

ENGINEERING SPECIFICATIONS - SEWER

MATERIALS OF CONSTRUCTION

1. GENERAL

The type and class of materials to be used shall be as shown on the project plans approved by the District. Where no specific reference is shown, the following specifications shall govern the materials used. All materials shall be new and undamaged of a known brand, with replacement parts readily available from the general Seattle area. All materials shall have a manufactured date within one year of installation.

Prior to the installation of any of the facilities required on the project, all materials shall be approved by the District.

All reference specifications herein shall be of the latest revision.

2. SEWER PIPE

Sewer pipe material shall be of the following type unless otherwise specified or directed:

Locations with less than five(5) feet of cover from top of pipe to finished grade

Class 52 Ductile Iron Pipe ANSI/AWWA C116 ceramic epoxy lined.

Locations with between five(5) feet and sixteen (16) feet of cover from finished grade

PVC Pipe, ASTM 3034 SDR 35

Locations with more than sixteen (16) feet of cover from finished grade

Class 52 Ductile Iron Pipe, or PVC C900 Pipe ANSI/AWWA DR 18 or as directed by District

Where Directed

High Density Polyethylene (HDPE) Pipe ASTM D3350 SDR 11 Gravity
Sewer

a. PVC Pipe and Fittings - ASTM 3034

Pipe and fittings shall be integral wall bell and spigot, rubber gasket joint, unplasticized polyvinyl chloride (PVC) pipe. All PVC pipe shall have a minimum "pipe stiffness" of 46 at 5 per cent deflection and 73° F when tested in accordance with ASTM Designation D 2412, external loading properties of plastic pipe; and a minimum impact strength of 210 feet-pounds based on ASTM D 3034 at 73° F using a 20 pound Tup A.

All ASTM 3034 PVC sewer pipe and fittings manufacture, and installation shall conform with ASTM recommended specifications D 3034, current revisions, and all installation shall be in strict compliance with the manufacturer's directions. All pipe shall be clearly marked with the date of manufacture. There shall be no reduction in pipe wall thickness at the bell as a result of bell formation. All pipe shall be provided with a reference mark for proper spigot insertion. Joint gaskets shall be fabricated from a compound of which the basic polymer shall be a synthetic rubber consisting of styrene, butadiene, poly-isoprene, or any combination thereof and shall meet the requirements of ASTM 1869, latest revisions.

b. Class 52 Ductile Iron Pipe and Fittings

Class 52 ductile iron pipe shall be new, epoxy-lined, conforming to ANSI Standard A21.51 (AWWA C-151).

Ductile iron pipe shall be push-on joint or mechanical joint. Pipe with push-on joints shall be furnished with a single rubber ring gasket. All gaskets, including MJ, shall be lubricated to affect the seal. Pipe with mechanical joints shall be furnished with a mechanical joint of the stuffing box type, including rubber gasket, cast-iron gland, and tee-head bolts and nuts to affect the seal. All joints shall conform to ANSI Standard A21.11 (AWWA C-111).

Where restrained joints are required, may be manufactured with U.S. Pipe TR Flex, Griffin "Snap Lok" or Pacific States Restrained Joint. In addition, Mega-Lugs may be used.

Bell and socket joints shall be in accordance with ANSI A21.10 and equal to U.S. Pipe "Uniflex".

Standard thickness, epoxy ~~mortar~~ -lined pipe shall be in accordance with ANSI Standard A21.4 (AWWA C-104).

Ductile iron pipe shall be encased in polyethylene encasement. Material and installation shall be in accordance with AWWA C105. Installation shall be in accordance with Method A or Method C.

The Contractor shall furnish certification from the manufacturer of the pipe and gasket being supplied that the inspection and all of the specified tests have been made and the results thereof comply with the requirements of this standard.

c. PVC Pipe and Fittings - AWWA C900

All AWWA C900 PVC pipe and fittings manufacture, and installation shall conform with AWWA recommended specifications C900, current revisions, and all installation shall be in strict compliance with the manufacturer's directions. Pipe and fittings shall be integral wall bell and spigot, gasketed pipe, extruded from virgin PVC compounds with cell classification 12454 B or better, as defined in ASTM D1784. Gaskets shall be elastomeric

meeting requirements of ASTM F477. Fittings shall be in accordance with AWWA C907. PVC C900 pipe shall have a minimum pressure class rating of 100 (DR25) with cast iron pipe outside diameter conforming to ASTM D2122.

d. Tees and Wyes

Connections for side sewer stubs shall be six (6) inch inside diameter tee fittings fabricated in the manufacturer's plant. Wye branches shall be used where the sewer main size is less than eight (8) inch inside diameter. No field cut-in tees or wyes will be allowed under these specifications without written approval of the District.

e. High Density Polyethylene (HDPE) Pipe and Fittings

The material shall comply with the requirements for Type III C5 P34 as tabulated in ASTM D 1248 and have PPI recommended designation of PE 4710 SDR-17 (125 psi). A melt flow (condition F) of less than 5.0 GMS./10 min. shall be required as determined by ASTM D 1238-65T and exceed 5,000 hours of Environmental stress crack resistance with no failure and no indication of stress crack initiation as determined by ASTM D 1693, Condition C.

The workmanship shall be of the highest level compatible with current commercial practice. The PE pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, or other injurious defects. It shall be uniform in color, opacity, density and other physical properties.

The pipe shall be non-pressure rated. Butt fusion of pipes and fittings shall be performed in accordance with the pipe manufacturer's recommendations as to equipment and technique. The pipe shall be fused by an individual who has a demonstrated ability to fuse polyethylene pipe in the manner recommended by the pipe supplier and/or the fusion manufacturer.

In direct burial applications, the trench and trench bottom, embedment materials and bedding installation practices shall be as specified in ASTM 2321, Sections 6,7,8, and 9. The pipe shall be Phillips 66 Driscopipe 1000 or equal.

Provide special anchor block at each end of the HOPE section as noted on the construction drawing and detailed in the Sewer Standard detail.

3. MANHOLES

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 three-thousand (3,000) psi structural concrete. Joints between precast wall sections shall be confined O ring. They shall be

constructed in full compliance with the details shown on Standard Sewer Detail SD-1, Precast Manhole, and as further specified herein.

a. Manhole Sections

Manhole sections shall be placed and aligned so as to provide vertical sides and vertical alignment of the ladder steps. The ladder shall be rigidly attached to the side of the manhole. The completed manhole shall be rigid, true to dimension, and be watertight. Rough, uneven surfaces will not be permitted.

Masonry units (manhole adjusting brick) shall conform to ASTM C 32, Grade MM. The outside and inside of manhole adjusting bricks and the joints of precast concrete sections shall be plastered and troweled smooth with one-half (1/2) inch (minimum) of mortar in order to attain a watertight surface.

The mortar used between the joints in the precast sections and for laying manhole adjusting bricks shall be composed of one part cement to two parts plaster sand. All joints shall be thoroughly wetted and completely filled with mortar, smoothed both inside and out to insure watertightness.

b. Manhole Steps

Manhole steps shall be made of Copolymer Polypropylene Plastic coated 1/2 (one half) inch Grade 60 Steel reinforcing bars, M.A. Industries PS2-PF Manhole step or equal. See the Standard Detail for the special step in adjusting ring area.

c. Grade Adjustment

Manhole necks that are not less than eight (8) inches nor more than twenty (20) inches shall be provided between the top of the cone or slab, and the top of the manhole frame.

d. Channels

Channels shall be made to conform accurately to the sewer grade and shall be brought together smoothly, with well-rounded junctions, satisfactory to the District Engineer.

The channels shall be field poured after the inlet and outlet pipes have been laid and firmly grouted into place at the proper elevation. Pre-cast may be allowed if pre-approved by the District Engineer. Allowances shall be made for a minimum of one-tenth (0.1) foot drop in elevation across the manhole in the direction of flow. The maximum allowable drop in inlet elevation across the manhole in the direction of flow shall be one (1.0) foot. 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 two

percent (2%) to drain. Rough, uneven surfaces will not be permitted. Channels shall be constructed to allow the installation and use of a mechanical plug of the appropriate size in the incoming and outgoing pipes.

e. Pipe Connections

All rigid pipe entering or leaving the manhole shall be provided with flexible joints within twelve (12) inches of the manhole structure and shall be placed on firmly compacted bedding. Special care shall be taken to see that the openings through which pipes enter the structure are completely and firmly filled with mortar from the outside to insure watertightness. All PVC pipe connections to manholes shall be made with approved Kor-N-Seal boots.

All stubbed out sewer pipes placed through manhole walls for future connections shall be suitably plugged and blocked in a manner acceptable to the District.

f. Drop Manholes

If pre-approved by the District Engineer, drop manholes shall, in all respects, be constructed as a standard manhole with the exception of the outside drop connection, as shown on the Standard Sewer Detail SD-3, Drop Manhole.

g. Lift Holes and Steel Loops

All lift holes shall be completely filled with expanding mortar, smoothed both inside and out, to insure watertightness. All steel loops must be removed flush with the manhole wall. The stubs shall be covered with mortar and smoothed. Rough, uneven surfaces will not be permitted.

h. Heat Shrinkable Wraparound Sleeves

All manholes shall be installed with heat shrinkable wraparound sleeves from the manhole ring flange to below the adjustment rings and blocks. Heat shrinkable wraparound sleeves shall be "Wrapid Seal" as manufactured by Canusa or approved equal.

4. FRAME AND COVERS

Frames and covers shall be cast iron and conform to the Standard Sewer Details SD-4, SD-4A and SD-4B. Materials are ductile iron cover ASTM A536, and Gray Iron Frame ASTM A48 CL35B Product # 3715ZPT Manufactured in the USA by East Jordan Iron Works Manufacturing Company. Heavy Duty Manhole Assembly (H20 and HS20 Loading). Locking lids are required. Rings and covers shall be adjusted to conform to the final finished surface grade of the street and to the satisfaction of the District per District's Standard Details.

ENGINEERING SPECIFICATIONS - SEWER - METHODS OF CONSTRUCTION

1. GENERAL

A pre-construction conference will be held at the District office prior to the start of construction.

The Contractor shall notify the District and the District's Engineer at least seventy-two (72) hours in advance of contemplated construction to allow for field staking the pipeline and checking of materials to be used on the job.

Except as otherwise noted herein, all work shall be accomplished with adopted standards of Cross Valley Water District and as recommended in applicable DOT/APWA Standard Specifications and according to the recommendations of the manufacturer of the material or equipment used. The Contractor performing the actual construction shall have a copy of the specifications on the jobsite at all times.

2. CLEARING AND GRUBBING

Clearing and grubbing shall consist of the removal of trees, stumps, brush, and debris, and shall be confined within the limits of the easements obtained for the construction of this project and/or existing public rights-of-way. Removal of clearing and grubbing debris shall be subject to the approval of the District Engineer and shall, in no way, constitute a hazard to the continuous operation of any existing utilities. Any damage to the existing utilities shall be repaired by the respective utility company, at the expense of the Contractor.

Within the limits described above, all vegetable growth, such as trees, shrubs, brush, logs, fences, upturned stumps and roots of downed trees and other similar items, shall be removed and disposed of. All trees shall be felled within the area to be cleared. Where the tree limb structure interferes with utility wires, or where the trees to be felled are in close proximity to utility wires, the tree shall be taken down in sections to eliminate the possibility of damage to the utility. Any damage which does occur shall be the responsibility of the Contractor.

All fences adjoining any excavation or embankment that may be damaged or buried shall be carefully removed and temporarily erected on the adjoining property or stored for reinstallation as directed by the District Engineers.

No debris of any kind shall be deposited in any stream, body of water, street, or alley.

Trees, shrubbery, and flower beds designated by the District shall be left in place and care shall be taken by the Contractor not to damage or injure such trees, shrubbery, or flower beds by any of their operations.

Where ornamental trees exist in planting areas and are not to be removed, it shall be the Contractor's responsibility to trim low limbs which would interfere with the normal operation of their equipment. Pruned areas must be sealed with an approved pruning tar or paint.

The trimming shall be performed in a professional manner, by competent personnel, prior to machine operations, and in such a manner as the District and/or the property owner may direct.

The refuse resulting from the clearing operation shall be hauled to a waste site secured by the Contractor. The refuse shall be disposed of in such a manner as to meet all requirements of State, County, and municipal regulations regarding health, safety and public welfare. Disposal of such refuse by burning on the site of the project shall not be allowed.

In no case, shall any material be left on the project, shoved onto abutting private properties, or be buried in embankments or sewer trenches on the project.

Clearing operations shall be carried out well in advance of the construction operations so as to permit a well-planned schedule of work.

The Contractor shall be responsible for all damage to existing improvements resulting from their operations.

3. DEWATERING AND CONTROL OF WATER

The Contractor shall dewater and dispose of the water so as not to cause injury to public or private property or to cause a nuisance or a menace to the public.

The control of groundwater shall be such that softening of the bottom of excavations or formation of "quick" conditions or "boils" shall be prevented. Dewatering systems shall be designed and operated so as to prevent the removal of the natural soils.

During excavation, installation of pipelines and sewers, placement of trench backfill, and placement and curing of concrete, excavations shall be kept free of water. The static water level shall be drawn down below the bottom of the excavation, so as to maintain the undisturbed state of the natural soils and allow the placement of backfill to the required density. The dewatering system shall be installed and operated so that the ground water level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property.

The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill, and prevent flotation or movement of structures, pipelines, and sewers.

In carrying out the work within the limits of streams or an area that will drain into a stream during a rain, the Contractor is required to comply with the regulations of the appropriate local, State and Federal agencies. Any isolated potholes remaining from the Contractor's operations shall be provided with open water channels in such a manner that there will be a direct drainage outlet at the lowest elevation of the pothole.

The Contractor shall contact the above referenced departments and secure such permits as may be necessary to cover their proposed method of operation within the areas described above. If no permit is necessary and if directed by the District Engineer, he should submit a letter from the appropriate agency stating that no permit is necessary.

4. EROSION CONTROL

The detrimental effects of erosion and sedimentation are to be minimized in conformance with the following general principles:

- a. Leave soil exposed for the shortest possible time.
- b. Reduce the velocity and control the flow of runoff.

- c. Detain runoff on the site to trap sediment.
- d. Release runoff safely to downstream areas.

In applying these principles, the Contractor shall provide for erosion control by:

- a. Conducting work in workable units.
- b. Minimizing the disturbance to cover crop material.
- c. Providing mulch and/or temporary cover crops.
- d. Providing sedimentation basins, and/or diversions in critical areas during construction.
- e. Properly controlling and conveying runoff.
- f. Establishing permanent vegetation as soon as possible.
- g. Installing erosion control structures as soon as possible.

a. Trench Mulching

Where, in the opinion of the District Engineer and/or the Developer Engineer or record, there is danger of backfill material being washed away due to steepness of the slope along the direction of the trench, trench mulching shall be used. Backfill material shall be held in place by covering the disturbed area with straw. The straw shall be held in place with a covering of jute matting or wire mesh anchored down with wooden stakes, or as directed by the District Engineer and/or the Developer Engineer of record.

b. Cover Cropping

A cover crop shall be in place in all areas excavated or disturbed during construction that were not paved, landscaped, and/or covered prior to construction. Areas landscaped prior to construction shall be restored to their original condition in accordance with Paragraph 16, Landscaping, Lawn Removal and Replacement.

The Contractor shall be responsible for protecting all areas from erosion until the cover is in place and affords such protection.

5. EXCAVATION, TRENCHING, AND SHORING

All excavation, trenching and shoring shall comply with Chapter 296-155 of the Washington Administrative Code (WAC) and these specifications. It is the Contractor's

responsibility to comply with all Department of Labor and Industry standards, specifically in regard to industrial safety and health.

For deep excavations, the Contractor shall provide shoring designed by a Structural Engineer registered in the State of Washington, as required by the Department of Labor and Industries Standards.

6. FOUNDATION GRAVEL

When required in areas of unsuitable trench bottom as directed, foundation gravel shall consist of clean, granular material free from objectionable materials such as vegetable matter or other deleterious substances, shall follow the District's Standard detail for Unsuitable Foundation Excavation.. At locations directed by the Engineer during construction, quarry spalls conforming to WSDOT Standard 9.13.6 shall be installed as sewer and manhole foundation material.

Approval of material and pit will be required by the District prior to construction.

7. PIPE BEDDING

Bedding material shall be carefully placed and firmly compacted to provide a firm, uniform cradle for the pipe. To provide a firm, continuous support for the pipe, it is necessary to hand tamp or "slice" bedding material solidly under the pipe.

All sewer pipe shall be completely bedded with imported pipe bedding gravel from 4" below the pipe bell to 12" over the pipe as shown on the Standard Detail.

Bedding material shall be 3/4" minus Crushed Surfacing Top Course per Section 9-03.9(3) of the State of Washington Standard Specifications for Road and Bridge Construction.

Bedding shall be placed in six (6) inch lifts compacted to 90% of maximum density from four (4) inches below the pipe to the crown of the pipe. Additional bedding material shall be placed and compacted by hand to approximately 90% of maximum density for the full width of the trench to a height of 12" above the top of the pipe. Care shall be taken to avoid contact between the pipe and compaction equipment.

Approval of material and pit will be required by the District prior to construction.

8. BACKFILL GRAVEL

Where excavated material is not approved for backfill, Gravel Base, conforming to the requirements of Section 9-03.10 of the State of Washington Standard Specifications for Road and Bridge Construction, or granular material commonly known as bank run gravel, shall be used as directed by the District and/or Engineer.

Bank run gravel shall be free from wood, roots, bark or other extraneous material. It shall have such characteristics of particle size and shape that it will compact readily to a firm, stable base.

Approval of material and pit will be required by the District prior to construction.

Trench backfill shall be performed in accordance with the requirements of the agency having jurisdiction. Please note that Snohomish County may require the use of Controlled Density Fill in transverse crossings of roads with high traffic volume or other situations where even a small amount of trench settlement cannot be tolerated. Generally, the requirements for trench backfill are as listed below:

a. Street and Paved Areas - Longitudinal Installations

Native trench materials are assumed suitable for backfill if 95 percent compaction can be obtained. All compaction tests must be done the same day as compaction.

If 95 percent cannot be obtained in trenches 8' deep or less, the entire trench must be replaced with imported pit run gravel and compacted to meet 95 percent modified proctor.

If 95 percent cannot be obtained in trenches greater than 8' deep, the upper 4' must be replaced with imported pit run gravel and compacted to meet 95 percent modified proctor.

b. Street and Paved Areas - Transverse Installations

In trenches 8' deep or less, the entire trench must be replaced with imported pit run gravel or imported crushed surfacing top course and compacted to meet 95 percent modified proctor.

In trenches 8' deep or more, the upper 8' must be replaced with imported pit run gravel or imported crushed surfacing top course and compacted to meet 95 percent modified proctor.

c. Easements

Backfill on easements can use native materials if 90 percent compaction can be met where there are no structures or pavement. Compaction must meet 90 percent of optimum density. If 90 percent compaction cannot be obtained, imported pit run gravel shall be used as directed.

The developer is responsible for providing in-place density tests necessary to demonstrate that the compaction is as required. In-place density tests shall be conducted in accordance with section 2-03.3(14) D of the State of Washington Standard Specifications for Road and Bridge Construction, latest edition.

Backfilling and surface restoration shall closely follow installation and testing of the pipe, so that no more than four-hundred (400) feet of pipe trench is left unrestored without express approval of the District Engineer. Care shall be taken to insure that the pipe and its protective coating are not damaged. No rocks or stones shall be permitted within twelve (12) inches of the pipe.

9. SEWER PIPE INSTALLATION

A ten (10) foot horizontal separation must be maintained between all sanitary sewer lines and water lines. A five (5) foot minimum horizontal separation shall be maintained between all water facilities and underground power and telephone facilities, unless otherwise approved. See Standard Water Detail WD-9A.

a. Pipe Laying

The sewer pipe, unless otherwise approved by the District Engineer, shall be installed upgrade from point of connection on the existing sewer, or from a designated starting point to line and grade, per approved plans. 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 adequately held shall be sufficient reason for the District Engineer to require restraints, whether or not movable shoring is being used.

b. Pipe Jointing

All extensions, additions, and revisions on the sewer system, unless otherwise indicated, shall be made with sewer pipe joined by means of a flexible gasket which shall be fabricated and installed in accordance with these specifications.

All joints shall be made up in strict compliance with the manufacturer's directions and all sewer pipe manufacture and handling shall meet or exceed the ASTM and CPAW recommended specifications, current revisions.

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, re- lubricated if required, and replaced, before the re-joining is attempted.

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.

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, as specified earlier, 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. At the end of the workday, the last pipe laid shall be blocked in an effective way to prevent creep during "down time".

10. SIDE SEWER STUBS

A side sewer stub 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.

All applicable specifications given herein for sewer construction shall apply to side sewer stubs.

Three (3) inch wide, green plastic side sewer detector tape shall be laid three (3) feet above the pipe in accordance with the Standard Sewer Details SD-8 or SD-8A.

Side sewers shall be single and installed according to Standard Side Sewer Detail SS-1. In no case may the specified side sewers be changed without the approval of the District Engineer.

Side sewers shall be connected to the tee provided in the sewer mains where such is available, utilizing approved fittings or adaptors. Side sewers shall rise at a maximum of forty-five (45) degrees and a minimum of two (2) percent slope, from the sewer main.

Where there are no basements, the minimum side sewer depth shall be six (6) feet below final ground at the property line, except where the property owner may require additional depth. The Contractor shall provide for each six (6) inch outlet a two (2) inch by four (4) inch wooden post which extends from the invert of the six (6) inch outlet to a point eighteen (18) inches (minimum) and two (2) feet (maximum) above the existing ground. The exposed area of this post shall be painted white and shall have marked thereon the letters SIS. (See Standard Details) The elevations of the side sewer connections shall be of sufficient depth to serve all existing and possible future basements.

a. Rigid Pipe:

Where no tee or wye is provided or available, connection shall be made by machine-made tap and suitable saddle, or otherwise as approved by the District Engineer.

b. Flexible Pipe:

Where no tee or wye is provided or available, a cut-in tee or wye will be installed with two (2) PVC couplings as approved by the District Engineer.

The maximum bend permissible at any one fitting shall not exceed a forty-five (45) degree bend. Bends exceeding forty-five (45) degrees with any combination of two fittings shall have a straight pipe of not less than three (3) feet in length installed between such adjacent fittings, unless one of such fittings be a wye branch with a cleanout provided on the straight leg. The maximum length of six (6) inch sewer line shall be **one-** hundred (100) feet; minimum length shall be five (5) feet unless otherwise approved by the District.

Clean-outs shall be locking lid type East Jordan MFG. Company or equal. Clean-outs shall be installed as shown on the Standard Sewer Details per the size of pipe,

11. HIGHWAY, STREAM, OR RAILROAD CROSSINGS

The Contractor may use any method which provides satisfactory results and is acceptable to the Engineer and the governmental agency having control of the highway, stream, or railroad, provided that the Contractor restores the area to its original condition. Normally, crossings require the placing of a steel pipe casing by jacking or tunneling and laying the sewer main within this casing.

All jacked highway, stream, or railroad crossings shall be encased with steel casing. Steel casing shall be of sufficient diameter, size, and strength to enclose the sewer pipe and to withstand maximum highway, stream, or railroad loading.

Sizing and wall thickness of casing is to be approved by the District Engineer.

The pipe within the casing shall be braced with casing spacers as manufactured by Cascade Manufacturing Company, Yorkville, Illinois, or approved equal. The spacers shall be 8 inches wide and placed at 6-foot intervals with a spacer within 2 feet of each end of the casing pipe. Spacers shall be designed to prevent movement of the pipe within the casing in any direction (See Standard Water Detail WD-9C, Water or Sewer Main Casing).

Casing spacers shall be bolt-on style with a two-piece shell made from T.A.304 stainless steel of a minimum 14-gauge thickness. Each shell section shall have bolt flanges formed with ribs for added strength. Each connecting flange shall have a minimum of three 5/16" T-304 bolts. The shell shall be lined with a ribbed PVC extrusion with a retaining section that overlaps the edge of the shell and prevents slippage. Bearing surfaces (runners) made from UHMW polymer with a static coefficient of friction of 0.11 - 0.13 shall be attached to support structures (risers) at appropriate positions to properly support the carrier within the casing and to ease installation. The runners shall be attached mechanically by T-304 threaded fasteners that are inserted through the punched riser section and TIG welded for strength. Risers shall be made of T-304 stainless steel of a

minimum 14 gauge. All risers over 2" in height shall be reinforced. Risers shall be MIG welded to the shell. All metal surfaces shall be fully passivated.

Casing spacers for the sewer main shall be as required, including custom fit if necessary, in order to provide the necessary line and grade.

The casing ends shall be sealed by approved methods after carrier pipe installation, testing and TV inspection, if required, is complete.

12. RE-DESIGN OF LINES

Should interferences or obstructions create construction difficulties that the District Engineer determines shall require redesign or relocation of the lines, the Developer's Engineer will prepare the necessary revised drawings. Revised drawings shall be approved by the District Engineer.

13. HAZARD OF ASBESTOS CEMENT PIPE REMOVAL

To remove existing asbestos cement pipe from the trench, a fee and permit is required from the Puget Sound Air Pollution Control Agency. In addition, Washington State Department of Labor and Industries requires the operators removing asbestos be certified.

The projects shall be completed by carefully disassembling existing AC pipe without saw cutting and the disassembled pipe left in the trench.

If the AC pipe is sawcut or removed from the trench, the Contractor shall be responsible for all fees and permits. The work shall be performed in accordance with requirements of the various agencies.

Where it is necessary to cross an existing asbestos-cement water line, a minimum of twenty-six (26) feet of the asbestos-cement pipe must be removed and replaced with ductile iron pipe or C-900 DR-18 of the same diameter. See detail SD-10

14. TESTING GRAVITY SEWERS FOR ACCEPTANCE

After backfilling the sewer main between joints with sufficient gravel to prevent movement of the pipeline and allowing sufficient time for any concrete blocking to set, the Contractor

shall furnish all facilities and personnel for conducting tests under the observation of the District Engineer. The equipment and personnel shall be subject to the approval of the District Engineer.

a. Preparation for Testing

The Contractor shall be required, prior to testing, to clean and flush with an approved cleaning ball and clean water, all gravity sewer lines. After completion of backfill and cleaning, the completed gravity sewer, including side sewer stubs, shall be tested by the low-pressure air test method.

The first section of pipe not less than three hundred (300) feet 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.

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, in the pipe to be cleaned, and water shall be introduced behind it. The ball shall pass through the pipe with only the pressure of the water propelling 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 shall remove the obstructions and/or repair any damaged pipe. All visible leaks showing flowing water from the pipeline 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 as to not infiltrate existing facilities.

Precautions shall be taken to prevent any damage caused by cleaning and testing. Any Damage resulting from cleaning and testing shall be repaired by the Contractor at their own expense.

The manner and time of testing shall be subject to approval of the District Engineer.

b. Low Pressure Air Test

Gravity sewers shall be tested with low pressure air, by the pressure drop method. The procedures, as set forth in the following paragraphs, shall be used in conducting the low-pressure air test. The Contractor shall furnish all facilities and personnel for conducting the air test under the supervision of the District Engineer. The Contractor may desire to

make an air test prior to backfilling for their own purposes. However, the acceptance air test shall be made after backfilling has been completed and compacted. In addition to the pressure test requirements, the pipeline shall be free of all visible leakage prior to acceptance.

Low Pressure Air Test - Pressure Drop Method:

All wyes, tees, or the end of the side sewer stubs, shall be plugged with flexible joint caps or acceptable alternative, securely fastened to withstand the internal test pressures. Such plugs or caps shall be readily removable, and their removal shall provide a socket suitable for making a flexible, jointed lateral connection or extension. No double plugs shall be allowed.

Immediately following the pipe cleaning, the pipe installation shall be tested with low pressure air, using the pressure drop method. A maximum reach to be tested shall be the reach between two consecutive manholes. Air shall be slowly supplied to the plugged pipe installation until the internal air pressure reaches four (4.0) pounds per square inch greater than the average back pressure of any groundwater above the center of the pipe being tested. At least two (2) minutes shall be allowed for temperature stabilization before proceeding further.

For air permeable pipe, the requirements of this specification shall be considered satisfied if the time required in seconds for the pressure to decrease from three and one half (3.5) to two and one half (2.5) pounds per square inch greater than the average back pressure of any groundwater that may submerge the pipe is not less than the listed values for the corresponding size pipe in Table 1. For non-air permeable pipe, the requirements of this specification shall be considered satisfied if the time required in seconds for the pressure to decrease from three and **one- half** (3.5) to three (3.0) pounds per square inch greater than the average back pressure of any groundwater that may submerge the pipe is not less than the listed values for the corresponding sizes of pipe in Table 1.

Surveyed, as-constructed inverts shall be submitted to the District and approved by the District prior to scheduling the air test and TVing with the District.

TABLE 1

Allowable Time for Pressure Drop Method Air Permeable and NON-Air Permeable Pipe				
	Air Permeable Pipe	NON-Air Permeable Pipe		
Size of Pipe (Inches)	Seconds per LF of Pipe	Maximum Seconds per Reach of Pipe	Seconds per LF of Pipe	Maximum Seconds per Reach of Pipe
4	0.176	113.3	0.352	226.6

6	0.396	170.0	0.792	170.0
8	0.704	226.7	1.408	453.4
10	1.100	283.3	2.200	566.6
12	1.584	340.0	3.168	680.0
15	2.475	425.0	4.950	850.0
18	3.564	510.0	7.128	1020.0
21	4.851	595.0	9.702	1190.0
24	6.336	680.0	12.672	1360.0
30	9.900	850.0	19.800	1700.0

The use of air pressure for testing sewer lines creates hazards that must be recognized. The Contractor shall be certain that all plugs are securely blocked to prevent blowouts. The air testing apparatus shall be equipped with a pressure release device such as a rupture disc or a pressure relief valve designed to relieve pressure in the pipe under test at six (6) pounds per square inch.

c. Deflection Test

All 8" or larger pipe laid shall be deflection tested in accordance with section 7- 17.3(2)G of the State of Washington Standard Specifications for Road and Bridge Construction, latest edition. For acceptance, pipe shall not have any diameter decreased by 5 per cent or more.

The Contractor shall be required, at no additional expense to the District, to locate and uncover any sections of pipe failing to pass the test and, if not damaged, reinstall the pipe. The Contractor shall retest the pipe after replacement of the pipe.

d. Line and Grade Inspection

Before sewer lines are accepted, all lines shall be inspected for line and grade by checking each section between manholes for alignment. A full circle of light shall be seen by looking through the pipe at a light held in the manhole at the opposite end of the section of sewer line being inspected.

Any corrections required in the line and grade shall be made by removing and replacing pipe as required. Corrections required shall be completed by the Contractor at the expense of the Contractor.

Variance from established line and grade shall not be greater than one **thirty-** second (1/32) of an inch per inch of pipe diameter and not to exceed one-half (1/2) inch, provided that such variation does not result in a level or 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 (1/64) of an inch per inch of pipe diameter, or one-half (1/2) inch maximum.

e. Television Inspection

All sanitary sewers shall be inspected by the use of a television camera and two video recordings provided to the District before final acceptance.

The video recording shall be in digital format. The replay shall be free of electrical interference and provide a clear, stable image.

The television camera used shall be color format specifically designed and constructed for such inspections.

Audio narrative shall be recorded by the operating technician on the videos as they are being produced and shall include the location of the sewer, manhole numbers, direction of travel, and a description of the conditions in the sewer line and an estimation of flow from any leaks encountered.

Continuously displayed on the monitors, or as directed, in the lower right corner, as part of the video presentation, shall be the number designation of the sewer section being surveyed and a continues reference distance from the departing manhole.

Water with non-toxic red dye shall be poured into the system immediately preceding the inspection as directed by the Engineer.

Inspection shall be performed on a manhole-to-manhole basis. The inspection shall be performed by pulling the television camera through the line along the axis of the pipe. A 1-inch steel ball shall be attached to the camera harness immediately ahead of the camera to act as a visual aid in determining low spots in the pipe. Water shall be run through the pipe to aid in visually identifying any low spots. At the Contractor's discretion or as directed by the Engineer, the camera shall be stopped or backed up to view and analyze conditions that appear unusual or uncommon to a good, sound sewer.

A TV inspection log shall be kept by the Contractor which will contain the date and time, clearly show the exact location in relation to adjacent manholes of each pipe defect or infiltration point, cracks, shears, pulled gaskets, changes in grade or alignment, and other discernible features. The log will be provided in duplicate to the District in typewritten report, broken-down from manhole to manhole. Each manhole-to-manhole pipe run shall be on a separate sheet.

Prior to TV inspection, the Contractor shall submit to the District a brief description of relevant experience and a sample video which illustrates the quality of their work.

In the District's opinion, the video and audio quality of all tapes made shall meet or exceed that of the sample tape provided and accepted by the District.

The District shall be notified seventy-two(72) hours prior to any TV inspection.

The Contractor shall bear all costs incurred in correcting any deficiencies found during television inspection including the cost of any additional television inspection that may be required by the District to verify the correction of said deficiency.

15. TESTING FORCE MAIN

a. Test Specifications

The pressure tests shall be performed in the following manner:

Water shall be pumped into the main, bringing the pressure in the main up to the required test pressure. After a period of fifteen (15) minutes, water shall again be pumped into the main to bring the pressure up to the required test pressure and the quantity of water used during the test shall be accurately measured through a standard water service meter with a sweep unit hand that registers one gallon per revolution. The meter shall be approved by the District Engineer prior to any testing. The allowable water consumption shall not exceed the quantities as shown in the following table.

All force main piping shall, upon completion, be subjected to a minimum hydrostatic test pressure of at least fifty (50) percent above the design operating pressure for at least thirty (30) minutes. Leakage shall not exceed the amount given by the following formula:

$$L = \frac{NxDxP}{1,850}$$

Where: L is allowable leakage in gallons per hour

 N is the number of pipe joints

 D is the pipe diameter in inches

 P is the test pressure in psi

A positive displacement type pump shall be furnished by the Contractor for the testing. Feed for the pump shall be from a container wherein the actual amount of "make-up" water can be measured.

Any leakage caused by defective workmanship or materials shall be repaired, and the main shall again be tested to full compliance at the Contractor's expense. Concrete thrust blocking for fittings shall be in place and the concrete "set" sufficiently to withstand the test pressure before starting the test. Where permanent blocking is not required, the Contractor shall furnish and install temporary blocking and remove it after testing. The test pressure shall be applied at the low end of the section of pipe being tested. Air in the pipe shall be vented at all high points. All field equipment for testing, as above described, shall be furnished and operated by the Contractor, and subject to approval by District Engineer.

b. Preliminary Tests

The Contractor shall conduct preliminary tests and assure himself that the section to be tested is in an acceptable condition before requesting the District Engineer to witness the test.

c. Thrust Blocks

All fittings, such as elbows, shall be blocked with concrete in order to prevent movement and separation of pipe joints. Timber used as permanent blocking will not be permitted. Sufficient time shall be allowed for concrete to set before commencement of pressure tests. See Standard Water Details WD-8 and WD-8A.

16. LANDSCAPING, LAWN REMOVAL, AND REPLACEMENT

In the event construction is to be carried out in areas which are landscaped, appropriate measures shall be taken to restore such areas to conditions existing prior to construction. Such measures shall include, but shall not be limited to, sod removal, replacement, and replanting, subject to the approval of the property owner and/or the District.

a. Lawn Removal and Replacement

The area of sod to be removed shall be laid out in squares or strips of such size as to provide easy handling and matching. The sod shall then be carefully cut along these lines to a depth of four (4) inches, taking care to keep all cuts straight and cut all strips to the same width. After the sod has been cut vertically, it shall be removed to a uniform depth of approximately three (3) inches with an approved type of sod cutter. This operation shall be performed in such a manner as to insure uniform thickness of sod throughout the operation.

As the sod stripping proceeds, the sod strip shall be placed in neat piles at convenient locations and, from then on, they shall be maintained in a damp condition continuously until the sod strips are replaced on the lawn. In no case shall the sod remain in piles longer than ten (10) days before replacement on the lawn.

Prior to replacing the strips of sod, the stripped area shall be carefully shaped to proper grade and be thoroughly compacted. Wherever the construction operations have resulted in the placement of unsuitable or poorer soils in the area to be re- sodded, the surface shall be left low and covered with a minimum of four (4) inches of topsoil.

All tools used shall be of the type specially designed for the work and be satisfactory to the District Engineer.

Water shall be furnished by the Contractor. The Contractor shall be responsible for providing a finished grass area which meets the approval of the owner.

b. Hydroseeding

All areas disturbed by construction which do not receive a specific type of restoration, such as paving, rock, sod, or bark, shall be hydroseeded according to section 8-01.3(2)B of the WSDOT Standard Specifications. Prior to beginning hydroseeding operations, the contractor shall submit seed mix and rate of application to the Engineer for approval. Prior to seeding, all areas to be seeded shall be raked smooth and all debris removed and disposed.

17. ROAD RESTORATION

The Contractor shall restore all roadway and driveway surfaces, excavated or disturbed, to a condition acceptable to the District and the governmental agency having control of the road.

All work in rights-of-way shall be subject to the approval of the permitting agency and/or Snohomish County, and/or the State of Washington Department of Transportation.

All work in County right-of-way shall be subject to the approval of the Snohomish County Engineer.

Paving restoration consists of two steps. The first step is installation of a temporary cold mix patch to be maintained until all work and other restoration is complete. The second step is installation and sealing of the permanent pavement trench patch.

Paving restoration shall consist of the preparation, placing, and compaction of subgrade, the patching of various types of pavement cuts, and/or the complete resurfacing of roadways, the performance of which shall be in accordance with the requirements outlined herein. Roadway surface restoration and patching shall be in accordance with the WSDOT Standard Specifications, unless specifically directed otherwise by the District, permitting agency and/or the Engineer. See Standard Trench Backfill and Restoration Details.

Before patching material is placed, all pavement cuts shall be trued so that marginal lines of the patch will form a rectangle with straight edges and vertical faces a minimum of one (1) foot back from the maximum trench width.

Proper signs, barricades, lights, and other warning devices shall be maintained **twenty-four** (24) hours of the day, until the patch is completed and ready for traffic.

a. Crushed Surfacing

Crushed surfacing material shall be one and one- quarter (1-1/4) inch and **five-** eighths (5/8) inch minus crushed gravel and shall be manufactured from ledge rock, talus, or gravel, in accordance with the provisions of Section 9- 03.9(3) of the WSDOT Standard Specifications.

All crushed surfacing top course shall be placed in accordance with the requirements of Sections 4-04.1 through 4-04.4 of the WSDOT Standard Specifications.

b. Gravel Base

All gravel base shall conform to the requirements of Section 9-03.10 of the WSDOT Standard Specifications. Gravel base shall be spread as directed by the Engineer during construction. It shall be compacted in accordance with the requirements of the WSDOT Standard Specifications before material for any succeeding course is spread. Gravel base shall be used for a base material and for the select backfill of trenches in the event that the excavated material is unsuitable for backfill.

Gravel base shall be used as shown on the plans and as directed by the District and/or the Engineer.

c. Asphalt Concrete Surfacing

Asphalt concrete surfacing or repair shall be asphalt concrete pavement, Class "B", and shall conform to Section 5-04.1 through 5-04.4 of the WSDOT Standard Specifications, and the Standard Specification Drawing for Permanent Asphalt Concrete Patch. All edges and joints of asphalt concrete pavement repair shall be sealed with asphalt cement. After pavement is in place, all joints shall be sealed with SS-1, or approved equal.

d. Cement Concrete Pavement

Concrete shall conform with, and shall be placed, in accordance with Sections 5-05.1 through 5-05.4, and Sections 5-05.5(1) of the WSDOT Standard Specifications and shall be Class "B" and shall be furnished only by manufacturers who are members of the Portland Cement Association. Concrete cylinder samples will be taken by the District Engineer for the purpose of testing the compressive strength of the concrete. The concrete shall be five (5) sack "High Early" cement mix. Subgrades shall be prepared as shown on the plans and in compliance with the WSDOT Standard Specifications.

All reinforcing steel shall conform with and be placed in accordance with Sections 5-05.3(10) and 9-07 of the WSDOT Standard Specifications. All reinforcing steel shall also conform to the requirements of ASTM A-615, A-616, and A-617.

e. Rigid-Type Pavements Resurfaced with Asphalt Concrete

Those areas that now have a Portland cement concrete base and are surfaced with an asphalt concrete mat shall be replaced in kind. The base shall be a five (5) sack mix using "High Early" cement. The surface of the cement concrete portion of the patch shall be left low enough to accommodate the asphalt portion of the patch. Brush finishing will not be required. Joints shall be placed if directed by the District and/or Engineer. The asphalt concrete surface mat to be placed over the Portland cement concrete base shall be Class "B", as designated by the WSDOT Standard Specifications; both the base and the surface mat shall be carefully prepared, placed, and cured, in full compliance with Section 5-04.3 of the WSDOT Standard Specifications.

Asphalt concrete or bituminous plant mix shall not be placed until the day after the cement concrete has been placed, unless otherwise permitted by the District and/or the Engineer. The edges of the existing asphalt pavements and castings shall be painted with hot asphalt cement or asphalt emulsion immediately before placing the asphalt patching material. The asphalt concrete pavement shall then be placed, leveled, and compacted, to conform to the adjacent paved surface. Immediately thereafter, all joints between the new and original asphalt pavement shall be painted with hot asphalt or asphalt emulsion and be covered with dry paving sand before the asphalt solidifies.

f. Shoulder, Gravel Surfaces

Shoulders, gravel driveways, and all other gravel surfaced areas shall be repaired as detailed on the plans, with a two (2) inch lift of five-eighths (5/8) inch minus crushed rock. Immediately prior to placement of the gravel, the drainage ditch, shoulders, and/or driveways, shall be graded to the original smooth contours existing prior to the construction of sewer lines in the area. The gravel shall then be placed and compacted in accordance with the applicable WSDOT Standard Specifications.

18. ADJUSTMENT OF NEW AND EXISTING UTILITY STRUCTURES TO GRADE

This work consists of constructing and/or adjusting all new and existing utility structures encountered on the project to finished grade.

a. 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 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.

Prior to commencing adjustment, a plywood and visqueen cover, as approved by the District Engineer, shall be placed over the manhole base and channel to protect them from debris.

The asphalt concrete pavement shall be cut and removed to a neat circle, the diameter of which shall not exceed twelve (12) inches from the outside diameter of the cast iron frame, or forty-eight (48) inches, whichever is smaller. The cast iron frame shall be brought up to desired grade, which shall conform to surrounding road surface. Adjustment to desired grade shall be made with the use of concrete leveling rings. No cast iron adjustment rings will be allowed. An approved class of mortar (one part cement to two parts of plaster sand) shall be placed between manhole sections; adjustment rings, and cast-iron frame, shall be placed to completely fill all voids and to provide a watertight seal. No rough or uneven surfaces will be permitted inside or out. Adjustment rings shall be placed and aligned so as to provide vertical sides and vertical alignment of ladder steps (if steps are necessary).

Check manhole specifications for minimum and maximum manhole adjustment and step requirements. (See Standard Sewer Detail SD-1.) Special care shall be exercised in all operations in order not to damage the manhole, frames and lids, or other existing facilities.

The annular spaces of the manhole frames shall be filled with five-eighths (5/8) inch minus crushed gravel and compacted with hand tamper to within two (2) inches of the top of the frame. Asphalt concrete patching shall not be carried out during wet ground conditions or when air temperature is below fifty (50) degrees. Asphalt concrete mix must 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 two (2) inches shall then be filled with Class B asphalt concrete and compacted with hand tampers and a patching roller.

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 the asphalt cement solidifies. All debris, such as asphalt pavement, cement bags, etc., shall be removed and disposed of by the Contractor. Before acceptance of a job, manholes shall be cleaned of all debris and foreign material. All ladders must be cleaned free of grout. Any damage occurring to the existing facilities due to the Contractor's operations shall be repaired at their own expense.

b. Adjustment of Monuments and Cast Iron Frames and Covers

Monuments and monument castings shall be adjusted to grade in the same manner as for manholes.

c. Adjustment of Valve Box Castings

Adjustment of valve box castings shall be made in the same manner as for manholes.

19. FINISHING AND CLEANUP

Before acceptance of sewer line 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 shall be neatly finished to the lines, grades and cross-sections shown on the plans and as hereinafter specified. The entire roadway, as referred to above, includes the roadbed, planting, sidewalk areas, shoulders, driveways, alley and side street approaches, slopes, ditches, utility trenches, and construction areas.

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. 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 hand work to meet requirements outlined herein, to the satisfaction of the District Engineer.

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 as shown on the typical sections, and as required by the District Engineer. Where the existing planting is below sidewalk and curb, the area shall be filled and dressed out to the walk, regardless of the limits shown on the plans. Wherever fill material is required in the planting area, it shall be left high enough to allow for final settlement, and the raised surface shall present a uniform appearance.

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. Overhangs on slopes shall be removed, and slopes dressed neatly, so as to present a uniform, well sloped, surface.

All excavated material at the outer lateral limits of the project shall be removed entirely. Trash of all kinds, including that resulting from clearing and grubbing or grading operations, shall be removed. No trash of any kind shall be placed in areas adjacent to the project. Where machine operations have broken down brush and trees beyond the lateral limits of the project, the Contractor shall remove and dispose of same at their own expense.

Drainage facilities, such as inlets, catch basins, culverts, and open ditches, shall be cleaned of all debris which is the result of the Contractor's operations.

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 District Engineer.

Castings for manholes, monuments, water valves, lamp poles, vaults, and other similar installations which have been covered with the asphalt material shall be cleaned to the satisfaction of the District Engineer.

20. EROSION CONTROL BLANKET

Erosion control blanket shall be installed at locations shown on the contract plans, if required by the Engineer, immediately after seeding operations have been completed.

Erosion control blanket may be either jute matting or a manufactured biodegradable mesh/excelsior composite fabric.

Jute matting shall be of uniform open plain weave of undyed and unbleached single jute yarn. The yarn shall be of a loosely twisted construction and shall not vary in thickness by more than one-half of its normal diameter. Jute matting shall be furnished in 50-yard long rolled strips with a width of 48 inches and an average weight of 0.92 pounds per square yard. A tolerance of plus or minus one inch in width and five per cent in weight will be allowed.

The mesh excelsior composite fabric shall consist of a machine-produced mat of curled wood excelsior having a consistent thickness and even distribution of fibers. The top side of each blanket shall be covered with a biodegradable extruded plastic mesh. The blankets shall be equal or better than curlex blankets as manufactured by the American Excelsior Company.

The erosion control blanket shall be installed and handled in accordance with the manufacturers' recommendations.