

Section 5 Index

Storm Drain

5-1	Storm Drain Pipe
5-2	Trench Excavation and Backfill
5-3	Pipe Bedding
5-4	Catch Basin
5-5	Standard Manhole
5-6	Standard Dry Well
5-7	Dry Well Percolation Tests
5-8	Abandoned Conduits
5-9	Storm Drainage Design

SECTION 5
CITY OF SUNNYSIDE
STANDARD SPECIFICATIONS
STORM DRAIN

5-1 STORM DRAIN PIPE

5-1.01 GENERAL

The work covered in this section shall include storm drainage design criteria and the furnishing, installation and testing of storm drain pipe of the types and sizes specified and shown on the plans together with other appurtenances and incidental work required to construct the storm drainage facilities in accordance with SWSS Section 7-04 except as herein modified. The minimum pipe size for catch basin runs is 8 inches. The minimum pipe size for main line runs is 12 inches.

Developer and builder storm drainage systems will be required to meet, or exceed the requirement of Section 5-10 of these Standard Specifications.

All storm sewer mainline under crossings of 6-inch and 8-inch AC water mains will require removal and replacement of a section of the AC water main as herein specified.

5-1.02 APPROVED PIPE MATERIALS

The storm drain pipe shall be one of the types indicated unless a different type and class of pipe is called for in the special provisions.

- A. DUCTILE IRON PIPE shall conform to the requirements of AWWA designation C151 with Class 2 up through 12-inch diameter and Class 1 for 14-inch diameter and larger.
- B. HIGH-DENSITY POLYETHYLENE PIPE - where a minimum height of cover below finish grade is 3.0 feet, high-density polyethylene pipe is approved. The high-density polyethylene pipe shall be WSDOT approved for culvert use under H-20 rated roadways. The high-density polyethylene pipe shall be manufactured in

accordance with the most recent AASHTO M252 and M294, ASTM F405 and ASTM F667, for smooth interior walled, corrugated polyethylene pipe.

Bell and spigot joints shall be a testable, water tight, rubber gasket and spigot pipe joint. The components shall be manufactured by the supplier of the pipe and shall be designed to meet or exceed the requirements of Section 5-1.04 and 5-1.05 of this specification section.

C. POLYVINYL CHLORIDE (PVC) PIPE, 10-INCH THROUGH 24-INCH

For 10-inch pipe, where a minimum height of cover below finish grade is 1.5 feet and for pipes 12-inch and over, where minimum height of cover below finish grade is 3.0 feet, PVC pipe may be used. PVC pipe shall meet or exceed one of the below specifications.

- a. PVC pipe 10-inches through 15-inches shall be bell and spigot gasket jointed per ASTM F477. Pipe shall conform to ASTM D3034 SDR 41 or SDR 35. Pipes over 15 inches shall be bell and spigot gasket jointed per ASTM F477. Pipe shall conform to ASTM F679, minimum T-1 wall thickness, or ASTM D2241 SDR 41 or ASTM 3034 SDR 41 or 35.
- b. Smooth interior ribbed PVC pipe shall be allowed where a minimum height of cover below finish grade is 3.0 feet. The pipe shall conform to the following specifications:

PVC compound shall conform to the requirements of ASTM D1784, Cell Class 12364B. The pipe shall be formed by an extruded single process operation without add-on components. Gasket material shall conform to the requirements of ASTM F477. The pipe shall conform to the requirements of ASTM F794, with a minimum pipe stiffness of 46 in accordance with ASTM D2412. The pipe joint shall have an integral bell gasketed joint conforming to the requirements of ASTM D3212.

D. GALVANIZED CORRUGATED STEEL PIPE, 27 INCHES AND LARGER

Galvanized corrugated steel pipe conforming to the requirements of AASHTO M36 may be utilized for storm sewers 27 inches and larger. Gauge shall be as required by the specified soil tests with a minimum 16 gauge.

5-1.03 SOILS TEST FOR CORRUGATED GALVANIZED STEEL

A protective pipe treatment shall not be required for corrugated plain galvanized pipe as long as the pipe manufacturer can warrant the service life of the pipe for a minimum of fifty (50) years. The pipe shall be warranted by using the procedure outlined in Chapter 5, pages 238 and 239 of the Handbook of Steel Drainage and Highway Construction Products, 3rd edition, published by the American Iron and Steel Institute in 1983.

Any protective pipe treatment required shall be in accordance with SWSS Section 9-05.4 (3) Treatment 1.

5-1.04 COUPLING AND JOINT MATERIALS

Rubber gasket jointing materials for concrete (reinforced and non-reinforced) pipe, ductile iron pipe, high-density polyethylene pipe, and PVC pipe shall be in accordance with SWSS Sections 9-05.7(3), 9-05.12 and 9-05.13.

Coupling bands for corrugated metal pipe shall be used in conjunction with synthetic sponge full width rubber gaskets. The bands shall be in accordance SWSS Section 9-05.4 (7).

5-1.05 TESTING

The Contractor shall provide all required test equipment and gauges and test all main line storm sewers 24 inches and smaller by the exfiltration pressure test per SWSS Section 7-04.3(4) B as herein modified, or the below described air test. Prior to testing, the pipe shall be thoroughly cleaned and flushed by the Contractor and visually inspected by the City, by lamping or televising as the Engineer chooses. Any protruding gaskets, pipe breaks or obvious imperfections, shall be repaired as directed by the Engineer. Infiltration leaks at a seam or joint that exceed the flow of adjoining sections, or leaks that appear to be the result of improper installation or faulty material shall be repaired by the Contractor as directed by the Engineer. The Contractor shall inspect completed storm sewer main lines by lamping, prior to acceptance. Storm sewer lines may be subject to television inspection by the City.

Exfiltration Test: Leakage shall be no more than one (1.0) gallon per hour per inch of diameter per 100 feet of storm sewer pipe, with a minimum test pressure of two (2) feet of water column above the crown at the upper end of the pipe.

The length of pipe shall be limited so that the pressure on the low end of the test section shall not exceed 16 feet.

Low Pressure Air Test: For pipe 24-inches in diameter and smaller, the Contractor may, at his option, test by a low-pressure air test. The pipe shall be plugged and pumped to 4.0 PSI. The pressure shall be allowed to drop to 3.5 PSI and a watch used to measure the time in seconds that it takes for the pressure to drop from 3.5 to 2.5 PSI. The time required in seconds for the pressure to drop from 4 PSI to 3.5 PSI or from 3.5 PSI to 2.5 PSI must exceed that calculated by the following equation:

$$\text{Time in seconds} = 14.15 \times \text{diameter in inches.}$$

This test allows double the allowable loss over what is allowed for a sanitary sewer test.

5-1.06 MEASUREMENT AND PAYMENT

The unit contract price for each size of pipe shown on the plans and in the proposal shall be paid per linear foot, and shall be measured along its length through manholes, dry wells, and catch basins. The unit contract price, per linear foot, shall be full compensation for furnishing all labor, equipment, materials, pipe fittings, tees, elbows, flared end sections, and all other incidentals necessary to place the pipe in the trench to the line and grade as shown on the plans and in accordance with these specifications or as directed by the Engineer.

5-2 TRENCH EXCAVATION AND BACKFILL

5-2.01 GENERAL

All trench excavation and backfill for storm drain pipe shall be to the depth as shown on the plans and/or as indicated in the proposal for the various depths. Trench excavation and backfill shall be completed in accordance with the requirements of SWSS Section 7-04.3 as herein modified and per Standard Detail 4-7.

Trench excavation shall be unclassified unless rock excavation is listed as a pay item, and shall include all excavation, disposal of surplus and unsuitable material, and all other work incidental to

the construction of trenches for drains, gravity sewers, force mains or culverts, including manholes, catch basins, inlets or other appurtenances which are part of the pipeline.

Rock excavation shall include solid rock formation requiring systematic drilling and blasting with explosives and any boulders or broken rock larger than one-half cubic yard in volume. Hardpan or cemented gravel, even though it may be advantageous to use explosives in its removal, shall not be classified as solid rock excavation. The bottom of the trench shall be brought up to grade by backfilling with selected backfill material and be compacted to the satisfaction of the Engineer.

The Contractor shall notify the Engineer at least 24 hours prior to any blasting. All blasting shall be done in accordance with local, county, and state regulations governing this class of work. Any damage to persons or property resulting from blasting operations shall be the sole responsibility of the Contractor and his surety.

Trench backfill material shall be compacted by means, approved by the Engineer, as required to preclude future settlement and to achieve a minimum of 95 percent maximum density when tested, in accordance with SWSS 7-04.3(3) as herein modified.

As a minimum, all trenches shall be water-flooded and compacted with a hoe-mounted or double drum, vibratory mechanical compactor. Water content during compactions shall exceed optimum at all times.

All trench excavation shall have adequate safety systems for the trench excavation that meet the requirements of the Washington Industrial Safety and Health Act, Chapter 49.17 RCW. The Contractor shall be fully responsible for providing the necessary back sloping, cribbing, trench boxes, etc., as required to meet the specified safety requirements for the trench, manhole, drywell, etc.

The Contractor is advised that all water main lines have thrust blocks typically located as shown on Standard Drawing 4-6. These thrust blocks have been found to be constructed of rocks, blocks, concrete or other materials. The Contractor shall take such precautions, shoring, etc. as required to protect and not disturb the existing thrust blocks.

When a sanitary sewer main line, or storm sewer main line will cross under a 6-inch or 8-inch AC water main, then prior to excavation under the water main, the section of AC water main which is estimated to span the trench and to a minimum of three feet each side of the trench, shall be removed and replaced with a section of City Standard C900 PVC water main. After completion of the excavation and backfill, the repair couplings shall remain firmly on undisturbed ground, or the contractor will be required to replace the water repair.

Sewer service locates and repairs shall be made in accordance with Section 10-19 of these specifications.

5-2.02 MEASUREMENT

A. TRENCH EXCAVATION AND BACKFILL

Measurement for payment of "Trench Excavation and Backfill" shall be by the Cubic Yard for the appropriate depth increment of trench excavation and backfill, including measurement through manholes.

Measurement shall be the depth from the pipe invert to original grade, except that where the storm sewer is constructed in conjunction with new street construction, and unless excavation to sub-grade is not allowed by the contract special provisions.

Measurement shall be from the pipe invert to the street design sub-grade regardless of when the Contractor chooses to excavate the street to sub-grade.

B. ROCK EXCAVATION

Measurement for payment of "Rock Excavation" shall include boulders exceeding one-half cubic yard in volume and solid rock, which requires systematic drilling and blasting. Rock Excavation will be measured on a cubic yard basis computed as follows:

a. Length

Length will be the entire horizontal distance where rock is encountered measured on a linear foot basis along centerline of the trench.

All excavation for dry wells and other structures will be excluded and will be measured separately. Measurement will commence at the first location where rock is encountered and continue to the point where rock terminates.

b. Width

The trench width for payment of "Rock Excavation" shall be as follows:

<u>Size of Pipe</u>	<u>Pay Width of Trench</u>
10" - 15"	2.5 feet
18" - 36"	Outside pipe diameter plus 12"
42" and larger	Outside pipe diameter plus 24"

c. Depth

Measurement for depth will be the vertical distance from six inches (6") below the pipe invert to the top of the solid rock strata. Depth will be measured at intervals of 25 feet along centerline of trench, beginning at the first location that solid rock is encountered, and the average depth between measuring points will be the depth used for computing depth of rock.

C. ROCK EXCAVATION FOR STRUCTURES

Rock excavation quantities for manholes, dry wells, and other storm drain structures shall be computed on a cubic yard basis from the actual profile depth as described above, multiplied by the area within a line parallel to and one foot (1') outside of the actual dimensions of the manhole, dry well, or structure base.

D. TRENCH SAFETY SYSTEMS

The unit contract price for "Trench Safety Systems", per Linear Foot, shall be measured along the trench length through manholes, drywells, and catch basins.

5-2.03 PAYMENT

A. TRENCH EXCAVATION AND BACKFILL

The unit contract price for "Trench Excavation and Backfill", per Cubic Yard, for the various depths indicated in the proposal, shall be full compensation for the cost of excavation, backfill, furnishing all labor, equipment, and all other incidentals necessary to perform the work in accordance with the Plans and Specifications or as directed by the Engineer.

Unless provided for in the contract special provisions, all costs for labor, equipment and materials as required to replace sections of 6-inch and 8-inch AC water mains at

main line trench crossings, shall be considered incidental to the "Trench Excavation and Backfill" bid items as provided in the bid proposal.

B. ROCK EXCAVATION

When included in the bid proposal, the unit contract price for "Rock Excavation", per Cubic Yard, will be paid in addition to the payment for trench excavation and backfill at the various depths indicated in the proposal in which the rock is encountered. If not included in the bid proposal, Trench Excavation is unclassified, and a separate measurement and payment will not be made for rock excavation. Payment for rock excavation shall be full compensation for all work required to excavate and dispose of the rock material. No payment will be made for rock excavated below required grade or outside the widths stated in Section 5-2.02B of these specifications, unless approved by the Engineer.

C. TRENCH SAFETY SYSTEMS

The unit contract price, per linear foot, shall be full compensation for furnishing all labor, equipment materials and all other incidentals necessary to meet the requirements of the Washington Industrial Safety and Health Act, Chapter 49.17 RCW, including all requirements for drywells, manholes and catch basins.

5-3 TRENCH BACKFILL

5-3.01 GENERAL

It is the intent of this contract to use imported granular crushed aggregate for all backfill around the water main pipe. The Contractor shall take care to not "float" the pipe during backfilling operations.

5-3.02 NATIVE AND IMPORTED BACKFILL MATERIAL

Imported backfill materials shall be placed in accordance with the City of Sunnyside Standard Drawing No. 4-7. The bedding material shall be placed in lifts of not more than six inches (6") in depth and compacted.

Backfill materials shall meet the requirements of Sections 4-4.02 and 4-4.03 of these specifications.

5-3.03 MEASUREMENT AND PAYMENT

The unit contract price for "Imported Trench Backfill", per Cubic Yard, shall be full compensation for furnishing all labor, materials, tools, all other equipment and incidentals required to provide and install bedding material in accordance with the plans and specifications or as directed by the Engineer.

Select native materials, where approved by the Engineer, which do not require truck hauling and are determined to be acceptable as bedding and utilized as bedding, shall be considered, as incidental to "Trench Backfill", and no additional payment will be made for its use as "Imported Pipe Bedding".

5-4 CATCH BASIN

5-4.01 DESIGN AND CONSTRUCTION

Catch basins are to be furnished and installed in accordance with City of Sunnyside Standard Drawings 5-1 and 5-2 and SWSS Section 7-.05, as herein modified.

Filter fabric shall be placed per the requirements of Section 2-27 of these specifications.

Catch basins shall be designed for the grade of the street, in order to maintain a maximum three foot wide flow during the design 25 year storm; however, the maximum catch basin spacing allowed shall be 400 feet.

Oil water separators, as shown on Standard Detail 2-18, shall be required at all locations as shown on the plans or as directed by the Engineer.

5-4.02 CATCH BASIN PROTECTION

Prior to construction, the Contractor shall supply and install a section of filter fabric under the grate of all existing catch basins on the project and downstream as directed by the Engineer and required by Sections 5-4.01 and 2-27 of these specifications. Catch basins installed in conjunction with the project shall also be similarly protected.

5-4.03 MEASUREMENT AND PAYMENT

The unit contract price for "Catch Basin", per Each, shall be full compensation for furnishing all labor, materials, equipment, rings, final adjustment, grates, fabric protection, oil water separators, and all other incidental work required to complete the catch basin in accordance with the Plans and Specifications or as directed by the Engineer. All costs for fabric protection of off-site and existing catch basins shall be incorporated into the project maintenance, or storm pipe bid items as provided for in the bid proposal.

5-5 STANDARD MANHOLE

5-5.01 GENERAL

Manholes shall be furnished and installed in accordance with the City of Sunnyside Standard Drawings 3-2, 3-3, and 3-5 and as herein modified. Storm drain manholes may have either a poured-in-place base or a precast base. All manholes shall provide for a minimum two (2) feet of sump measured from the bottom invert of the lowest pipe to the inside base of the manhole. Channelization is not required.

5-5.02 CONSTRUCTION

Construction of manholes shall conform to the SWSS Section 7-05 as herein modified. The following provisions shall apply to the construction of all manholes:

- A. Manhole steps shall not be allowed within any structure.
- B. Precast concrete cones shall be eccentric. If used in conjunction with flat top, sections in shallow bury areas; the access openings shall be aligned.
- C. All manhole joints shall be made with flexible gaskets or a positive self-sealing mastic.
- D. Where directed by the Engineer, the channelization of manhole bases will be covered by a rigid material such as three-quarter inch (3/4") plywood or better. This cover shall remain in place until street construction is completed and the manhole

castings are grouted and then shall be removed, along with any the debris, prior to acceptance of construction.

- E. Manhole connections shall be reconstructed in accordance with the requirements of SWSS Section 7-05.
- F. Manhole sections installed below the high static ground water level shall be infiltration tested. A water infiltration allowance of 0.20 gallons per hour, per foot of static head above the lowest manhole invert, shall be considered as a satisfactory manhole test.

5-5.03 MEASUREMENT AND PAYMENT FOR STANDARD MANHOLE

The unit contract price for "Standard Manhole," per Each, shall be full compensation for furnishing all materials, labor, frames, covers, adjustment ring, final adjustment, and all other incidental work required to construct a ten-foot (10') deep standard manhole in accordance with the Plans and Specifications.

5-5.04 MEASUREMENT AND PAYMENT FOR ADDITIONAL MANHOLE DEPTH

Payment for additional depth manholes, which are over ten feet (10') in depth, shall be in accordance with the unit contract price for "Additional Manhole Depth," per Vertical Foot, as measured from the invert thereof, to the top of the cover, less ten feet (10'), and shall be full compensation for furnishing all labor, materials, and equipment required to construct the manhole in accordance with the plans and specifications or as directed by the Engineer.

5-5.05 MEASUREMENT AND PAYMENT FOR DROP CONNECTIONS

Payment for drop connections shall be in accordance with the unit contract price for "Drop Connection", per Vertical Foot, as measured from the invert thereof to the invert of the pipe from which the drop was made, and shall be full compensation for furnishing all labor, materials, and equipment required to construct the drop connection in accordance with the Plans and Specifications or as directed by the Engineer.

5-6 STANDARD DRYWELL

5-6.01 GENERAL

The City of Sunnyside does not allow for the construction of dry wells within City rights of way. Private developers may install them per the terms and conditions set forth by the Washington State Dept. of Ecology Underground Injection Control Permit.

5-7 THIS SECTION INTENTIONALLY LEFT BLANK

5-8 ABANDONED CONDUITS

All pipes, conduits and other openings determined to be abandoned, which are cut or opened during the storm sewer installation, shall be capped or concrete plugged, prior to backfilling of the trench. Measurement and payment for required pipe cuts, labor, equipment, work and materials required to complete the specified plug shall be incidental to the pipe installation pay items.

5-9 STORM DRAINAGE DESIGN

5-9.01 COMMERCIAL DEVELOPMENT/PRIVATE STREETS

Commercial sites and private streets shall be designed to retain and dispose of a 10-year 24-hour storm on-site. Drywells, perforated pipe systems and other means of infiltration may be used, where there is no potential for groundwater contamination.

The developer is advised that the Department of Ecology has determined that infiltration facilities are Class V injection wells. It is required, that the owner of the facility registers the drywell with the Washington State Department of Ecology. Registration forms may be obtained from the Department of Ecology web page, or the City of Sunnyside Municipal Services Department.

Parking lots may not be used for storm water storage in conjunction with an infiltration system. Where the "*Rational*" method is used for design, the minimum storage volume for an infiltration system shall be based on the peak hour.

Grassy swales and retention ponds may also be used. Due to winter ground freeze conditions, where surface retention is used without sub-surface infiltration mechanism, the facility shall be designed to store the entire 10-year 24-hour event, without regard to surface infiltration. Detention facilities using controlled outfall to the city's storm drain system (ponds, vaults, etc.) are not allowed.

Design calculations, bearing a registered professional engineer's stamp, are required for all storm drainage designs.

The City will not assume ownership or maintenance of the on-site commercial storm drainage facilities.

5-9.02 RESIDENTIAL DEVELOPMENT

Residential sub-divisions shall be designed to retain and dispose of a 25-year 24-hour developed state storm, with allowance for the continuous overflow, where conditions allow, of a 10-year 24-hour natural state storm. The developed state shall include streets, sidewalks, an estimated average driveway and one-half of an estimated average building roof for impervious surfaces and 50-foot from back of sidewalk for pervious surfaces.

All street low points, including localized curb return low points, shall have a positive overflow. An analysis of downstream impacts is required for off-site overflows.

Catch basins shall be designed, spaced and installed as required by Section 5-4.01. The main line storm sewer shall be designed with a minimum 5.0 foot bury, to provide for water and other utilities to be installed in the corridor above the storm sewer. The storm sewer shall be designed as required to not conflict with sewer laterals.

Sub-surface infiltration is preferred where there is no potential for groundwater contamination. The City Engineer may restrict or deny the use of sub-surface infiltration where percolation rates are marginal. Infiltration facilities shall be constructed in accordance with City Standards and a retention pond will be required.

Retention ponds (no outfall) may be required where percolation rates are marginal, or may be used in lieu of sub-surface infiltration, with prior approval from the City Engineer. Where retention ponds are required and/or approved for use, the facility shall be designed to store the entire 25-year 24-hour event, without regard to surface infiltration. A drywell shall be utilized in conjunction with the retention pond to provide pond drainage when the ground is frozen.

Detention ponds (controlled outlet) may be used only where it can be clearly demonstrated that infiltration, or retention, are not feasible. Detention ponds may only be used with prior approval of the City Engineer. Where detention ponds are approved for use, the release rate shall not exceed the 5-year natural state peak hour flow.

Retention and/or detention ponds shall be designed with a minimum 2-foot of freeboard. An emergency spillway shall be constructed and shall include an analysis of downstream impacts. The City will not assume ownership or maintenance of retention and/or detention ponds. Maintenance of retention ponds shall be the responsibility of a homeowners association approved by the City Engineer.

Swales and detention vaults are not allowed for residential development.

Design calculations, bearing a registered professional engineer's stamp, are required for all storm drainage designs.