

# **CATEGORY 1000 UTILITY CONSTRUCTION**

## **1001 - GENERAL REQUIREMENTS.**

**1001.01 DESCRIPTION.** This section provides specifications peculiar to water, sanitary sewer and storm drain construction. Storm drain specifications not addressed in this category are covered in Category 300, Drainage. Specifications common to both highway and utility construction are found in other portions of this volume as applicable.

**1001.02 MATERIALS:** Not applicable

### **1001.03 CONSTRUCTION:**

#### **1001.03.01**

(a) **Contract Drawings.** The contract drawings show the location, dimensions and sizes of the materials, on the lines and slopes, at the depths, with the connections and the manner in which they are to be placed as called for by the Specifications. They outline the work and the materials to be provided and placed under the contract or in accordance with such changes as may be approved from time to time during the progress of the work, as hereinafter provided.

#### **(b) Ground Profiles.**

(1) The ground profiles shown on the drawings represent the finished grade elevations along the centerline of the street for all work in streets and the centerline of trenches for work not in streets unless otherwise noted in the contract documents. No additional payment is made on lump sum bids where the actual elevations of the ground or surface over the structure differ from those shown on the profiles for pipe trenches.

(2) On all Developer Projects the Contractor and Developer shall provide the Engineer with a hold harmless agreement which

stipulates that Baltimore County will not be responsible for any additional cost due to any road or right-of-way failing to comply with the subgrade or proposed profile as shown on the contract drawings. This form is available from the Construction Contracts Administration Division, and shall be provided to the Engineer as soon as possible following the award of the Contract.

### **1001.03.02 Removal and Storage of Surface Materials:**

#### **(a) General.**

- (1) Surface Materials.** The Contractor shall grub and clear the surface and remove all surface materials, of whatever nature, over the line of the trench and from the site of other structures, and shall store, guard and preserve the materials as may be required for use in backfilling, resurfacing, repaving or for other purposes.
- (2) Paving Materials.** The Contractor is responsible for any loss or damage to curb, gutter, flagstone and paving material resulting from careless removal or neglectful or wasteful storage, disposal or use.

#### **(b) Paving.**

- (1) Removal** — The Contractor shall remove the paving only for such width as is necessary for the excavation of the trench as shown in the Standard Details. The County may retain from any monies due or to become due the Contractor the cost of permanently replacing paving removed under the following circumstances:

Removing paving for a greater width than is deemed necessary by the Engineer.

Removing or distributing paving on account of settlement, slides or caves; or

Removing or distributing paving as a result of excavation outside the lines of the work without written order of the Engineer.

- (2) **Failed or Damaged Paving** — The Contractor is responsible for the cost of replacing paving, surfacing or roadbeds that have failed or have been damaged at any time before the termination of the contract on account of work done by him. He must also bear the expense of resurfacing or repaving over any tunnel excavation that settles.

### **1001.03.03 Existing Utilities**

- (a) **Protection.** Water mains, storm drains, sanitary sewers, gas mains and other utilities are shown on the Drawings in accordance with the best information available for the information of the Contractor. The County assumes no responsibility for accuracy or completeness of information shown. The Contractor shall carefully protect existing mains and services. Any damage to existing utilities shall immediately be brought to the attention of the Engineer. At his expense, the Contractor shall immediately repair any damage to them caused by the work to the satisfaction of the Engineer.

Any damage to existing utilities caused by the work shall be immediately repaired to the satisfaction of the engineer at the Contractor's expense.

- (b) **Locating Connection to Existing Utility.** Before beginning excavation for the new installation, the Contractor must locate the connection to the existing utility by excavating for the end of the existing water or sewer main at the point of the proposed tie-in. This excavation and the refill is paid for under the Fixed Price Contingent Item "Test Pit Excavation".

- (c) **Removal of Obstructions.**

- (1) **Owner's responsibility.** If the engineer determines that the position of any pole, pipe, conduit or other structure requires its

removal, realignment or change, it will be done as Extra Work or will be done by the owner of the obstruction without cost to the Contractor. As required, utility poles will be braced by their owners at no expense to the Contractor.

**(2) Contractor's Responsibility.** Before removal and before and after realignment or change, the Contractor shall uncover, support and protect the structures in the limits of his trench at his expense as part of the contract. The Contractor is not entitled to any claim for damage nor extra compensation on account of the presence of the structure or on account of any delay in its removal or rearrangement.

**(d) Reconstruction of Obstructions.** Without extra compensation, the Contractor shall break through and reconstruct, if necessary, the invert or arch of any sewer, culvert or conduit he may encounter if the Engineer determines that the structure is in such position as not to require its removal, realignment or complete reconstruction. This work must be done so as not to interfere in any way with the flow of water or other liquid which the sewer, culvert or conduit is designed to carry.

**(e) Leaving a Gap.** If obstructions would hold up the work of laying pipe, the Contractor may leave a gap and return to fill the gap after the obstructions have been removed.

**(f) Non-Interference with Others.** The Contractor shall not interfere with the County or any persons, firms, or corporations in protecting, removing, changing or replacing their pipes, conduits, poles or other structures. He shall allow the County or these persons, firms, or corporations to take all measures they deem necessary or advisable for the purposes aforesaid. The Contractor is, in no way, relieved of any of his responsibilities under the contract.

**1001.03.04 Excavation.** Excavation shall be by open cut except where and to such extent the Engineer permits, authorizes or requires that the Contractor excavate by tunneling. No extra compensation is allowed for tunneling over the cost of open cut unless provided for in the bid item or negoti-

ated by the engineer. Generally, trenches may be excavated and refilled either by hand or by machinery as the Contractor chooses. However, the Contractor has no claim, and no extra compensation is allowed, if hand excavation or refilling is required to protect adjacent properties or improvements.

**(a) Excavation of Trenches.** Trench Requirements During Pipe Installation:

Prior to the start of trench excavation, the Contractor shall thoroughly familiarize himself with the latest OSHA requirements relating to the work specified.

Trenches for pipes or structures shall be excavated to the lines and grades or elevations shown on the plans or as directed by the Engineer. Bell holes shall be excavated in the bottoms and sides of trenches to permit the proper making of joints, without extra payment therefore. The sides of trenches shall be vertical to the top of the pipe and practically plumb above this point with the following exception: in unimproved areas and in proposed subdivision streets, unless otherwise noted, sloping or benching of sides of trenches shall be permitted in accordance with the latest OSHA requirements from a point one foot minimum above the top of the pipe for pipes greater than 24 inches and from a point 3 feet above pipe subgrade for pipes 24 inches or less in diameter. The maximum depth of sloping shall be 8 feet below existing trench ground surface. Sloping or benching will not be allowed in locations where it might affect the subgrade of existing utilities or proposed water lines. A minimum of 18 inches clearance shall be maintained between existing utilities and the sloped side of the excavation for the new utility. When conditions are encountered which, in the opinion of the Engineer, render it impracticable to slope or bench sides, then the sides of trenches shall be practically plumb as stated above. Payment limits for any additional excavation or backfill shall not exceed the limits shown on Baltimore County's general detail, Trench Payment Width.

All trench bracing or support systems shall comply with the latest

requirements of the Maryland Occupational Safety and Health Administration (MOSH) and the Federal Occupational Safety and Health Administration (OSHA).

- (1) **Single Tier Provision.** If the Contractor elects to use single-tier bracing (either solid sheeting or metal trenching box), applicable contingent item payments are based on Detail G-6 and G-7

*Trench Width plus 2 feet,  
Crusher Run Paving Width plus w feet, and  
Finished Paving Width plus 2 feet.*

- (2) **Double Tier Provision.** If the Contractor elects to use double-tier bracing (either solid sheeting or metal trenching box), 16 feet or more above invert in an excavation, the applicable contingent items associated with the bottom tier are based on (1) above. The applicable contingent items associated with the top tier are based on Detail G-6 and G-7

*Trench Width plus 4 feet  
Crusher Run Paving Width plus 4 feet, and  
Finished Paving Width plus 4 feet.*

- (3) **Trench Width Around Appurtenances.** Through areas of appurtenant construction (manholes, inlets, etc.) total trench width must be 4 feet greater than the outside width of the appurtenance for a total distance of 4 feet longer than its outside length. Item payments are based on these widths plus the above bracing additives where applicable.

- (4) **Non-Continuous sheeting.** If the Contractor elects to use non-continuous sheeting, no additions to Trench Width are allowed.

- (b) **Dewatering Excavations.** The Contractor is completely responsible for adequately controlling water present in the excavation. He must provide for the disposal of water removed from excavations in such a manner as not to cause damage to public or private property or to any portion of the work completed or in progress, and he

must not create any impediment to the use of any area by the public. During construction of storm water drains, sanitary sewers and water mains, the Contractor must not discharge into existing sanitary sewers.

- (c) **Condition of Excavation.** The Contractor is responsible for the condition of all excavation made by him. He must remove all slides and caves, without extra compensation, at whatever time and under whatever circumstances they occur. The Contractor is also responsible for sizing and application of sheeting and shoring, as well as the methods and procedures employed to incorporate all labor and materials.
- (d) **Rock Bottom.** Where the bottom of the trench at subgrade is in rock, excavation shall be carried at least 6 inches below the specified subgrade with a minimum of 4 inches under bells. The trench bottom shall be restored to subgrade with earth or granular material as approved by the Engineer. Excavation and refill to the 6-inch depth will be paid for as Class 3 Excavation and Selected Backfill (by Template method).
- (e) **Unstable Bottom.** If the bottom of the trench at subgrade is in unstable or unsuitable material, excavate to the depth ordered by the Engineer. Restore the trench bottom to subgrade with Selected Backfill. All excavation and refill is paid for as Class 3 Excavation and Selected Backfill.
- (f) **Protection of Persons and Property.** The Contractor must conduct all work in such a manner as to protect persons and property against injury. The fact that the County or its authorized representatives are involved in performing their respective duties does not relieve the Contractor of his obligation under the contract or applicable regulations of this or other governmental agencies.
- (g) **Ownership of Excavated Material.** The Contractor has no property right in any material taken from any excavation, and he must not remove any earth, sand or other material from the site of the work except on direction or written permission of the Engineer.

**(h) Length of Open Trench.** The Contractor shall not leave open a greater length of trench in any location in advance of the completed structure placed therein, than is authorized or directed by the Engineer. Trenches left open and unattended shall be properly secured.

**(i). Refilling Trench.**

**(1) Required by Engineer.** At any time, the Engineer may require the refilling of open trenches over completed pipe lines if he believes such action is necessary. The Contractor has no claim for extra compensation even though, to accomplish the refilling, he must temporarily stop excavation or other work at any place.

**(2) Work Stoppage.** If work is stopped on a trench for any reason except by order of the Engineer, and if the excavation is left open for an unreasonable time in advance of construction, the Contractor, if so directed, shall refill the trench at his own cost and shall not open it again until he is ready to complete the structure therein. If the Contractor refuses or fails to refill the trench completely within 48 hours after notice, the Engineer is authorized to do the work, and the County will charge the expense to the Contractor and will retain same out of any monies due or to become due to him under the contract.

Refilling shall normally be accomplished by the use of suitable material, excavated on the project, which is free from large lumps, clods or rocks except as noted below and which can be compacted to the degree specified by normal means. Suitable material shall not be frozen or composed of ash, cinders, organic matter or other refuse. If suitable material is not available on the project or if directed by the Engineer, Borrow for Backfilling Trenches, a contingent fixed price item, shall be used. Pavement limits for these materials shall be in accordance with the widths shown in the Standard Details.

No rock shall be allowed in refilling until earth has been placed at least 2 feet over the pipes or structure. Above this, except

for the last 1 foot, small stones not larger than 10 inches in their greatest dimension will be permitted in an amount not to exceed 20 percent of the volume of the backfill. Within these limits the stones will be well distributed throughout the mass.

Suitable material shall be carefully placed around and to a depth of 2 feet over the pipe or structure. This initial backfill shall be carefully placed and tamped by approved mechanical means in 6-inch layers, to a minimum of 92 percent of AASHTO T-180 density. Care shall be exercised during this operation in order to insure that the pipe is not damaged and the alignment of the utility is not disturbed.

In unimproved areas outside the existing or proposed road right-of-way, unless full trench compaction is specified on the Plans, compaction shall be accomplished as follows for the remaining depth of trench. Backfill material shall be placed in 12-inch layers and compacted in such a manner that a completely dense refill is obtained which is free of voids and not susceptible to settlement.

In all County and State roads, full trench compaction as described below, will be required within rights-of-way except as noted on the Contract Drawings. The area extending from 2 feet above a pipe to the subgrade shall be refilled in layers not to exceed 8 inches. The refill shall be tamped by approved mechanical means and compacted to not less than 92 percent of the maximum density at optimum moisture content, as determined by the modified Proctor method, AASHTO designation T-180, to within the top foot of subgrade. The top foot of subgrade shall be compacted to 95 percent of the maximum density determined as noted above.

In all proposed subdivision roads, the area extending from two feet above a pipe to the subgrade shall be refilled in layers not to exceed 12 inches. The refill shall be tamped by approved mechanical means and compacted to 90 percent of AASHTO T-180 density for all material within plus or minus 3 percent of

the optimum moisture content. For all material with a moisture content more than three percent above optimum, the material shall be compacted to a minimum of 98 percent AASHTO T-180 density at existing moisture content. Soils more than 3 percent below optimum moisture content shall be wetted to bring the moisture content to within plus or minus 3 percent of optimum.

Prior to placement of the stone road base or subbase, the subgrade will be inspected and tested for structural capacity in accordance with existing procedures, In those instances where additional subgrade preparation is required to increase pavement support, the following procedures apply:

- a. Undercut trench backfill one foot plus an overcut of two feet or each side of the trench.
- b. Place soil reinforcing fabric, such as Mirafi 500X or approved equal to subgrade with Aggregate Base Course.
- c. Aggregate backfill: Aggregate backfill shall be rutted, regraded and compacted prior to pavement base construction.

Insofar as Specifications for mechanical tamping equipment or methods are concerned, no specific requirements are included in these Specifications other than the use of any particular type of equipment is subject to approval of the Engineer, and that he has the sole right to judge what equipment is suitable for the uses intended.

After the completion of refilling, all material not used therein shall be removed and disposed of in such a manner and to such a point as approved or directed by the Engineer; and all roads, sidewalks and other places on the line of the work shall be left clean and in good order. Cleaning up shall be done by the Contractor without extra compensation; and, if he shall fail to do such work within a reasonable time after receipt of notice,

the cleaning up will be arranged by the Engineer, and the cost will be retained out of monies due to or to become due the Contractor, under the Contract.

- (j) **Maintenance of Refilled Excavations Outside Paved Areas: Reshaping.** At his own expense, the Contractor shall maintain refilled excavation in proper conditions as specified herein. Just before final restoration or final inspection, the Contractor shall give the trench surfaces a final reshaping where necessary.

#### **1001.04 MEASUREMENT AND PAYMENT, CLASSIFICATION OF EXCAVATION**

- (a) **Bid Price or Fixed Price.** Payment for excavation is normally included in prices bid for items or at the fixed prices in the proposal and as defined in these Specifications.

(b) **Class 3 Excavation.**

- (1) **Definitions of Subgrade.** In the case of pipe lines, subgrade (except as modified herein) is the underside of the barrel of the pipe when the pipe is laid on a natural or concrete foundation, and the underside of the ribs or sills when the pipe is laid on a timber foundation.

For miscellaneous structures, subgrade is the underside of the masonry or fill material as shown on the Drawings.

- (2) **Excavation Below Subgrade.** Additional depth is Class 3 Excavation when:

- a. The character of the material at the bottom of an excavation requires excavation to an additional depth for any purpose except for the construction of a timber foundation or the laying of an underdrain, or
- b. A trench was excavated by machinery to the grade di-

rected by the Engineer, and he deems it necessary to excavate deeper because of a change in plan or because he had previously been given the wrong grade.

Excavation which may be taken out by default or the Contractor's negligence is not classified as Class 3 Excavation.

- (c) **Preparation of Foundation.** The Contractor must complete excavations in earth as nearly as practicable to the neat lines of the structures to be built therein. Fill all irregularities and cavities (either in earth or rock excavation or in the bottom of trenches or tunnels) to the required level with clean earth or other approved material and compact firmly before laying pipes. This work is performed without extra compensation unless the cavities were formed by the removal of unstable material under the direction of the Engineer, in which case, the excavation is Class 3 Excavation.

## **1002. REPAIRING TRENCH OPENINGS. Flexible Paving:**

**1002.01 DESCRIPTION.** This item consists of repairing trench openings in flexible paving in accordance with Standard Detail R-38 or SHA Standard Details, whichever is appropriate.

**1002.02 MATERIALS.** Not Available

### **1002.03 CONSTRUCTION REQUIREMENTS.**

**1002.03.01 Stage 1.** Place and compact temporary repairs on a daily basis unless otherwise directed for maintenance of traffic by methods which the Engineer judges reasonable. Give minimal regard to seasonal constraints, recognizing the nature of a temporary patch and its relation to the early restoration of traffic. Stage 1 trench repair shall be maintained until stage 2 is done at the Contractor's expense.

**1002.03.02 Stage 2.** Place, compact and test permanent repairs in Accordance with the requirements of 504 and 520 as applicable.

**1002.04 Method of Measurement & Basis of Payment.** Stages 1 and 2 measurements are by the ton as determined by computation. The tonnage reported is determined as the product of trench length, standard width, standard thickness and standard weight based on samples from the supplier for aggregate base course, divided by 2000 pounds per ton.

(a) **Contract Unit Price.** The quantity reported, as provided above, is paid at the contract unit price per ton for Crusher Run Aggregate for Maintenance of Traffic and Bituminous Concrete for Maintenance of Traffic for Stage 1 repairs and for Bituminous Concrete for Permanent Trench Repairs for Stage 2.

(b) **Full Compensation.** Payments constitute full compensation for work incidental to and necessary to provide the finished repair. This work includes, but is not limited to, pavement cutting, excavation disposal of spoil, preparation of subgrade, and placement and compaction of stone and bituminous concrete, maintenance of Stage 1 as well as all necessary labor, materials and equipment.

## **SECTION 1003 — WATER MAINS**

**1003.01 DESCRIPTION.** Sections of cast iron, ductile iron, steel or prestressed concrete cylinder pipe of the diameter shown on the Plans, laid on a firm bed true to line and grade according to these specifications.

### **1003.02 MATERIALS.**

Cast Iron Pipe for Water Mains	905
Ductile Iron Pipe for Water Mains	905
Prestressed Concrete Steel Cylinder Pipe	905
Steel Pipe	905

### **1003.03 CONSTRUCTION REQUIREMENTS.**

**1003.03.01 Laying Pipe.** The Contractor shall:

- (a) **Lowering in Trench.** Carefully lower pipe, fittings and valves into the trench. The ends of pipe must meet each other so that there is no shoulder or unevenness on the inside of the main.
- (b) **Foundation.** Take special care to insure that the pipes are well-bedded on a solid foundation. The Contractor, at his own expense, must correct any defects due to settlement. Dig bell holes large enough to insure the making of proper joints. Take special precautions to prevent any pipe from resting on rock.
- (c) **Tools.** Use proper and suitable tools and appliances for the safe and convenient handling and laying of pipes and fittings. Take great care to prevent the pipe lining and coating from being damaged. The Contractor must repair any lining or coating damaged in any way to the engineer's satisfaction.
- (d) **Cleaning.** Thoroughly clean the pipes and fittings before laying them and keep them clean until the completed work is accepted. After the pipe is thoroughly cleaned, carefully lower it into the trench so as to exclude dirt and other foreign substances. After it has been "joined", keep the end closed with a tight stopper until the next length is laid. At the close of work each day, the end of the pipe must be tightly closed with an expansion stopper so that dirt or other foreign substances do not enter the line. Keep the stopper in place until pipe laying is resumed.
- (e) **Cutting.** If a pipe must be cut to fit it in the line or bring it to the required location, the work shall be performed in a satisfactory manner so as to leave a smooth end. Springing of bell and spigot joints to effect a change in direction is not permitted. Crimping within the limits shown in the Standard Details is allowed.

### **1003.03.02 Mechanical Joints.**

- (a) **General.** Experienced pipe layers shall be employed to install, to the Engineer's satisfaction, all pipes, fittings, fire hydrants and valves to be connected by mechanical joints.

**(b) Sequence of Operations.** The Contractor shall:

- (1) Before making up joints, ensure that the bells, spigots, and rubber gaskets are free from foreign material.
- (2) Position a cast-iron gland on the spigot end of the pipe, then install a thoroughly lubricated rubber gasket with its tapered side facing the bell.
- (3) Fully insert the spigot into the bell.
- (4) Move the rubber gasket into position by hand until the gasket is flush with the face of the bell.
- (5) Place the gland against the face of the rubber gasket, insert the bolts, and make finger-tight.
- (6) Draw the bolts up evenly on alternate sides, beginning at the top.
- (7) Keep the gland parallel to the face of the bell at all times.
- (8) Tighten all nuts uniformly with a torque of not less than 60 nor more than 90 foot-pounds.

### **1003.03.03 Push-On Type Rubber Gasket Joints.**

**(a) General.** Experienced pipe layers shall be employed to install, to the Engineer's satisfaction, all pipes to be connected by push-on type rubber gasket joints.

**(b) Sequence of Operations.** The Contractor shall:

- (1) Perform rubber-gasket jointing in the manner recommended by the manufacturers (essentially as follows).

- (2) Before making up joints, ensure that sockets and spigots are free of foreign material. Insert the gasket in the cleaned gasket seat.
- (3) Apply lubricant to the inside face of the gasket and outside of the spigot.
- (4) Suspend the pipe in its relative position in the trench.
- (5) Push the suspended pipe away from the bell to the adjacent pipe about 1/4 inch, lining it up with the bell; then drive home in a quick movement. The driving leverage method is subject to the Engineer's approval.

**1003.03.04 Prestressed Concrete Cylinder Pipe.** The Contractor shall:

- (a) **Cleaning.** Clean the spigot thoroughly before lowering the pipe into the trench. Also clean the bell of the pipe in a place and lubricate with vegetable soap. Thoroughly lubricate the gasket by immersing it in a viscous solution of vegetable soap before installing it.
- (b) **Maintaining Tension.** After lowering then pipe into the ditch, stretch the gasket around the spigot and settle it into the circumferential groove so that the gasket maintains as even a tension as possible all around the spigot.
- (c) **Aligning with Pipe in Place.** While the pipe is still clear of the trench bottom, align it with the pipe to which it will be joined. While advancing the pipe toward the pipe in place, depress the spigot manually and guide it into the flare of the bell. then lower the pipe until both sections are in the same plane. At this point, thrust the pipe home by advancing the dipper stick.
- (d) **Checking Joints.**
  - (1) **24" Pipe and Larger.** The joints of pipes 24 inches in diameter and larger may be checked from within the pipe. While thrusting the spigot home, check its advance by 2 steel inserts

held in the seat of the bell 180 degrees apart. Then remove the inserts and enter a feeler gauge into the recess until the gasket can be felt. By using the gauge, detect any irregularity in the position of the gasket at any point on the entire circumference of the pipe. If the gasket is out of place, remove the pipe and examine the gasket for cuts. If it is undamaged, it may be used again, but relubricate both the gasket and the joint.

- (2) **Up to 24" Pipe.** In pipes up to 24 inches in diameter, check the joint from without. Insert a gauge in the flare of the bell and run entirely around the pipe to insure that no portion of the gasket is protruding.
- (e) **Thrusting Home.** After checking the joint, thrust the pipe completely home. If additional power is needed, move the sling nearer the bell of the pipe being installed.
- (f) **Grouting.** Place the cloth band around the joint recess, fastening it in place with either the wire or the steel strapping stitched into its edges. Prepare a mix of 1:2 mortar sand grout, liquid enough to flow easily. Pour it into the joint recess beneath the cloth band. To assist the flow and to insure complete filling of the entire recess around the pipe, rod the joint recess with a stiff wire curved to the radius of the pipe. Close the joint recess at the top with a stiffer mix of the same material. The Flex-Protex type joint filler is an acceptable alternate to the above.
- (g) **Filling with Mortar.** Fill the inside joint recess of pipes 24 in diameter and larger with a 1:1 mortar mix. Trowel flush with the interior surface and remove all excess.

**1003.03.05 Connections.** The Contractor shall make connections to existing work when and as directed by the Engineer. On being notified by the Engineer, the Contractor shall notify the consumers in the area to be affected by the shut-off. All valves involved in the work must be operated by Baltimore City Forces. The Contractor must complete the connections

with the greatest possible speed so that the public is inconvenienced as little as possible. If necessary, the Contractor will be required to make connections at night and will be allowed extra compensation for such work. If the Contractor has to remove existing buttresses in order to make connections, he shall do this work without additional compensation.

**1003.03.06 Buttresses and Anchorages.** Place buttresses behind all caps, horizontal bends and branches. When reducers are buttressed, the details will be shown on the Plans. Place anchorages beneath vertical bends. Buttresses and anchorages must be of concrete and steel, as required. Extend them to solid, undisturbed soil and construct in accordance with the Standard Details or as shown on the Contract Drawings.

**1003.03.07 Chlorination and Field Tests.**

**(a) Responsibility.**

**(1) Engineer.** The Engineer will perform the chlorination test on new water main installations before connecting them to the existing structures. He will determine the amount of main to be chlorinated and tested at any one time and he may separate the installation into several sections for long extensions or installations of pipe designed for different head conditions or for other reasons.

**(2) Contractor.** The Contractor shall perform the field test on all new water main installations.

**(b) Water Samples.** The Engineer will collect water samples and provide for their analysis for bacteriological quality. Because the water samples must be brought to the laboratory no later than 4 hours after being taken, chlorination testing is only done between 7:30 a.m. and 12:00 noon. The actual bacteriological tests and report data take about 2 days. If the results are satisfactory, the water main can then be tied into the distribution system. If the results are unsatisfactory, further tests will be conducted. All tests must comply with the A.W.W.A. Standard No. C601-68 for Disinfecting Water Mains.

- (c) **Requests for Testing.** Requests for chlorination testing of new water mains must be made in writing to the Bureau of Engineering & Construction (Division of Construction Contracts Administration), Department of Public Works, at least 3 working days before the date of the test (3 days notice in advance of actually charging water main). The hydrostatic test is conducted under the supervision of the Maintenance Department, Baltimore City, and the Contractor must notify them that the tests are to be made.
- (d) **Temporary Stopping.** At his cost and expense, the Contractor shall furnish all necessary bulkheads, caps, plugs, or other fittings required to temporarily stop off the main for test purposes. After the main is satisfactorily tested according to the requirements of the Specifications, the Contractor must remove the buttresses and caps and connect the new main with the existing main by sleeves and spacers.
- (e) **Discharge of Hydrous Solution.** Discharge a hydrous solution of high-test hypochlorite of lime or chlorine gas into the main near the point where the main is charged. It must be enough to produce a residual of 10 parts per million by weight, of free chlorine, after a contact of 24 hours. If the required residual is not obtained, the Contractor must repeat the chlorination until he obtains this residual.
- (f) **Hydrostatic test.** The Contractor shall: While the main is filled with chlorinated water, raise the pressure to a value as specified in the contract drawings. Maintain the specified test pressure at the low point on the main for at least 30 minutes by adding additional water if required. If the tests show the main to be defective, remedy the defects and retest the main as specified above. Repeat the procedure until the test requirements are met.
- (g) **Leakage Test.** After the satisfactory completion of the hydrostatic tests, the new installation must be subjected to a leakage test of at least 24 hours at working pressure, as directed by the engineer. This test must show a leakage not exceeding 25 gallons per inch of diameter per mile per 24 hours. Until the leakage test re-

quirements are met, the Contractor must make all repairs that may be necessary to accomplish this. After all test have been satisfactorily completed (including the removal of chlorine), the Contractor shall connect the new water main to the distribution system.

**(h) Labor and equipment.** The Contractor shall furnish all labor, water, material and equipment necessary for making the tests and chlorinating the mains.

**1003.04 MEASUREMENT AND PAYMENT.** Measurements for payment are made horizontally along the centerline of the trench through all fittings and valves except between vertical bends where measurement is made along the center of the pipe, including all fittings. The list of pipe fittings shown on water drawings is for convenience only. In case of discrepancy between the list of pipe fittings and the drawings, the drawings will govern.

Water Mains are paid for at the contract unit price per linear foot for the particular type of pipe specified on the Plans or directed by the Engineer. The contract price bid includes:

- Cutting of paving;
- Unclassified excavation and refill;
- Removal, storage and rehandling of excavated material;
- Bracing;
- Pumping and other disposal of water;
- Furnishing and placing of pipe;
- Concrete anchors and buttress;
- Fittings and appurtenances exclusive of valves, vaults and fire hydrants;
- Chlorination field testing; and
- All labor, equipment and work necessary to complete the item.

## SECTION 1004 - WATER VALVES AND VAULTS

**1004.01 DESCRIPTION.** This item consists of placing water valves with appurtenant enclosures and access provisions in water mains at the locations specified on the Plans or as directed by the Engineer according to these Specifications.

**1004.02 MATERIALS.** References to sections on concrete, masonry, reinforcement and casting:

Valves 905

### 1004.03 CONSTRUCTION METHODS.

**1004.03.01 General:** refer to Section 1003.03 and the following:

#### 1004.03.02 Vaults Around Valves:

- (a) **General.** Erect and construct vaults around all valves according to the Standard Details or Plans. Precast concrete vaults as shown on the Standard Details are to be used unless otherwise noted on Plans or directed by the Engineer.
- (b) **Valves 8" and Smaller.** When permitted or directed by the Engineer, erect small sectional concrete vaults around valves 8 inches in diameter and smaller.
- (c) **Valves 10" and 12".** When permitted or directed by the Engineer, erect large sectional concrete valve vaults around 10- and 12-inch valves. Mortar concrete vault sections together and brick up pipe openings on the outside of the vault, using half brick set in mortar.
- (d). **Valves 16", 20", 24" and 30".** Construct built-in-place vaults or fabricate and install precast concrete vaults around valves larger than 12 inches. Pipe layouts must be such that a bell end joint falls within 12 inches of the outside face of the vault with the bell end looking out. Install one-inch pitometer corporations on each side of

each valve over 12 inches in size. The location of these taps must be as shown on the Plans or as directed by the Engineer.

**1004.04 MEASUREMENT AND PAYMENT.** Valves and vaults are measured on the basis of the number of each type built as shown on the Plans or as directed by the Engineer.

Valves and vaults are paid for at the contract unit price bid for the particular type and size installed, which price includes all unclassified excavation and refill; removal, storage and rehandling of excavated material; bracing; pumping or other disposal of water; pitometer corporations; and all materials, tools and labor necessary to complete the item.

## **SECTION 1005 - WATER HOUSE SERVICE, WATER METER SETTING, AND VAULTS**

**1005.01 DESCRIPTION.** This item consists of copper or ductile iron pipes with appurtenant meter housings and connections to the parent main, of the diameter shown on the Plans, arranged and constructed according to the Standard Details and these Specifications, and located as shown on the Plans or as directed by the Engineer.

### **1005.02 MATERIALS.**

Ductile Iron Pipe	905
Copper Pipe	905
Cast Iron Frames & Covers	905
Meter Vaults	905

### **1005.03 CONSTRUCTION METHODS.**

**1005.03.01 Jacking and Driving.** Jack or Drive the water house services under any type of paving unless directed otherwise by the Engineer. For areas other than paved, the Contractor may choose whether to open-cut or drive water house services.

**1005.03.02 Corporation Taps.** Install corporation taps in water mains only after they are chlorinated and tested according to Section 1003.03.07.

**1005.03.03 Water Service Leads.** When installing water service leads 4

inches in diameter and larger, ensure that these leads are level between the proposed meter location and the pipe diameter towards the parent main and that they have a minimum of 4 feet of cover at the curb.

**1005.03.04 Copper Service Lines.** Take special care in placing precast meter vaults over copper service lines to ensure that the vault does not bear on the service and lessen its size. Service lines and tail pieces must have a minimum bury of 4 feet. Tail pieces on 3/4-inch and 1-inch service lines must extend 2 feet past right-of-way line unless otherwise noted.

**1005.03.05 Marking Termination of Tail Piece.** Mark the termination of the tail piece for future location with a 2" x 6" board, extending vertically from the pipe to an elevation 2 feet above grade as an incidental to the house service.

#### **1005.04 MEASUREMENT AND PAYMENT.**

**1005.04.01 Water House Services.** Water house services are measured along the centerline of the pipe and through fittings. Water house services are paid for at the contract unit price per linear foot for the pertinent type of pipe involved. This price includes:

- All material;
- Cutting paving; Driving Sleeves;
- Unclassified excavation and refill;
- Removal, storage and rehandling of excavated materials;
- Bracing, pumping and other disposal of water;
- Labor and all incidentals necessary to complete the work.

**1005.04.02 Meter Settings and Vaults.** Meter settings and vaults are measured on the basis of the number actually built and accepted.

Meter setting and vaults are paid for at the contract unit price for the pertinent meter type and size involved. This price includes:

- Tapping of the main;
- Vaults, frames and covers;
- Fittings as shown in the Standard Details or Plans; and
- All labor and incidentals necessary to complete the item.

**1005.04.03 Meter Relocations.** Meter relocations are measured on the basis of the number actually relocated. Relocations are paid for at the contract unit price for the pertinent meter type and size involved. If new meter vaults, frames and covers, meter yokes or fittings are required, they are paid for on a force-account basis for replacement materials only. All labor and incidentals required to relocate salvaged material, install new material, or revise service connections according to the Plans are included in the contract unit price.

## **SECTION 1006 - FIRE HYDRANTS**

**1006.01 DESCRIPTION.** This work consists of the installation of fire hydrants in, or related to, the locations specified on the Plans or as directed by the Engineer according to these Specifications.

**1006.02 MATERIALS.** Only fire hydrants approved by the Baltimore City Department of Public Works are accepted. See Section 905.

### **1006.03 CONSTRUCTION REQUIREMENTS.**

**1006.03.01 Hydrant Tees.** The Contractor shall install hydrants according to the pertinent drawings in the Standard Details. In addition, he shall tie the hydrant valves to the main line tee with two 3/4-inch diameter, threaded steel rods and nuts or by use of restrained hydrant tee. This permits future removal of the hydrant without requiring the parent main to be shut down.

**1006.03.02 Concrete Buttresses.** Take special care to lay the hydrant leads level on a firm foundation so that the hydrant is plumb. Install standard concrete buttresses against undisturbed earth, capable of developing a passive pressure of 3,000 pounds per square foot. If this bearing cannot be achieved, special buttresses will be required as shown on the Plans or as directed by the Engineer.

**1006.03.03 Relocating Hydrants.** When hydrants are to be relocated,

the Contractor must find out whether or not the hydrant valve has been restrained before removing the hydrant to be relocated. If necessary, cap and block the lead so that service can be restored to the parent main pending the removal or plugging of the mainline tee.

**1006.03.04 Elevation.** Install hydrants at an elevation recommended by the manufacturer for replacement of the breakaway bolts. Install extension pieces if necessary.

**1006.04 MEASUREMENT AND PAYMENT.** Hydrant installation or relocation is measured on the basis of the number built or moved as shown on the Plans or as directed by the Engineer.

Hydrants, complete in place, are paid for at the contract unit price for the particular size installed or relocated. This price includes all excavation and refill, bracing, pumping and other disposal of water, concrete buttresses, and material, tools and labor necessary to complete the item. Extensions pieces which were not included on the Plans, but required due to field conditions, are paid for as extra work.

## **SECTION 1007 - SANITARY SEWERS AND SANITARY SEWER HOUSE CONNECTIONS**

**1007.01 DESCRIPTION.** This work consists of sanitary gravity sewers and house connections of cast iron, ductile iron, clay, concrete, ABS, PVC or asbestos cement pipe of the diameter shown on the Plans, laid on a firm bed true to line and grade according to these Specifications.

**1007.02 MATERIALS.**

Ductile Iron Pipe for Sanitary Sewers	905
PVC Plastic Pipe	905
Reinforced Concrete Pipe for Sanitary Sewers	905

**1007.03 CONSTRUCTION METHODS.**

### 1007.03.01 Laying Pipe.

- (a) **Lowering into Trench.** The Contractor shall carefully handle and lower pipe into the trench. In laying pipe, take special care to insure that each length abuts against the next so that there is no shoulder or unevenness along the inside of the bottom half of the pipe line. Blocking or wedging is not permitted in laying pipe unless by written order or permission of the Engineer.
- (b) **Securing in Place.** Before making joints, the Contractor shall insure that each pipe is well-bedded on a solid foundation. He shall not bring the next pipe into position until the preceding length is thoroughly embedded and secured in place. The Contractor must correct any defects due to settlement at his own expense and shall dig bell holes large enough to insure that the pipe is firmly bedded on the full length of the barrel.
- (c) **Tools and Appliances.** The Contractor shall use proper and suitable tools and appliances in the safe and convenient handling and laying of pipes.
- (d) **Cleaning.** The Contractor shall thoroughly clean the pipes before laying them and keep them clean until the completed work is accepted. He shall carefully fit a stopper in the open ends of pipe lines to keep dirt and other substances from entering. He shall keep the stopper in the end of the pipe line at all times when laying is not in actual progress.
- (e) **Cutting.** When a pipe needs cutting to fit into the line or to bring it to the required location, the Contractor shall perform the cutting in a satisfactory manner so as to leave a smooth end, without extra compensation.
- (f) **Reinforcement.** The Contractor shall place concrete required to support and reinforce Y-branches and bends as shown in the Standard Details or as directed.
- (g) **Construction.** The Contractor shall lay sewer house connections

on a 2-percent grade unless otherwise directed by the Engineer. Construct them of the same class and materials as the sewer mains to which they are connected. Construct single or twin sewer house connections to terminate perpendicular to the property line, with a plugged bell end which will accommodate 6-inch VCPX, unless otherwise noted on the Plans. House connections should terminate 5 feet past right-of-way line unless otherwise noted on the Plans.

- (h) **Watertightness.** The Contractor shall keep the excavation in which pipe is being laid free from water. He shall not make any joints under water nor allow water to rise in the excavation until the joint material receives its set. He shall take the greatest care to secure watertightness and to prevent damage to, or disturbing of, the joints during refilling or at any time. After laying pipes and making the joints, he shall not walk on or work over them, except as may be necessary in tamping, until there is a covering at least 2 feet deep over their top.
  
- (i) **Cement Asbestos Pipe.** The Contractor shall place in accordance with the installation recommendations of the pipe manufacturer and applicable portions of this Specifications.
  
- (j) **Branches.** The Contractor shall locate in the position designated by the Engineer or his representative. He shall field-cut short pieces of lateral sewer to meet this condition. The Contractor must have on the work, at all times, factory-approved equipment to machine and adapt the field-cut end of short pieces of pipe to standard couplings and jointing materials.
  
- (k) **Weather Restrictions.** Do not lay pipe on a foundation into which frost has penetrated nor at any time the Engineer deems there is danger of the formation of ice or the penetration of frost at the bottom of the excavation, unless the minimum length of open trench and promptness of refilling are observed.
  
- (l) **In-Use Deflection Limit.** The maximum allowable in-use deflection limit is 5%.

(m) **References.** See section 1003.03 for additional information on laying cast iron and concrete pipe which is applicable to this work also. Refer to ASTM Designation D-2321 for installation requirements of ABS and PVC sewer pipe. Also refer to the manufacturers' recommendations.

### **1007.03.02 Acceptance Testing.**

(a) **Examination.** The Contractor will examine all completed pipelines to insure that they are laid to proper alignment and grade and free of foreign materials. Upon the Engineer's approval, the Contractor will test all portions of the sewers built under this contract.

(b) **Method.** The testing method shall be the low-pressure air test (ASTM F1417 for thermoplastic pipe or ASTM C924 for concrete and ductile iron pipe), unless otherwise directed by the Engineer.

(c) **Test.** If so directed by the Engineer, the following test methods may be required:

Negative Air Pressure (Vacuum) Test, ASTM C1214

Infiltration Test, ASTM C969 (for concrete or ductile iron pipe)

Infiltration Test, ASTM C1091 (for thermoplastic pipe)

(d) **Standards.** ASTM Standards shall be used to establish procedures, equipment, acceptance criteria, and safety precautions.

**1007.03.03 Connections to Existing Sewers.** Connection can only be made with the permission of the Engineer.

Do not make connections to existing sanitary sewers until after the final inspection and approval of tests. The Contractor must furnish all material and labor required for the tests. The cost thereof is included in the prices bid for furnishing and laying sewers. The Contractor must also furnish water for leakage tests.

**1007.03.04 House Connections.** All house connections to existing sewers shall be unobstructed, watertight, and capable of passing an air pressure test as described in the Section “Acceptance Testing” above.

Only two methods are permitted for making house connections to existing sewers:

- (a) Connections made by cutting the existing line and installing a compatible wye section by means of sleeves, all as approved by the Engineer
- (b) Tapping into the existing line using saddle connections as submitted to and approved by the Engineer.

House connections shall be marked with a 2" x 6" board extending vertically from the pipe to an elevation two (2) feet above grade, as an incidental to the house connection.

**1007.03.05 Measurement and Payment.** Sanitary Sewers: Horizontally along the centerline of the trench from center-to-center of manholes and through fittings.

Sewer House Connections: Along the centerline of the 6-inch pipe through the 6-inch x 6-inch x 4-inch wye fitting from the home of the wye branch on the main sewer to the 6-inch cap and from the home of the 4-inch, 45 degree elbow to the 4-inch plug (stand detail S-12A)

The unit price bid per linear foot for furnishing and laying sanitary sewers and sewer house connections includes and covers:

Cutting paving;

Unclassified excavation and refill removal;

Storage and rehandling of excavated materials;

Bracing;

Pumping and other disposal at water;

Furnishing and placing all pipe, fittings, and joining materials, including the encased 6-inch x 6-inch x 4-inch wye and 45 degree elbow on house connections;

Testing;

Incidentals and related work as shown, specified, and directed.

## SECTION 1008 - SANITARY SEWER MANHOLES

**1008.01 DESCRIPTION.** This work involves sanitary sewer manholes and miscellaneous structures of concrete or brick masonry, built to the shapes and dimensions shown in the Standard Details or on the Plans, at the locations indicated on the Plans or as directed by the Engineer.

### 1008.02 MATERIALS.

**1008.02.01 General.** The materials to be used in any particular structure shall be as specified on the Plans, the Standard Details or the Special Provisions. Structures shall be of precast concrete unless noted otherwise. Unreinforced concrete shall be Mix No. 1, air-entrained, unless noted otherwise.

### 1008.02.02 Materials.

Sewer Brick	903.01
Manhole Brick	903.02
Concrete and Mortar	902
Reinforced Steel	908
Castings	909

### 1008.02.03 Manhole Steps.

- (a) **Construction Material.** Galvanized steel, stainless steel; or polypropylene, plastic-coated, deformed steel rod.
- (b) **Design.** Design steps according to 29 CFR 1910.27(a) for the minimum design live load specified. Minimum tread width is 10 inches. Provide a clearance between the step tread and the manhole wall of 6 inches. Provide a minimum of 3 inches imbedment in the walls of precast manhole walls. Design manhole steps to prevent the foot from sliding off the end of the step.
- (c) Precast Manhole Steps shall be in accordance with ASTM C478 and as specified above, whichever is more stringent.

**1008.02.04 Precast Concrete Manholes.** These manholes must meet the requirements of ASTM C 478. The adjustment brick under the frame must not be more than 1 foot high.

### **1008.03 CONSTRUCTION.**

**1008.03.01** Precast Concrete Manholes shall be installed as shown on the Plans and Standard Details.

**1008.03.02 Weather Restriction (Brick Manholes).** Do not lay brick when the temperature is below 40 degrees Fahrenheit or when lower temperatures are predicted within 24 hours unless the protection of brickwork is approved by the Engineer. Take such measures as may be approved to prevent brickwork from being exposed to freezing temperatures for no less than 5 days after laying.

**1008.03.03 Plastering (Brick Manholes).** Plaster the outside of brickwork with cement mortar 1/2 inch thick. Do not backfill around brick structures until the third day after completing brickwork.

**1008.03.04 Channels for Water.** Form channels for receiving and passing water in the bottom of manholes as shown or directed. Line the channels with sewer brick. Channels must slope smoothly and evenly from the main pipe entering the manhole to the outlet pipe. Build channels for future extensions into manholes where shown on the Plans or where directed by the Engineer.

**1008.03.05 Wider or Deeper Foundations.** Build foundations wider or deeper than shown on the detail drawings for manholes of concrete masonry, whenever directed. Build manholes as pipe laying progresses. The Engineer may stop work entirely on laying pipe until the manhole just passed is completed.

**1008.03.06 Templates (Brick Manholes).** In constructing manholes, accurate templates, set at a height to which the manhole is to reach, may be required. From the templates, draw no less than 4 lines to serve as a guide for the brickwork. Neatly strike and point the joints on the inside of manholes. A reasonable number of bats originating on the work may be used.

**1008.03.07 Manhole Frames, Covers and Steps.** Furnish and set these items as work progresses. Insure that the frames are well-bedded in mortar. Space vertically and align as shown on the Standard Detail Drawings.

**1008.03.08 Drop Connections.** Build drop connections of the various types shown in the Standard Details where shown on the Plans or where directed by the Engineer.

**1008.03.09 Acceptance Testing.**

- (a) The Contractor shall test all manholes using the Negative Air Pressure (Vacuum) Test ASTM C1244 which establishes procedure, equipment, acceptance criteria and safety procedures.
- (b) The Contractor must replace or repair all defects on manholes failing to meet the test requirements.

**1008.04 MEASUREMENT AND PAYMENT.**

**1008.04.01 Sanitary Sewer Manholes.** Measurement is on the vertical-foot basis from the bottom of the frame to the invert of the channel at the center of the manhole.

- (a) **Items Covered.** Sanitary Sewer Manholes are paid for at the contract unit price per vertical foot constructed. The price bid per vertical foot includes and covers:

Furnishing and placing all concrete and brick masonry and appurtenances, excluding frame and cover, and

Building manholes complete as shown, specified or directed.

- (b) **Items Not Covered.**

Excavation and refill, bracing, acceptance testing and pumping or other disposal of water are included in the price bid for furnishing and laying sanitary sewers.

**1008.04.02 Cast-Iron Frames and Covers.** Measurement for cast-iron frames and covers of the type specified is based on the number installed and accepted. Payment for furnishing and placing these items is made at the unit price for the number of frames and covers furnished and set as shown, specified, and required.

**1008.04.03 Building Drop Connections.** Measurement is based on the number constructed and accepted. The manhole on which the drop structure is placed is measured and paid for separately. Payment is made at the unit price bid for each of the several types and various sizes constructed as shown, specified, and directed.

**1008.04.04 Contingent Items.** Payment is based on trench width as specified.

## **SECTION 1009 - SANITARY SEWER FORCE MAINS**

**1009.01 DESCRIPTION.** This work consists of sanitary sewer force mains of Ductile Iron or Prestressed Concrete Pressure Pipe and appurtenances of the sizes shown on the Plans, laid on a firm bed, true to line and grade, in accordance with these specifications.

**1009.02 MATERIALS.** Ductile Iron Pipe - Section 905 (Force Main thickness class will be Class 54 unless otherwise noted on the Plans. The Contractor shall select fittings having socket dimensions and thickness suited for the class designated.)

Prestressed Concrete Cylinder Pipe - Section 905 (For sanitary sewer force mains, PCCP shall be manufactured with ASTM C150, Type II cement, only. Coarse aggregate for pipe concrete shall consist only of hard, durable, particles of limestone.)

**1009.03 CONSTRUCTION METHODS.** Follow the methods outlines in Subsection 1003.03 for Water Mains, except that chlorination is not required for testing force mains after installation of the pipe.

**1009.04 MEASUREMENT AND PAYMENT.** Measurement is made horizontally along the centerline of the force main through all fittings except between vertical bends where measurement is made along center of the pipe, including all fixtures.

Force Mains are paid for at the contract unit price per linear foot for the particular type of pipe specified on the Plans or directed by the Engineer. The contract price includes:

- Cutting and paving; Unclassified excavations;
- Refill, removal, storage and rehandling of excavated material;
- Bracing, pumping or other disposal of water;
- Furnishing and placing all pipe and appurtenances;
- Concrete anchors and buttresses; Testing; and
- Related work as shown, specified and directed.

## **SECTION 1010 - TRENCHLESS EXCAVATION / TUNNELING**

**1010.01 DESCRIPTION.** This work consists of the furnishing of trenchless excavation (interchangeably used with the terms trenchless technology, tunnel, tunneling, or method for purposes of this specification) which serve as a carrier for other utilities or as the conduits themselves. These trenchless excavations shall be installed to the lines and grades shown on the Plans by a method chosen by the Contractor unless otherwise specified on the Plans. The Contractor is responsible to select a method suitable for the conditions to be encountered and to assure no disturbance to the existing surface.

**1010.02 MATERIALS.** The Contractor shall have the latitude to choose the material of the trenchless excavation subject to the restrictions noted below.

**1010.02.01 Design.** The trenchless excavation method shall be designed for the earth, construction, and other loads present plus AASHTO HS25 Highway Live Load increased 30 percent for impact. The Contractor's engineer, who must be registered in the State of Maryland, shall prepare the design for approval by the Engineer. Steel Tunnel Liner Plates, if used,

shall be designed in accordance with the latest edition of the Standard Specifications for Highway Bridges adopted by the American Association of State Highway and Transportation Officials. All design shall be in accordance with OSHA, MOSH, and all federal, state, and local regulations.

**1010.02.02 Steel Tunnel Liner Plates.** Steel tunnel liner plates shall be galvanized in accordance with ASTM A386 if under a state highway or if the steel tunnel liner is to be the conduit itself.

### **1010.03 Construction.**

**1010.03.01 Working Drawings.** The Contractor shall submit working drawings for approval by the Engineer on the trenchless excavation method itself and on any required jacking and receiving pits. The working drawings shall be signed and sealed by an engineer registered in the State of Maryland. The Contractor shall submit six copies of drawings showing typical sections and details of the trenchless excavation method to be used, and any grouting procedures. Working Drawings shall contain certification by the Contractor's engineer that the proposed trenchless excavation method and the proposed construction of any jacking and receiving pits have been designed in accordance with these Specifications. It is the intent of these Specifications to specify a performance standard leaving the choice of material and trenchless excavation method of construction to the Contractor. Approval of the Working Drawings is to insure preparation of design by a Professional Engineer and shall not relieve the Contractor of the responsibility for the adequacy and accuracy of the Working Drawings when implemented in the field.

**1010.03.02 Placing and Furnishing of Trenchless Excavation.** After submittal of the Working Drawings and at least two weeks before Construction begins the Contractor shall submit to the Engineer a Trenchless Excavation Plan wherein the Contractor will present his schedule for trenchless excavation operations, and fully describe his proposed methods and operations to be employed. Review of the Trenchless Excavation Plan is for quality control and record keeping purposes and shall not relieve the Contractor of the responsibility for the accuracy and adequacy of the Trenchless Excavation Plan when implemented in the field. If at any time during the progress

of the work the method of trenchless excavation does not produce the desired result, the Contractor shall submit a revised Trenchless Excavation Plan until a technique is arrived at that shall produce the desired results. The revised Trenchless Excavation Plan and method shall be performed at no additional cost to the County.

**1010.03.05 Grout.** Mortar for grouting shall conform to the requirements of Section 903.06 with only enough water to permit the material to flow properly. Flowable Backfill may also be used for grouting in accordance with Section 313. Other backfilling methods may be submitted for approval but must be able to meet the performance standard that the grout or equivalent must be non-erodible, must completely fill the space between the conduit and the tunnel liner, and after the deterioration of the tunnel liner must be able to transmit all loads to the conduit. The Contractor shall also provide sufficient grouting plugs and make provisions to backgrout outside of the tunnel liner to fill voids, prevent shifting of the tunnel, and prevent overhead settlement.

**1010.03.03 Preconstruction Survey.** The Contractor shall survey, photograph, and videotape all buildings, structures, and roadways within a horizontal distance of the centerline of the trenchless excavation that is three times the vertical distance from the invert of the trenchless excavation to the finished grade over the trenchless excavation. This survey shall be performed by a company that can show acceptable previous experience to the Engineer. The Survey shall be prepared and submitted to the Engineer and shall be sufficient to document the existing condition of any cracks, settlement, upheaval, spalls, or other existing deficiencies in existing buildings, structures, or roadways. If the trenchless excavation is under wetlands or other surface, the complete condition of the wetlands or other surface which is over the proposed trenchless excavation shall be documented. The Preconstruction Survey shall be made before any trenchless excavation is done in the field.

**1010.03.04 Line and Grade.** It is of essential importance that all trenchless excavations be constructed to the line and grade specified on the Plans. The

Engineer shall establish initial control information prior to the initiation of work. The Contractor shall furnish line and grade information to the Engineer at intervals not exceeding 25 feet, so that the Engineer can verify proper line and grade.

**1010.04 Measurement and Payment.** Trenchless Excavation shall be measured and paid for at the Contract unit price per linear foot. The payment will be full compensation for all trenchless excavation and refill; the storage and rehandling of excavation, disposal of all excess excavation; the furnishing of select borrow if required; replacing sod where disturbed; pumping or other disposal or control of water and sewage; the protection of all structures, utilities, and wetlands, and their restoration in case of injury; the furnishing and placing of all pit sheeting and bracing to remain in place; the furnishing and placing of the tunnel material; the grouting of voids outside the tunnel liner if used; and the furnishing and placing of grout, concrete or sand fill, and brick bulkheads; and the furnishing of all labor, tools, materials, apparatus, equipment, Working Drawings, Trenchless Excavation Plan, Preconstruction Survey, and related work necessary to complete the trenchless excavation section. The furnishing and placing of the utility pipe in the trenchless excavation will be paid for under the item of the Proposal for furnishing and laying utility pipe of the size and material required on the Drawing.

## **SECTION 1011 - ABANDONMENT OF WATER APPURTENANCES**

**1011.01 DESCRIPTION.** This work shall consist of the disposition of existing appurtenances of the water system noted on the contract drawings to be abandoned or removed and restoration of the site.

**1011.02 MATERIALS.** N/A

**1011.03 CONSTRUCTION.**

- (a) The Contractor shall remove fire hydrants, water valves eight inches and larger, and valve frames and covers which are to be abandoned and return them to the Baltimore City Maintenance Facility

at 2947 Washington Boulevard on weekdays between 8:30 a.m. and 4:30 p.m.

- (b) The Contractor shall remove water meters which are to be abandoned and return them to Baltimore City as directed.
- (c) The Contractor shall remove the top portions of valve vaults, meter vaults and roadway boxes to be abandoned and backfill the area.
- (d) The Contractor shall restore the surface with materials appropriate to the site as directed by the Engineer.

**1011.04 MEASUREMENT AND PAYMENT.** This item is not measured. Costs of Abandonment of Appurtenances are included in the price bid for items of new construction. Restoration of the surface is paid for under the items bids for seed and mulch, sod, bituminous concrete for permanent trench repair, or concrete sidewalk, as applicable.