.C. pipe) bedding shall consist of crushed, processed, or naturally occurring granular material. It shall be essentially free from various types of wood waste or other extraneous or objectionable materials. It shall have such characteristics of size and shape that it will compact readily and shall meet the following specifications for grading and quality:

| <u>Sieve Size</u> | <u>Percent Passing*</u> |
|-------------------|-------------------------|
| 3/4" Square | 100 |
| 3/8" Square | 95-100 |
| U.S. No. 8 | 0-10 |
| U.S. No. 200 | 0-3 |
| Sand Equivalent | 35 MIN. |

*All percentages are by weight.

- D. Native Material shall not be used for bedding, unless approved by the Public Works Superintendent.

6.10 BACKFILLING

Backfilling and surface restoration shall closely follow installation of pipe so that not more than 100 feet is left exposed during construction hours without approval of the City. Selected backfill material shall be placed and compacted around and under the sewer pipe by hand tools. Special precautions shall be provided to protect the pipe to a point 12 inches above the crown of the pipe. The remaining backfill shall be compacted to 95 percent of the maximum density in traveled areas and road "prisms", 90 percent outside driveway, roadways, road prism, shoulders, parking or other traveled areas. Where governmental agencies other than the City have jurisdiction over roadways, the backfill and compaction shall be done to the satisfaction of the agency having jurisdiction. Typically, all utility

trenches located in roadway sections, roadway “prisms”, or beneath traffic bearing areas shall be backfilled with 5/8-inch minus crushed rock, or other City approved structural material. Due to localized conditions, the City may allow/permit the backfill of the trench section with suitable excavated material, as determined by the City Inspector, or if suitable native material is not available from trenching operations, the City may order the placing and compaction of gravel base conforming to Section 9-03.10 of the Standard Specifications (WSDOT) for backfilling the trench. All excess material shall be loaded and hauled to waste.

6.11 SANITARY SEWER LIFT STATIONS

- A. Lift stations and ancillary equipment shall not be constructed in City rights-of-way, unless otherwise approved by the City. The station site shall be paved and fenced and a dedicated access to the lift station provided with a minimum width of 20-feet.
- B. The Developer shall submit to the City for review and approval, complete sewage lift station plans and design which provide for the lift station, electrical service/controls and telemetry system, and auxiliary generator/transfer switch together with all accessories for a complete, automatically operating installation per Chapter 9. Odor control and/or corrosion control facilities may also be required.
- C. Design material and drawings shall provide all civil, mechanical and electrical details and align with all applicable codes and regulations, and good engineering practice. The Developer shall be required to acquire all permits and approvals for the installation/construction of this facility as required from regulatory agencies.

6.12 STREET PATCHING AND RESTORATION

See Chapter 4.15 and 4.16 for requirements regarding street patching and trench restoration.

6.13 EROSION CONTROL

- A. The detrimental effects of erosion and sedimentation shall be minimized.
 - 1. Soil shall be exposed for the shortest possible time;
 - 2. Reducing the velocity and controlling the flow of runoff;
 - 3. Detaining runoff on the site to trap sediment; and

4. Releasing runoff safely to downstream areas.
- B. The Developer and/or Contractor shall provide for erosion control by conducting work in workable units; minimizing the disturbance to cover crop materials; providing mulch and/or temporary cover crops, sedimentation basins, and/or diversions in critical areas during construction; controlling and conveying runoff; and establishing permanent vegetation and installing erosion control structures as soon as possible.
 - C. Trench mulching shall be used where there is danger of backfill material being washed away due to steepness of the slope along the direction of the trench. Backfill material shall be compacted and held in place by covering the disturbed area with straw and held with a covering of jute matting or wire mesh anchored in place.
 - D. Cover-Crop Seeding
 1. A cover crop shall be sown in all areas excavated or disturbed during construction that were not paved, landscaped and/or seeded prior to construction. Areas landscaped and/or seeded prior to construction shall be restored to their original or superior condition. Cover-crop seeding shall follow backfilling operations.
 2. The Developer and/or Contractor shall be responsible for protecting all areas from erosion until the cover crop affords such protection. The cover crop shall be re-seeded if required and additional measures taken to provide protection from erosion until the cover crop is capable of providing protection.
 3. During winter months, the Contractor may postpone seeding, if conditions are such that the seed will not germinate and grow. The Developer and/or Contractor will not, however, be relieved of the responsibility of protecting all areas until the cover crop has been sown and affords protection from erosion.
 4. The cover crop shall be sown at a rate of 10 to 15 pounds of seed per acre using a hand or power operated mechanical seeder capable of providing a uniform distribution of seed.

6.14 ADJUSTMENT TO GRADE

- A. All new and existing utility structures encountered on the project shall be constructed and/or adjusted to finished grade.

- B. On asphalt concrete paving projects, the manholes shall not be adjusted until the pavement is completed, at which time the center of each manhole lid shall be relocated from references previously established by the Developer and/or Contractor. The pavement shall be cut as further described and base material removed to permit removal of the cover. The manhole shall then be brought to proper grade.
- C. Prior to commencing adjustment, a plywood and visqueen cover as approved by the City Inspector shall be placed over the manhole base and channel to protect them from debris.
- D. The asphalt concrete pavement shall be cut and removed to a neat circle, the diameter of which shall not exceed 48” or 14” from the outside diameter of the ductile iron frame, whichever is smaller. The ductile iron frame shall be brought up to desired grade, which shall conform to surrounding road surface.
- E. Adjustment to desired grade shall be made with the use of concrete or bricks. No cast or ductile iron adjustment rings will be allowed. An approved class or mortar (one part cement to two parts of plaster sand) shall be placed between manhole sections; adjustment rings or bricks and ductile iron frame to completely fill all voids and to provide a watertight seal. No rough or uneven surfaces will be permitted inside or out. Adjustment rings or brick shall be placed and aligned to provide vertical sides and vertical alignment of manhole steps and ladder.
- F. Manhole specifications for minimum and maximum manhole adjustment and step requirements will be met. Special care shall be exercised in all operations in order not to damage the manhole, frames and lids or other existing facilities.
- G. As soon as the street is paved past each manhole, the asphalt concrete mat shall be scored around the location of the manhole, catch basin, meter boxes or valve box. After rolling has been completed and the mat has cooled, it shall be cut along the scored lines. The manholes, catch basins, meter boxes and valve boxes shall then be raised to finished pavement grade and the annular spaces filled with cement concrete to within 1-1/2 inches of the finished grade. The remaining 1-1/2 inches shall be filled with asphalt concrete Class B to give a smooth finished appearance. See detail in Project Plans.
- H. After pavement is in place, all joints shall be sealed with hot asphalt cement (AR 4000W). A sand blanket shall be applied to the surface of the AR 4000W hot asphalt cement binder to help alleviate “tracking”.
- I. Asphalt concrete patching shall not be carried out during wet ground conditions or when the ambient air temperature is below 50°F. Asphalt concrete mix shall be at required temperature when placed. Before making the asphalt concrete repair, the edges of the existing asphalt concrete pavement and the outer edge of the casting

shall be tack coated with hot asphalt cement. The remaining 2” shall then be filled with Class B asphalt concrete and compacted with hand tampers and a patching roller.

- J. The completed patch shall match the existing paved surface for texture, density and uniformity of grade. The joint between the patch and the existing pavement shall then be carefully painted with hot asphalt cement or asphalt emulsion and shall be immediately covered with dry paving sand before asphalt cement solidifies. All debris such as asphalt pavement, cement bags, etc., shall be removed and disposed of by the Developer and/or his Contractor.
- K. Prior to acceptance of a project, manholes shall be cleaned of all debris and foreign material. All manhole steps and ladders shall be cleaned free of grout. Any damage occurring to the existing facilities due to the Developer’s and/or Contractor’s operations shall be repaired at his/her own expense.
- L. Manholes in easement areas shall be adjusted to insure drainage away from the manhole frame and cover. The manhole frame and cover shall be set approximately 0.1 foot above finished grade. Concrete collars shall be set about the structure, as detailed herein, in all non-paved areas.
- M. Adjustment of valve box castings (force main valving) shall be made in the same manner as for manholes.

6.15 FINISHING AND CLEANUP

Before acceptance of sewer system construction, all pipes, manholes, catch basins, and other appurtenances shall be cleaned of all debris and foreign material. After all other work on this project is completed and before final acceptance, the entire roadway, including the roadbed, planting, sidewalk areas, shoulders, driveways, alley and side street approaches, slopes, ditches, utility trenches, and construction areas shall be neatly finished to the lines, grades and cross sections of a new roadway consistent with the original section.

- A. On sewer construction where all or portions of the construction is in undeveloped areas, the entire area which has been disturbed by the construction shall be shaped so that upon completion the area will present a uniform appearance, blending into the contour of the adjacent properties. All other requirements outlined previously shall be met.
- B. Slopes, sidewalk areas, planting areas and roadway shall be smoothed and finished to the required cross section and grade by means of a grading machine insofar as it is possible to do so without damaging existing improvements, trees and shrubs. Machine dressing shall be supplemented by handwork to meet

requirements outlined herein, to the satisfaction of the City Inspector and/or the Public Works Superintendent.

- C. Upon completion of the cleaning and dressing, the project shall appear uniform in all respects. All graded areas shall be true to line and grade. Where the existing surface is below sidewalk and curb, the area shall be filled and dressed out to the walk. Wherever fill material is required in the planting area, the finished grade shall be elevated to allow for final settlement, but the raised surface shall present a uniform appearance.
- D. All rocks in excess of one (1) inch diameter shall be removed from the entire construction area and shall be disposed of the same as required for other waste material. In no instance shall the rock be thrown onto private property. Overhang on slopes shall be removed and slopes dressed neatly to present a uniform, natural, well-sloped surface.
- E. All excavated material at the outer lateral limits of the project shall be removed entirely. Trash of all kinds resulting from clearing and grubbing or grading operations shall be removed and not placed in areas adjacent to the project. Where machine operations have broken down brush and trees beyond the lateral limits of the project, the Developer and/or Contractor shall remove and dispose of same and restore said disturbed areas at his own expense.
- F. Drainage facilities such as inlets, catch basins, culverts, and open ditches shall be cleaned of all debris, which is the result of the Developer and/or Contractor's operations.
- G. All pavements and oil mat surfaces, whether new or old, shall be thoroughly cleaned. Existing improvements such as Portland cement concrete curbs, curb and gutters, walls, sidewalks, and other facilities, which have been sprayed by the asphalt cement, shall be cleaned to the satisfaction of the City Inspector and/or Public Works Superintendent.
- H. Castings for manholes, valves, lamp holes, vaults and other similar installations, which have been covered with the asphalt material, shall be cleaned to the satisfaction of the City.
- I. All curb and pavement markings such as, but not limited to, crosswalks, bike lanes, and handicapped symbols shall be preformed fused thermoplastic or as approved by the Public Works Superintendent.

6.16 FINAL ACCEPTANCE

- A. Prior to final inspection, all pipelines shall be flushed and cleaned and all debris removed.
- B. A pipeline “cleaning ball” of the proper diameter for each size of pipe shall be flushed through all pipelines prior to final inspection.
- C. Each sanitary sewer line shall be “videotaped” in its entirety using a remote controlled camera.
- D. Acceptable “As Built Drawings”, signed, stamped and acknowledged by a licensed engineer, shall be delivered to the City.
- E. Operations and Maintenance manual, where applicable, shall be delivered to the City.

6.17 GENERAL GUARANTEE AND WARRANTY

- A. The Developer shall be required, upon completion of the work, and acceptance by the City, to furnish the City a written guarantee covering all material and workmanship for a period of three years after the date of final acceptance. The Developer shall make all necessary repairs during that period at Developer’s sole expense, if such repairs are necessitated as the result of furnishing, poor materials and/or workmanship. The Developer shall obtain warranties from the contractors, subcontractors and suppliers of material or equipment where such warranties are required, and shall deliver copies to the City upon completion of the work. The existence of such warranties does not relieve the Developer from liability under Developer’s guarantee.
- B. Easement documents, if applicable, shall be filed and recorded with the County Auditor’s office and the documents reviewed by the City and/or its Attorney prior to project acceptance.