ITEM 603.98XX--07 M-POLYVINYL CHLORIDE (PVC) SEWER PIPE & FITTINGS

DESCRIPTION:

Under this item the Contractor shall furnish, install and test (PVC) Sewer Pipe and fittings of the size and at the locations shown on the plans or as ordered by the Engineer.

MATERIALS:

The Contractor shall be responsible for all material furnished under this item and shall replace at his expense all material found defective in manufacture or damaged in handling. Materials shall be as follows:

POLYVINYL CHLORIDE (PVC) SEWER PIPE

All polyvinyl chloride (PVC) pipe and fittings shall meet or exceed all of the requirements of ASTM specification D3034, "Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings," 4 NPS through 15 NPS, Class SDR-35 and ASTM F679 "Poly (Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings" for 18 NPS through 36 NPS. Minimum modules of elasticity shall be 133 kPa. All pipes shall be suitable for use as a gravity sewer conduit. Provisions must be made for contraction and expansion at each joint with a rubber ring. The bell shall consist of an integral wall section which securely locks the solid cross-section rubber ring into position. The gasket shall meet the requirements of ASTM F477-76.

Fittings - All fittings and accessories shall be as manufactured and furnished by the pipe supplier, and have bell and/or spigot configurations identical to that of the pipe to which they are connected. Service connections shall be of the "tee-wye" combination. The PVC pipe shall be cut to the correct length in the field as necessary to allow installation of new service connections or service connections to existing laterals.

Saddles - Where it is impractical to install a PVC "tee-wye" service connection, a saddle may be used to make a service connection for new lateral.

The saddle shall contain a rubber (O) - ring gasket cemented in place in accordance with ASTM D1869 specifications. The saddle shall have a spigot or bell inlet suitable for acceptance of the kind and size of lateral pipe to be connected. If necessary, a flexible coupling or gasket may be used to connect the lateral to this saddle. The saddle shall be installed in accordance with the manufacturer's specifications and shall meet any requirements established by the owners of the sewer system.

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CONSTRUCTION DETAILS:

A) EXCAVATION - Excavation shall conform to the requirements of Item 206.02 M - Trench and Culvert Excavation or Item 206.04 M - Trench and Culvert Excavation - O.G., except as modified herein and the limits are shown in the Contract Plans.

B) BACKFILLING – No trench, pit or other excavation shall be backfilled until the pipe or appurtenant structures contained therein shall have been completely installed and inspected and approved by the Engineer. In backfilling around and over pipes, stone bedding material shall be spread in layers not over 150 mm in depth on both sides of the pipe and thoroughly spaded and tamped around the pipe so that no displacement of the pipe results. Backfill for a minimum distance of 600 mm above the top of the pipe shall be of the same material and shall be spread in layers not to exceed 150 mm in thickness or depth and each layer shall be thoroughly compacted by spading and tamping before further refilling is done. In all cases, the backfill above the top of the pipe shall be placed to a minimum of 450 mm before compaction is begun directly over the pipe.

C) DISPOSAL OF WATER - Except when included in another specification (i.e. work area located in a hazardous or contaminated area), water in excavated trenches or pits shall be removed by pumping, bailing or other satisfactory method before the installation of any pipe or structure. Water so removed shall be conveyed to such places and points that it will not interfere with the progress of the work or be a hazard or damage to public or private property. No water containing mud, grit or substances that would settle and be detrimental to the operation of sanitary sewers shall be permitted to flow into any storm or sanitary sewer or drain. No sewage entering excavated trenches or pits shall be pumped or dumped into any surface drainage course. No water, sewage or other material shall be allowed to enter any water main.

D) LAYING SEWER PIPE - Excavation of trenches for sewer pipe shall be made to the line and grade established or as directed by the Engineer and shall be made straight and true with no deviations from a straight line or grade between manholes.

The sewer pipe shall be bedded on a minimum of 150 mm of stone bedding material.

The trench bottom shall be flat. Holes for bells or couplings shall be dug so that no portion of the bell or coupling will contribute to the support of the pipe. The barrel of the pipe shall be uniformly supported throughout the entire length. Should over-excavation occur, all loosened material shall be removed and the trench bottom brought back to grade with stone bedding material. Bedding material shall be according to specifications and shall be placed and tamped in a manner satisfactory to the Engineer. Bedding material in such instances shall be placed at the sole expense of the Contractor.

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In areas of rock excavation the pipe shall be bedded on a minimum of 150 mm bedding material.

In areas where unstable trench bottoms are encountered, the trench shall be excavated to an additional depth below the layer of stone bedding material and a layer of stone foundation material placed and graded so as to properly support the bedding material, pipe, and backfill. The depth shall vary according to the actual conditions. Payment for such foundation material shall be as hereinafter specified.

All preformed joints shall be made according to manufacturer's specifications. Where it may be necessary to connect to existing facilities of like or unlike materials, such connection shall be made by use of special manufactured adapters as approved by the Engineer.

The inside of each pipe shall be inspected and all foreign matter, joint material that squeezed through, etc., shall be removed before backfilling. Care shall be taken in placing backfill so that the joints are not loosened or sprung. The backfill shall be packed and tamped into place under the pipe. All loosened or broken joints shall be removed and replaced.

E) LEAKAGE TESTS - Unless otherwise ordered by the Engineer, all sewers, service connections and sewer laterals, shall be tested for leakage and shall satisfactorily meet the test requirements. No connections to existing sewer laterals shall be made until the leakage requirements are met. The Contractor shall furnish all labor, materials and equipment and shall perform the tests. The Contractor shall make all necessary repairs or replacements and shall repeat the final leakage test(s), until the minimum leakage requirements are met.

Leakage tests shall be made only after backfilling is completed. Two types of tests will be acceptable: (a) Exfiltration Test or (b) Low Pressure Air Test. The type of test used will depend upon the extent and type of installation and shall be as directed by the Engineer.

(a) Exfiltration Test

This leakage test consists of an exfiltration test wherein the main sewer, sewer laterals and manholes are filled with clear water to provide a head of at least 1.5 m above the top of the pipe or 1.5 m above the level of the groundwater table, whichever is higher, at the highest point of the sewer line under test, and measuring the loss of water from the line by the amount which must be added to maintain the original level. In this test the line must remain filled with water for at least 24 hours prior to taking measurements, and the actual test period shall not be less than two (2) hours.

For purposes of determining the elevation of the top of the groundwater table, the Contractor shall furnish and install an open-end standpipe of perforated pipe. The standpipe shall be installed at least 24 hours before the line is filled with water. One (1) standpipe shall be installed for each section of sewer line tested. A section of sewer is defined as the length of main sewer, including sewer laterals, between two consecutive manholes. Following successful completion of the leakage tests, the standpipe shall be filled with approved material and the top cut off at least 600 mm below finished grade.

Exfiltration shall be measured by the drop of water level in a standpipe or in one of the sewer manholes. When a standpipe and plug arrangement is used in the upper manhole of a line under test, there must be some positive method of releasing entrapped air in the sewer prior to taking measurements. In the case of sewers laid on steep grades, the length of line to be tested at any one time may be limited by the maximum allowable internal pressure on the pipe and joints at the lower end of the line. The recommendations of the pipe manufacturer shall be followed.

When the level of the groundwater table is of such height that the manholes cannot be used for convenient measuring, or if the vertical distance between the top of the pipe and the manhole rim is less than 1.5 m, the Contractor shall test the pipe separately from the manholes utilizing the standpipe method including plugs, hoses, etc., to establish the required head of water. Manholes shall then be tested separately.

The total leakage of any section tested shall not exceed the rate of 175 Liters per kilometer of pipe per 24 hours per 25 mm of nominal pipe diameter. For purposes of determining the maximum allowable leakage, manholes shall be considered as sections of 1200 mm or 1500 mm diameter pipe, depending on the type manhole included in the test. The equivalent leakage allowance shall be 17 Liters per manhole per 24 hours for 1200 mm diameter manholes, and 22 Liters per manhole per 24 hours for 1500 mm diameter manholes.

(b) Low Pressure Air Test

This leakage test consists of plugging each section of sewer, pressurizing the line with air, and measuring the pressure drop time relationship.

Each end of the section of line to be tested shall be sealed off with inflatable pneumatic or manual plugs which shall hold against the air pressure without external bracing and without movement. Plugs shall have at least two valved connections opening into the pipe section, one for introducing low pressure air and one for connecting an approved air gauge calibrated in 2 kPa increments.

Air shall be introduced into the test section to a pressure of 28 kPa above the average pressure of any ground water that may be over the pipe. In such ground water areas, the Contractor shall install during the original installation a 13 mm capped pipe nipple through the manhole wall at a level of the top of the lowest pipe. The ground water level shall be determined by clearing the nipple with air and connecting a clear plastic hose to the same and measuring the water level in the hose. The height of the water level in meters above the pipe invert divided by .102 shall establish the kPa to be added to all readings.

A minimum of two minutes shall be allowed for the pressure to stabilize during which time the pressure shall not drop more than 3.44 kPa. The air supply shall then be disconnected and the time in minutes shall be recorded for the pressure to drop no more than 6.89 kPa. Such time shall not be less than the following:

NOMINAL SIZE	MINUTES
4 NPS	2.0
6 NPS	3.0
8 NPS	4.0
10 NPS	5.0
12 NPS	5.5
15 NPS	7.5
18 NPS	8.5
21 NPS	10.0
24 NPS	11.5
27 NPS	13.0
30 NPS	14.5
33 NPS	16.0
36 NPS	17.5

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METHOD OF MEASUREMENT

The quantity to be paid for under these items will be the number of meters of new sewer pipe (including all necessary connections and fittings) furnished and installed in accordance with the plans, specifications and as ordered by the Engineer.

BASIS OF PAYMENT

The unit prices bid per meter for these items shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work including fittings, plugs, connections, and leakage tests.

Excavation, sheeting, and backfill material will be paid for separately under their respective items. Payment will be made under:

ITEM NO.	DESCRIPTION	UNIT OF PAYMENT
603.9804--07 M	Polyvinyl Chloride (PVC) Sewer Pipe & Fittings 4 NPS	Meter
603.9806--07 M	" 6 NPS	Meter
603.9808--07 M	" 8 NPS	Meter
603.9810--07 M	" 10 NPS	Meter
603.9812--07 M	" 12 NPS	Meter
603.9815--07 M	" 15 NPS	Meter
603.9818--07 M	" 18 NPS	Meter
603.9821--07 M	" 21 NPS	Meter
603.9824--07 M	" 24 NPS	Meter
603.9827--07 M	" 27 NPS	Meter
603.9830--07 M	" 30 NPS	Meter
603.9833--07 M	" 33 NPS	Meter
603.9836--07 M	" 36 NPS	Meter

"Progress payments will be made at the unit price bid for 80 percent of the quantity of pipe installed. The remaining 20 percent will be paid for when the testing of the system has been completed."

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