

CATEGORY 300

DRAINAGE & UTILITY CONSTRUCTION

SECTION 300 - GENERAL REQUIREMENTS

300.01 DESCRIPTION. This section provides specifications peculiar to water main, sanitary sewer and storm drain construction. Specifications common to both highway and utility construction are found in other portions of this volume as applicable.

300.02 MATERIALS: Not applicable

300.03 CONSTRUCTION:

300.03.01

(a) **Contract and As-Built Drawings.** The Contractor shall have contract drawings showing 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. The Contractor shall also maintain a complete set of these plans showing As-Built construction changes for use in maintaining a permanent record of the completed construction that shall become the property of Baltimore County at the completion of the Contract.

Following installation, the Contractor shall provide the Engineer with “As-Built” survey data for each fire hydrant, water meter vault cover, water valve vault cover, sanitary and storm drain manhole invert and frame and cover, storm drain inlet invert and grate, and sanitary sewer cleanout (block) installed, as applicable. Survey data shall consist of horizontal datum based upon Maryland State Plane coordinate system NAD 83/91 and shall be accurate to 0.10 feet. Vertical datum shall be based upon NAVD88 and shall be accurate to 0.10 feet.

At the Contractor’s option, the required “As-Built” survey data may be provided on either individual sketches or on the “red-lined” As-Built drawings that he is to supply to the Engineer at the completion of the Contract.

Final payment shall not be made and/or Contract acceptance shall not be given until the Contractor provides an acceptable As-Built plan and survey.

As-Built requirements for Stormwater Management facilities, specialized geotechnical or biotechnical inspections, use of geotextiles, and for other specified

purposes shall be in accordance with Sections 306.03.02, 314 and 315.

(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. The County does not require a hold harmless agreement for UA and RA contracts.

300.03.02 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 also shall bear the expense of resurfacing or repaving over any tunnel excavation that settles.

300.03.03 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.

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 main, sewer main or storm drain, as applicable, at the point of the proposed tie-in. This excavation and the associated backfill shall be measured and paid for as part of the Fixed Price Contingent Items for *Test Pit Excavation*, either within or outside of road paving as applicable.

(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. Owners will brace their utility poles when required, 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, with the approval of the Engineer, may leave a gap and return to fill the gap after the obstructions have been removed.

(f) **Non-Interference with Others.** See Sections GP 5.06, 7.06 and 7.07.

300.03.04 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 negotiated 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 Standard Detail G-6, ***Trench and Trench Payment Width.***

All trench bracing or support systems shall comply with the latest requirements of the Maryland Occupational Safety and Health Administration (MOSHA) 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 Standard Details G-6 and G-7

§ *Trench Width plus 2 feet,*

§ *Crusher Run Paving Width plus 2 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 Standard Details 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. If depth is over 16 feet, trench width will be increased to 6 feet greater than the outside width of the appurtenance for the portion over 16 feet deep. Item payments are based on these widths.

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

- (5) **Use of trench boxes with flexible pipe.** Prior to construction of pipe systems involving use of flexible metal or plastic pipe, the Contractor shall present and obtain approval from the Engineer for a trench design that will allow use of a trench box without disturbing placed and compacted pipe bedding and/or haunching used to support flexible pipes. The Engineer shall require that sheeting be left in place in lieu of using trench boxes if the movement of a trench box will disturb placed and compacted pipe bedding and/or haunching used to support flexible pipes. If the Engineer determines that disturbance of compacted pipe support material has occurred, the Contractor shall be solely responsible for replacement or repair to pipe alignment and compacted supporting material to the satisfaction of the Engineer in the event that any such disturbance occurs.

- (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, or be in violation of MDE or Baltimore County Department of Environmental Protection and Sustainability requirements. 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 contingent fixed price item *Class 3 Excavation and Selected Backfill* with proper onsite / offsite disposal as applicable (by Template method) except as otherwise directed by the Contract Documents.
- (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 contingent fixed price item *Class 3 Excavation and Selected Backfill* with proper onsite / offsite disposal as applicable.
- (f) **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.

If the material excavated from the trench is a combination of materials that are suitable and unsuitable for backfill based upon strata or location, the Contractor shall be responsible for separating the suitable material for use as backfill in accordance with the instructions of the Engineer. All costs associated with this effort shall be included in the price of the pipe or structure being installed.

- (g) **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.

(h). Refilling Trench.

(1) **Required by Engineer.** At any time, the Engineer may require the refilling of open trenches over completed pipelines 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 shall cause the ditch to be refilled, 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.

(3) Refilling Procedures.

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 With Onsite / Proper Offsite Disposal of Unsuitable Material***, contingent fixed price items, shall be used. Payment 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.

Use all suitable excavated material for backfill or store for future use. Do not waste excavated material without approval. Prior to using excavated material as backfill, remove boulders, logs, and other unsuitable material. Dispose of unsuitable material in an approved disposal area.

(4) Compaction Around Pipes.

Prior to beginning excavation, the Contractor shall present the Engineer with manufacturer-approved specifications for compaction to be used for the particular pipe material being installed. The pipe to which the manufacturer-approved specifications apply shall be installed in full compliance with these specifications, except as otherwise directed by the Contract Documents.

For rigid pipes such as reinforced concrete pipe and for ductile iron pipes, the following compaction specifications shall be used: Suitable material shall be carefully placed around the pipe and brought up evenly along both sides of the pipe 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 trench compaction as used within road right-of-way 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, trench compaction as described below, will be required for rigid pipe and ductile iron pipe 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 where rigid pipe and/or ductile iron pipe are used, 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 to ensure no consolidation or settlement. If a waiver of 60-day maintenance of stone base is desired, the Developer must contact the Division of Construction Contracts Administration for application prior to grading. For all material with moisture content more than 3 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 shall apply:

- a. Undercut trench backfill 1 foot plus an overcut of 2 feet on each side of the trench.
- b. Place soil reinforcing geotextile meeting AASHTO M-288 Class SE or ST as applicable or an equivalent reinforcing grid, as specified, and fill to original subgrade with Aggregate Base Course.
- c. 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. The Contractor shall clean up without extra compensation. If the Contractor fails to do such work within a reasonable time after receipt of notice, the Engineer shall arrange for the necessary clean up effort, and the cost will be retained out of monies due to or to become due to the Contractor, under the Contract.

- (i) Place magnetically detectable plastic tape in the trench immediately above the structural backfill. The minimum thickness of the tape shall be 5.5 mils and the minimum tensile strength shall be 5000 psi. Demark the tape as to its purpose (i.e., "STORM DRAIN").
- (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.

300.03.05 Steel Plates

300.03.05.01 Description. Work consists of temporary placement of steel plates to allow equipment access and maintenance of traffic where construction requires that an open trench or open cut excavation be maintained.

300.03.05.02 Materials. All steel plates shall be flat, shall be at least one (1) inch thick and shall be held in place with pins. Steel plates shall be large enough to allow a minimum of one (1) foot of bearing on the sides of the trench or open cut excavation. Steel plates shall be welded along abutting edges if required by the Engineer.

300.03.05.03 Construction. If the Contractor elects to bridge a trench or open cut excavation within paved areas of the construction area with steel plates, the Contractor shall notify the Engineer forty-eight (48) hours in advance of placement of any steel plates. If multiple plates are required to cover an open cut excavation, the Contractor shall also submit a detailed plan to the Engineer showing the placement of all steel plates and the proposed support system if required. The Engineer shall approve this detailed plan prior to any installation or use of steel plates by the Contractor. The County reserves the right to require that a registered Professional Engineer, licensed in the State of Maryland, sign and seal the plan. Steel plate locations in public roads shall be subject to speed restrictions as directed by the DPW Bureau of Traffic Engineering.

The Contractor shall place appropriate signs at the locations of all steel plates. These signs shall conform to Md MUTCD specifications. Spacing of these signs shall be approved by the Engineer and shall be determined by field conditions.

Steel plates shall be set as flush as possible with the road or ground surface. There shall be no

lateral movement of the individual steel plates when vehicles cross the plates.

When steel plates will be left in any public road longer than seven (7) calendar days, the steel plates shall be recessed in order that the plate surface is flush with the road surface. Steel plates placed in paved roads shall have bituminous concrete cold mix placed along all edges of the plate in order to minimize the transition of vehicle wheels from adjacent paving to plate and from plate to adjacent paving. Cold mix shall be tapered from the height of the steel plates to the existing road surface to provide a smooth transition for traversing vehicles and minimize the risk to the public. The Contractor shall maintain the cold patch as a transition for as long as the plates are to be traversed by traffic.

The Contractor shall be responsible for maintaining the surface of steel plates in the case of wet or slippery weather. At the direction of the Engineer, the Contractor shall spread sand and/or salt to maintain tire traction on the surface of the plates.

The Contractor shall provide the Engineer with the names and phone numbers of at least two (2) contact persons that shall be available for the duration of the steel plate installation to respond to problems or emergencies involving the steel plates or its support system. If a problem or an emergency occurs with a steel plate in a public road that requires immediate attention, County forces will correct the issue. The County shall withhold payment to the Contractor for related items to compensate for any costs incurred by the County.

300.03.06 Television Inspection: Storm Drain, Sewer Pipes and Associated Structures

300.03.06.01 DESCRIPTION OF WORK.

(a) **Reference.** All applicable requirements of other portions of the Contract Documents apply to the Work of this Section.

(b) **Description of Work.** The work covered by this section consists of providing all labor, equipment, material and supplies and performing all operations required to conduct the internal closed-circuit television inspection and recording of all storm drain and sewer pipelines.

(c) **Definitions.**

- Pre-Installation TV Inspection is a video inspection by the Contractor of sewer and storm drain pipelines specified for rehabilitation to confirm cleaning, location of drain and sewer service connections and constructability of the rehabilitation according to the Specifications.
- Post-Installation TV Inspection is a video inspection to determine that rehabilitation, replacement or new construction of a sanitary sewer or a storm drain pipeline has been completed according to the Specifications.

- TV Inspection Log. Information collected and recorded by each TV operator for any TV inspection that is submitted to the County.
- PACP: Pipeline Assessment and Certification Program. A CCTV inspection standardization certification and observation coding system sponsored by the National Association of Sewer Service Companies (NASSCO).
- Digital Recordings: For purposes of this work, inspections shall be recorded to digital (DVD, USB flash drive) rather than analog (video tape) media. All digital recordings made shall be fully compatible with CASSWORKS, and shall have the capability to be integrated into CASSWORKS.

(d) Submittals

- Digital recordings for each pipeline project inspected. Digital recordings shall be submitted to the Engineer in the form of a DVD, or on a USB flash drive (subject to prior approval by the Engineer).
- TV Inspection Log: Each TV Inspection Log shall be submitted to the County, accompanied by the respective digital recordings.
- PACP Operator Certification: Prior to initiating CCTV Inspection work associated with condition assessment assignments, the Contractor shall present the County with copies of PACP certifications of operators that will be performing the work.

300.03.06.02 MATERIALS.

(a) Closed Circuit Television Equipment. Select and use closed-circuit television equipment that will produce a color video.

(b) Pipe Inspection Camera. Camera shall produce a video using a pan-and-tilt, radial viewing, pipe inspection camera that pans ± 275 degrees and rotates 360 degrees. The television camera used for the inspection shall be specifically designed and constructed for such inspection. The camera shall be operative in 100% humidity conditions. All attributes (distance, etc.) must be coded in accordance with accepted PACP standards. Use a camera with an accurate footage counter that displays on the monitor the exact distance of the camera (to the nearest tenth of a foot) from the centerline of the starting manhole. Use a camera with camera height adjustment so that the camera lens is always centered at one-half the inside diameter for circular pipe and two-thirds the rise (height) for elliptical pipe. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The video camera shall be capable of showing on the digital files the Owner name, Contractor name, date, line size and material, line identification (Owner's manhole numbers at both ends) and ongoing footage counter. The camera, television monitor, and other components of the video system shall be capable of producing picture quality to the

satisfaction of the County; if picture quality is not satisfactory, the TV inspection will not be accepted. The camera shall remain properly focused at all times during recording. No payment will be made for an unsatisfactory inspection recording.

(c) Data Media.

- All television inspections shall be provided on DVD (or via flash drive if pre-approved by the Engineer). All DVDs (and flash drives) will become the property of the County when submitted to the Engineer.
- Submittals shall be equipped with an appropriate software viewer, to be supplied by the Contractor at no additional cost to the County. The submittal's electronic files shall be capable of being downloaded to CASSWORKS. CASSWORKS is currently capable of accepting POSM and WINCAM software. All conversion required to accomplish the download to CASSWORKS-compatible formats shall be done by the Contractor at his expense.
- Two labels are required for DVDs. One label shall be placed on the DVD and the other on the DVD case. One tag shall be wired to a flash drive. Permanently label each submittal with the following information:

On DVD/Flash Drive Tag:

County Name: _____	Contractor's Name: _____	Project Name
Inspection Type:	<input type="checkbox"/> Survey	<input type="checkbox"/> Pre-Installation <input type="checkbox"/> Post-Installation
DVD No.: _____	Date Televised: _____	Contract
No.: _____		
Basin No: _____	Drawing No. _____	

When a flash drive is approved for use, this same information shall be legibly placed on a paper tag attached securely to a flash drive. Manhole from and to, pipeline diameter and length and street name information shall be legibly added to the rear face of the tag.

DVD Case as applicable:

County Name: _____		Contractor's Name: _____		Project Name _____	
Inspection Type: [] Survey [] Pre-Installation [] Post-Installation					
DVD No.: _____		Date Televised: _____		Date Submitted: _____	
Basin No: _____		Contract No.: _____		Dwg.No.: _____	
Manhole No. From	Manhole No. To	Pipe Diameter	Pipe Length	Street	
_____	_____	_____	_____		
_____	_____	_____	_____		
_____	_____	_____	_____		
_____	_____	_____	_____		

300.03.06.03 CONSTRUCTION.

(a) Pre-Installation Inspection: For storm drain projects, a pre-installation inspection shall be done only for pipe rehabilitation projects.

1) Procedure.

- Perform pre-installation TV inspection immediately after pipeline cleaning and before pipeline rehabilitation work. Prepare Television Inspection Logs. Maintain copies of digital recordings and reports for reference by the County for the duration of the project.
- Prior to any repair work, the entire storm drain (from outfall to inlets) or sewer line from manhole to manhole shall be televised. The Engineer may direct at his discretion that camera inspection of large storm drains that are otherwise accessible for entry and inspection may be exempted from camera inspection. The pre-installation inspection shall be used to determine whether the pipeline has been cleaned sufficiently; to confirm the location and nature of defects; and to confirm that the proposed method of repair is proper for the defects observed.
- The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the pipeline's condition. In no case shall the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the pipeline condition shall be used to move the camera through the storm drain.
- If, during the inspection operation, the television camera will not pass through the entire section of pipeline or the manhole/structure section, the Contractor shall set up his equipment so that the inspection can be performed from the opposite direction/manhole. If, again, the camera fails to pass through the

entire pipe section, the inspection shall be considered incomplete until repair/adjustment is made allowing camera passage for completion of the TV inspection. If the section of pipeline is determined impassable, the Contractor shall request additional instructions from the Engineer, which may include making contact with BCBE/Design or the associated consulting design engineer to identify subsequent actions. Improper cleaning is not acceptable as a reason for incomplete televising of a section of storm drain or sewer pipeline.

- When manually operated winches are used to pull the television camera through the pipeline, telephones or other suitable means of communication shall be set up between the two manholes of the section being inspected to insure good communication between members of the crew.
- The importance of accurate distance measurements is emphasized. Measurements for location of defects shall be above ground by means of a meter device. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Accuracy of the distance meter shall be checked by the use of a walking meter, roll-a-tape, or other suitable device. The meter device shall be accurate to within one-tenth of a foot.
- During the internal inspection the television camera shall be temporarily stopped at each defect along the line. The Contractor shall record the nature and location of the defect. Where defects are also active infiltration sources, the infiltration shall be classified in terms of PACP coding. In sewers, the camera shall also be stopped at active service connections where flow is discharging. If the flow is continuous, the Contractor shall check the property involved in an effort to determine whether the flow is indeed sewage. Flows from sewer service connections that are determined to be infiltration shall also be recorded. If soil/backfill has infiltrated into pipe at a joint or elsewhere, the location and severity shall be noted.
- Camera operator shall slowly pan and tilt at beginning and ending manholes/inlets, at each sewer service connection and drain pipe connection, at each joint, at visible defects and when pipe material transitions from one material to another. Zoom in on defects and connections if the camera will allow this.
- TV inspection digital recordings shall be continuous for pipe segments between manholes. Do not leave gaps in the recording of a segment between manholes, do not repeat pipe segment inspections on the same or subsequent digital recordings, do not show incomplete pipe inspections or overlap a pipe segment inspection between 2 DVDs or flash drives.

2) Flow Control.

- Televising a storm drain pipeline shall be done only during periods when minimal base flow (or no flow) is present.
- The contractor shall remove all equipment from storm drains and replace manhole covers when rainfall sufficient to raise the level of water in the drain is imminent.
- Flow control for televising the pipeline shall be the responsibility of the Contractor.
- In sewers, if the flow depth of a manhole section exceeds 20% of the pipe diameter during a survey TV inspection, reduce the flow depth to an acceptable level by diversion pumping, by pulling a camera with swab, by high-velocity jet nozzle or by other acceptable dewatering devices or methods. If this is not possible, perform the survey TV inspection during minimum flow hours. A digital recording made while floating the camera is not acceptable unless approved by the County prior to doing the inspection.

3) Documentation of Television Inspection.

- The Television Inspection shall be documented using a computerized datalogger and reporting system.
- Television Inspection Logs: Printed location records shall be kept by the Contractor and shall clearly show the location of each defect or infiltration point (sewers) observed during inspection in relation to an adjacent manhole. Sanitary manholes should be identified by number, with no prefixes such as MH-, SMH-, etc. In addition, locations of drain connections, sewer service connections, building sewers, unusual conditions, roots, cross connections with other utilities, broken or damaged pipe, presence of scale and corrosion on metal pipe, and other discernible features shall be recorded. A copy of these records shall be supplied to the County.
- Digital Photographs: Noted defects and connections shall be documented as digital files and hard copy print-outs. Photo logs shall accompany each photo submitted.
- Digital Recordings: The purpose of digital recording shall be to supply a visual and audio record of problem areas of the drains that may be replayed. Digital recordings shall include an audio track recorded by the inspection technician during the actual inspection work describing the parameters of the line being inspected (i.e. location, depth, diameter, pipe material), as well as describing connections, defects and unusual conditions observed during the inspection. Digital recording playback shall be at the same speed that it was

recorded. Slow motion or stop-motion playback features may be supplied at the option of the Contractor. Once recorded, the digital recordings shall be labeled and become the property of the County. The Contractor shall have all digital recordings and necessary playback equipment readily accessible for review by the County during the project.

- All digital recordings and TV inspection records associated with a capital project shall be forwarded to Construction Contracts Administration Division for review. After completion and final approval of the project, the digital recordings and other inspection records shall be forwarded to the Storm Drain and Sewer Maintenance Division of the Bureau of Utilities for Cassworks entry and for permanent storage for future reference. Digital recordings done for the Bureau of Utilities shall be forwarded to that agency upon completion of work.

(b) Post - Installation Inspection.

1) Procedure.

- Post-Installation TV inspection shall not be performed until all work, including inlet and/or manhole restoration, is complete on a section of pipeline. Manhole work, including benches, inverts and pipe penetrations into manhole, shall be complete prior to post-installation TV work. The post-installation TV inspection digital recordings shall be submitted to the Construction Contracts Administration Division prior to acceptance of the work by the Department of Public Works.
- The Contractor shall complete the post-installation TV inspection in the presence of the County. The post-installation TV inspection shall be completed to confirm completion of rehabilitation and to verify that the rehabilitation work conforms to the requirements of the Specifications. Provide a color digital recording showing the completed work, including the condition of restored connections. Prepare and submit Television Inspection Logs providing location of connections along with location of any discrepancies.
- For post-installation TV inspection, exercise the full capabilities of the camera equipment to document the completion of the rehabilitation and replacement work and the conformance of the work to the Specifications. Provide a full 360 degree view of pipe, joints, connections and service connections subject to the following:
 1. For new pipelines involving sewer pipe 18 in. or larger, at least one joint between manholes shall be panned and shown, and
 2. For new construction of smaller sewers, if the Contractor performs his

smaller CCTV work following a successful pressure test, joint panning is not necessary, and

3. Sewer relining projects require no joint panning.
4. For storm drains larger than 48 in. in diameter, no joint panning is required. Storm drains smaller than 48" in diameter shall be panned at every fifth joint, unless the Engineer or the Contract Documents require more pans in areas of interest.

- Methodology shall be in accordance with Section 300.03.06.03(a) 1) Pre-Installation Inspection.

- 2) **Flow Control and Documentation of Television Inspection** shall be conducted as specified in paragraph 300.03.06.03(a) 2) and 3) for pre-installation inspection.

300.04 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. All trench excavation for pipe and structure installation shall be unclassified and included in the price of the associated pipe or structure.

(b) Class 3 Excavation.

- (1) **Definitions of Subgrade.** In the case of pipelines, 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 directed 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.

(3) Change of Trench Location. In case the Engineer directs that the location of a trench be changed to a reasonable extent from that proposed on the drawing on account of the presence of an obstruction, or from other cause, or if a changed location is authorized upon the Contractor's request, the Contractor will not be entitled to extra compensation or to a claim for damages, provided that the change is made before the excavation has begun. If, however, such change made at the direction of the Engineer involves the abandonment of excavation already made, such abandoned excavation, together with the necessary refill, will be classified as Class 3 Excavation. Where trenches have been completely excavated, payment will be based on the widths shown in the Standard Details. In the event that the trench is abandoned in favor of a new location at the Contractor's request, the abandoned excavation and refill shall be at the Contractor's expense.

Class 3 Excavation for Incidental Construction shall be measured and paid for at the Contract unit price per cubic yard of *Class 3 Excavation / Selected Backfill, Onsite Disposal / Unsuitable Material per Owner*, or as *Class 3 Excavation / Selected Backfill, Proper Offsite Disposal / Unsuitable Material* or as *Class 3 Excavation for Incidental Construction* in cases where backfill is not used. The payment shall be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

- (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.
- (d) Location of Connection to Existing Utility.** The excavation and the refill required to locate a connection to an existing utility shall be paid for under the Fixed Price Contingent Item *Test Pit Excavation within/outside Paved Road*.
- (e) Steel Plates.** Steel plates are considered as incidental to any Contract Construction and/or Work and shall not be measured for payment. No County payment shall be made to the Contractor for the use or installation of any steel plates and their support system or for any temporary or permanent trench or paving repair required by the County that is related to the use of steel plates. Refer to Section 300.03.05.
- (f) TV Inspection.** TV inspection shall not be measured. The costs associated with TV inspection shall be paid for as part of the costs associated with installation / rehabilitation of the pipelines of interest.

SECTION 301-REPAIRING TRENCH OPENINGS IN PAVING

301.01 DESCRIPTION. This item consists of temporary and permanent repairs to trench openings. This work shall be performed in accordance with Standard Detail R-38 or SHA Standard Details, as applicable.

301.02 MATERIALS.

Graded Aggregate Base	901
Hot Mix Asphalt	904.04
Portland Cement Concrete	902

301.03 CONSTRUCTION.

301.03.01 Stage 1 Temporary Repair. Place and compact temporary repairs for maintenance of traffic on a daily basis except when otherwise directed to use methods judged to be reasonable by the Engineer. Give minimal regard to seasonal constraints, recognizing the nature of a temporary patch and its relation to the early restoration of traffic. Stage 1 repairs shall be maintained at the Contractor's expense until Stage 2 repairs are done. Refer to Sections 105 and 106.

301.03.02 Stage 2 Permanent Repair. The Contractor shall obtain written approval of the Engineer prior to beginning any Stage 2 repairs. Place, compact and test permanent repairs in accordance with the requirements of Sections 504 and 520 of these Specifications as applicable.

301.03.03 Trench Repair Per SHA Permit. Work items for permanent and temporary trench repair in SHA-maintained paving sections shall follow all requirements of the applicable SHA permit. In the event the Contractor determines there is a conflict between the contract requirements and the requirements given in the SHA permit, the Contractor shall notify the Engineer immediately for a determination of how to resolve the conflict.

Specific requirements of trench repair shall be provided in the SHA permit included as part of the contract documents. Limitations and restrictions may include, but not be limited to: weather events, holiday scheduling, day-of-week scheduling, and time-of-day scheduling. The SHA permit may also include specific work zone limitations.

301.04 Method of Measurement & Basis of Payment. Stages 1 and 2 repair measurements (except those involving Reinforced Concrete repairs, see item 2 below) 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.

1. The quantity reported, as provided above, for use in Baltimore County Right-of-Way is paid at the contract unit price per ton for ***Graded Aggregate Base for Stage 1 Maintenance of Traffic; Hot Mix Asphalt for Stage 1 Maintenance of Traffic***, and for ***Hot Mix Asphalt for Stage 2 Permanent Pavement Repairs***. Refer to Sections 105 and 106.
2. ***Reinforced Concrete Trench Repair Per SHA Permit*** shall be measured and paid for at the contract unit price per Cubic Yard for the volume of Portland cement concrete furnished and installed within SHA Right-of-Way. The payment shall be full compensation for all work specified regardless of the depth or volume of concrete placed, including trench excavation and backfill; aggregate installation; compaction; reinforcing, including epoxy coating where required; Portland cement concrete placement; steel plating; cleaning; saw cutting and removal of existing surface and/or base material; and for all materials, labor, equipment, tools and incidentals necessary to complete the work. Payment for trench excavation, backfill, and compaction; aggregate; and traffic control shall be paid for under other bid items in the Contract.
3. ***Bituminous Concrete Temporary Trench Repair Per SHA Permit*** shall be measured and paid for at the contract unit price per Ton for the weight of temporary hot mix asphalt furnished and installed within SHA Right-of-Way. The payment shall be full compensation for all work specified regardless of the depth or weight of material placed; shall include full compensation for saw cutting and removal of existing surface and/or base material; trench excavation and backfill; aggregate installation; compaction; temporary hot mix asphalt placement; joint sealing; steel plating; cleaning; and shall include full compensation for all materials, labor, equipment, tools, and incidentals necessary to complete the work. Payment for trench excavation, backfill, and compaction; aggregate; and traffic control shall be paid for under other bid items in the Contract.
4. ***Bituminous Concrete Permanent Trench Repair Per SHA Permit*** shall be measured and paid for at the contract unit price per Ton for the weight of permanent hot mix asphalt furnished and installed within SHA Right-of-Way. The payment shall be full compensation for all work specified regardless of the depth or weight of material placed; saw cutting and removal of existing paving; excavation of aggregate and temporary asphalt as required; addition of new aggregate; compaction; permanent hot mix asphalt placement; joint sealing; steel plating; and cleaning; cut back and removal of existing surface and/or base material, including temporary trench repair material; and shall include full compensation for all materials, labor, equipment, tools, and incidentals necessary to complete work. Payment for trench excavation, backfill, and compaction; aggregate; and traffic control shall be paid for under other bid items in the Contract.

SECTION 302 - SELECTED BACKFILL

302.01 DESCRIPTION. This work shall consist of placing selected backfill material as specified in the Contract Documents or as directed by the Engineer.

302.02 MATERIALS.

No. 57 Aggregate	901, Table 901 A
Crusher Run Aggregate CR-6	901, Table 901 A
Geotextile	921.09

302.03 CONSTRUCTION. Unsuitable foundation material shall be replaced as directed by the Engineer. Compaction may be achieved using tamped fill methods conforming to Section 210, acceptable to the Engineer. No. 57 Aggregate greater than 6 inches in thickness shall be completely protected with AASHTO M-288 Class SE Geotextile unless directed otherwise by the Engineer.

302.04 MEASUREMENT AND PAYMENT. Selected Backfill using No. 57 Aggregate, or Selected Backfill using Crusher Run Aggregate CR-6 required to replace Class 3 Excavation for unsuitable pipe and structure foundations will be measured and paid for at the Contract unit price per cubic yard of *Class 3 Excavation / Selected Backfill / Onsite Disposal / Unsuitable Material Per Owner* or as *Class 3 Excavation / Selected Backfill, Proper Offsite Disposal / Unsuitable Material*. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work. Geotextile shall be measured and paid for at the Contract unit price per square yard.

SECTION 303 - PIPE CULVERTS

303.01 DESCRIPTION. This work shall consist of placing pipe on a firm bed to the specified line and grade. The pipe shall be the size and type as specified in the Contract Documents.

303.02 MATERIALS.

No. 57 Aggregate	901, Table 901 A
Crusher Run Aggregate CR-6	901, Table 901 A
Concrete Mix No. 2	902.10.03
Pipe Materials	905
Roofing Paper	911.07

Asphalt Sealer for Concrete Pipe	911.09
Geotextile	921.09

Pipe Certification. Manufacturer’s Certification is required for each shipment of pipe. When requested by the Engineer, this Certification shall include a copy of the actual test results indicating that the delivered units conform to the Contract Documents. Provide a copy of the Certification to the Engineer, to the testing facility if applicable, and to the Contractor with each shipment. One copy shall remain at the plant. Include the name and address of the manufacturer, the material, type, size and classification of pipe, the identification number, the date of manufacture, the date of shipment, a statement that indicates conformance with the Specifications, and the signature of the plant’s quality control manager. Any manufacturer’s documentation regarding warranty, disclaimers, or third party interests shall be delivered to the Engineer with the Manufacturer’s Certification.

Pipe shall be marked in accordance with section 905.01.01 through 905.01.15 of these Specifications, as applicable.

303.03 CONSTRUCTION. Pipe lengths and gradients shall be verified by the Contractor and shall be acceptable to the Engineer before installation. Existing pipes shall be cleaned and resulting refuse shall be removed from the work site and disposed of in a lawful manner.

When a pipe is to be laid on existing ground, on or under fill, an embankment shall be constructed to a height of at least 9 inches, but not more than 3 feet above the top of the proposed pipe. A trench is then excavated to receive the pipe within this embankment in accordance with Standard Detail G-6.

Use all suitable excavated material for backfill or store for future use. Do not waste excavated material without approval. Prior to using excavated material as backfill, remove boulders, logs, and other unsuitable material. Dispose of unsuitable material in an approved disposal area.

303.03.01 Excavation. The width of trench shall be sufficient to permit thorough tamping of the backfill under the haunches and around the pipe. See Standard Detail G-6, “Trench and Trench Payment Width” in *Standard Details for Construction*, latest edition.

303.03.02 Bedding. 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 (completely protected with geotextile if greater than 6 inches) as approved by the Engineer.

When directed by the Engineer to provide a bedding of 12 inches or greater the selected backfill shall be crusher run aggregate CR-6 or No. 57 stone completely protected with geotextile.

Culverts 48 inches or more in nominal horizontal diameter shall be bedded in an approved

foundation shaped by means of a template that will support the pipe for at least 10 percent of its overall height.

303.03.03 Installation. Pipes shall be laid with hubs upgrade. A single lay hole through the shell of the pipe will be permitted with an approved lifting device. The lay hole shall be cast in the pipe during fabrication or cored into the pipe without damaging or exposing any reinforcement. After installation, the lay hole shall be filled completely using expandable insulating foam or another acceptable watertight seal. Excess material shall be removed from the interior of the pipe.

303.03.04 Pipe Joints. All storm drain pipe installed in Baltimore County shall have joints that are soil-tight, meaning that the joint shall not allow intrusion of soil particles of any size into the pipe through any joint. The preferred method of accomplishing soil-tight joints is use of a pipe with a joint design that has previously been accepted by the County as soil-tight. Acceptable pipe joints include ASTM C-76 concrete pipe with joints meeting ASTM C-443 Specifications, low head concrete pressure pipe (ASTM C-361) for applications in pond embankments, pipe joints designed in accordance with AASHTO Standard Specifications for Highways and Bridges Section 26.4.2, or any other pipe joints accepted as watertight by these Standard Specifications.

Per AASHTO Standard Specifications for Highways and Bridges Section 26.4.2.4(e), joints with the ability to pass a 2-psi hydrostatic test without leakage will be considered soil-tight.

As alternates to the use of approved soil-tight joint designs, soil-tightness may be accomplished by one or more of the following methods:

- Selected backfill around pipe of a non-erodible nature, including granular soil with grain sizes equivalent to coarse sand, small gravel or larger (ratio of soil D_{85} to maximum size of any joint opening > 0.2 for uniform sand or 0.3 for medium to fine sand), cohesive clay soils ($P.I.>12$) or flowable fill. This selected backfill must fill the entire trench width from the bottom of the excavation to a minimum of 12 inches above the crown of pipe, with specified compaction.
OR
- Asphalt sealers (AASHTO M198) or resilient grouts with prior approval for use in Baltimore County as pipe sealers that penetrate the entire joint and fill all voids in the pipe joints, used in accordance with manufacturer's recommendations.
OR
- Wrapping the circumference of the pipe at the joint with a double layer of geotextile overlapping the joint on both sides by 18 inches minimum. The geotextile selected shall be suitable for filtering out fine sands and silts per AASHTO M-288.
OR
- Application of interior or exterior sealing bands or pipe gaskets with prior approval for use in Baltimore County and used in accordance with manufacturer's recommendations.

Mortared concrete pipe joints shall NOT be considered soil-tight without additional measures as

described above. The Engineer shall approve the soil-tightness and suitability for use of each installed pipe joint. Costs of all gaskets, filter fabric, joint sealing or sealing bands shall be included in the cost of the pipe.

303.03.05 Pipe Connections. Pipe connections shall be prefabricated when made between two new pipes and whenever possible between a new and existing pipe. A field pipe connection (cut-in) shall include cutting a hole in a cleaned area on the side of an existing pipe at the spring line, inserting and trimming the connecting pipe and placing a concrete collar at the connection. In the case of corrugated pipes, a welded connection may be substituted for the concrete collar, the weld to be coated with a zinc-rich paint coating per M-36. All pipe connections shall be inspected and determined to be soil and water-tight prior to backfilling.

For connections to drainage structures, refer to 305.03.05.

Field connections (cut-ins) shall be used only where:

1. the larger pipe is existing;
2. 15" pipes enter 33" and larger pipe;
3. 18" pipes enter 42" and larger pipe; and
4. a manhole or inlet is within 10 feet of the cut-in for adequate access for maintenance.

Where possible, spring lines of pipes to be joined at a cut-in shall be at the same elevation at the point of junction. Approval for cut-ins not meeting all of the above requirements shall be obtained from the Storm Drain Design Section, BCBE.

303.03.06 Pipe Encasement and Low / High Concrete Cradles. When specified in the Contract Documents or when directed by the Engineer, pipe shall be encased in concrete or shall have a low or high concrete cradle per Standard Detail G-8.

303.03.07 RESERVED.

303.03.08 Removal of Existing Pipe Culverts. Where specified in the Contract Documents, existing pipe culverts shall be removed and shall become the property of the Contractor. Backfilling of trenches resulting from pipe removal shall conform to the pertinent backfilling provisions of Section 210.

303.03.09 Relaying Existing Pipe. When specified in the Contract Documents, removed culverts shall be salvaged and relaid in the same manner as described for new pipe.

303.03.10. Television Inspection of Storm Drains. Refer to Section 300.03.06.

303.03.11 Connecting Existing Property Drains. An item may be provided to drain abutting properties, swales, roofs, etc. Connections are not necessarily shown on the Plans, but shall be constructed where, if, and as directed by the Engineer.

It is County policy that roof leaders may be connected to the proposed storm drains, if

directed by the Engineer. Basement drains may be connected, if desired by the Engineer, provided that the property owner has previously obtained written permission from the County to do so.

303.03.12 Abandoned Pipes. When specified, plug abandoned pipes using Concrete Mix No. 2 or brick masonry. When specified, fill pipes with Flowable Backfill. Refer to Section 313 and 424.

303.03.13 Clean Existing Pipes. When specified, clean existing pipes of all sediment and debris without damaging the pipe and drainage structures. Remove and dispose of sediment and debris as specified in Section 308.03.16.

303.03.14 Inspection and Acceptance. No sooner than 30 days after installation visually inspect all new pipe in the presence of the Engineer. Any cracks, differential movement, efflorescence, rust stains, spalls, exposed reinforcement, slabbing, dents, buckling, holes, damaged coating, obstructions, improperly engaged joints, improper gasket placement, excessive joint gaps, misaligned joints, excessive deflection, or undue horizontal or vertical misalignment will be cause for repair or replacement at no cost to the County. Video inspect pipe and send to the Division of Construction Contracts Administration for approval per 300.03.06. Ensure that thermoplastic pipe deflection does not exceed 5 percent.

303.04 MEASUREMENT AND PAYMENT. The payment for the items specified in the Contract Documents will be full compensation for all applicable excavation, sheeting, shoring, dewatering, hauling, invert paving, storing, rehandling of material, removal and disposal of excess and unsuitable material, tamped fill, forming bed or foundation, backfilling, compaction and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

303.04.01 New *pipe* for culverts and storm drains will be measured complete in place and paid for at the Contract unit price per linear foot for the type, size, cross-section and grade of pipe used.

303.04.02 *Pipe connections* and *pipe elbows* will be measured and paid for at the Contract unit price per each for the type, size, cross-section and grade of pipe used. No deduction from the pipe measurement will be made for pipe connections. Connection to drainage structures containing prefabricated holes in which the pipe will be connected will not be measured but the cost will be incidental to the pertinent pipe item.

303.04.03 Additional excavation required below the planned elevation will be measured and paid for as specified in Section 300.04. For bedding in rock subgrade (Section 303.03.02), excavation and refill to the 6-inch depth will be paid for as a ***Class 3 Excavation and Selected Backfill*** (by the template method) ***with Onsite*** or ***Proper Offsite Disposal of Unsuitable Material***, as applicable.

303.04.04 *Removal of Existing Pipe Culverts* 12 inches in diameter or larger will be

measured and paid for per the total number of linear feet removed, regardless of the type of pipe and its condition. When a multiple pipe installation is removed, each pipe will be measured and paid for. Endwalls, etc. removed with the pipe will not be measured but the cost will be incidental to the Contract unit price per linear foot. Removal of existing pipe culverts less than 12 inches in diameter will not be measured but the cost will be incidental to the Contract unit price per linear foot.

Where the proposed new pipe or new pipe arch culvert is at the location of an existing pipe culvert so as to interfere with the construction of the new culvert, the cost of removal and disposal of the entire existing culvert will be included in the cost per linear foot of the new pipe or new pipe arch culvert. Where shown on the plans or directed by the Engineer, only that portion of the existing culvert in the new pipe trench need be removed. The cost of abandonment, brick bulkheads and/or filling with suitable material will be included in the cost per linear foot of the new pipe.

303.04.05 Selected Backfill using No. 57 Aggregate or Selected Backfill using Crusher Run Aggregate CR-6 required to replace the **Class 3 Excavation for Incidental Construction** will be measured and paid for as specified in Section 302.

303.04.06 Relaid Existing Pipe Culverts will be measured and paid for as specified in 303.04.01 unless otherwise specified in the Contract Documents. Endwalls, end sections, etc. removed with the pipe will not be measured but the cost will be incidental to the Contract unit price per linear foot.

303.04.07 New Endwalls, End Sections etc., will be measured and paid for as specified in Section 305.

303.04.08 Removal of Existing Headwalls, etc., that are not incidental to the Contract unit price for the respective pipe items will be measured and paid for as specified in Section 207.

303.04.09 Encasement concrete, and concrete or brick masonry to plug existing pipes will be measured and paid for at the Contract price for the pertinent **Mix No. 2 Concrete for Miscellaneous Structures** or **Brick Masonry for Miscellaneous Structures** item, each measured in cubic yards.

303.04.10 Television Inspection for New or Rehabilitated Pipes will not be measured. Payment for television inspection will be included in the prices bid for items in the proposal as defined in these Specifications.

303.04.11 Connection of property drains encountered within a trench excavated for construction of a storm drain pipe or structure shall be paid for as part of the price bid per linear foot for that pipe complete in place, or shall be paid for as part of the price bid per "each" for the minimum depth of that drain structure complete in place.

The cost of connecting existing roof leaders or basement drain lines into the proposed storm drains will be incidental to the Contract prices for the storm drains. If it is necessary to run

connecting lengths of pipe for the connection, payment will be made under the appropriate bid items included in the proposal.

303.04.12 Clean Existing Pipe Any Size will be measured and paid for at the Contract unit price per linear foot. Removal and proper disposal of construction debris and sediment will not be measured for payment.

SECTION 304 - STRUCTURAL PLATE PIPE AND STRUCTURAL PLATE PIPE ARCH CULVERTS

RESERVED.

SECTION 305 - MISCELLANEOUS STRUCTURES

305.01 DESCRIPTION. This work shall consist of constructing, reconstructing or repairing miscellaneous cast-in-place concrete or masonry structures and installing precast concrete structures as specified in the Contract Documents or as directed by the Engineer.

305.02 MATERIALS.

Mortar Sand	901.01, Table 901 A
Curing Materials	902.07
Concrete Mix No. 2, No. 3 or No. 6	902.10.03
Grout	902.11
Brick	903.02
Masonry Cement	903.06
Reinforcement Steel	908
Castings for Frames, Covers, Gratings and Steps	909.04
Zinc Coating	A 153
Precast Concrete Inlets and Manholes	M 199
CR-6, CR-1	901.01

Certification. Manufacturer's Certification is required for each shipment of precast units and metal castings for frames, etc. When requested by the Engineer, this Certification shall include a copy of the actual test results indicating that the unit conforms to the Contract Documents. Provide a copy of the Certification to the Engineer, to the testing facility if applicable, and to the Contractor with each shipment. One copy shall remain at the plant. Include the name and address of the manufacturer, the type of structure, the identification number, the date of manufacture, the date of shipment, a statement that indicates conformance with the Specifications, and the signature of the plant's quality control manager. Copies of any manufacturer's documentation regarding warranty, disclaimers, or

third party interests shall be delivered to the Engineer with the Manufacturer's Certification.

Mark the precast unit with the station number/location and designation, the identification number, the name or trademark of the manufacturer, the date manufactured, and stamp that indicates conformance with the Specifications, using indentation or waterproof paint. The manufacturer will mark metal castings in accordance with Section 909.04 of these Specifications.

Replacement grates shall be flat and true on all bearing surfaces and shall not "rock" within the matching frame after installation is complete. Existing frames to be re-used shall be cast iron (909.04) and shall not be cracked, broken, warped, improperly sized or otherwise unsuited for continued use.

305.03 CONSTRUCTION. Construction shall conform to the following:

Portland Cement Concrete (PCC)	414
Brick Masonry	424

305.03.01 Construction Sequence. Underground drainage structures shall be completed before roadway surfacing is placed. Manholes, catch basins and inlets shall not be completed to final grade until the grading has been finished and all necessary arrangements have been made to insure suitable connections and tie-ins at proper grade and alignment with pavements, gutters and curbs.

305.03.02 Castings. Frames for grates and covers for inlets and manholes shall be set in full beds of mortar and rigidly secured in place to proper grade and alignment as specified in the Contract Documents, unless otherwise directed by the Engineer or shown otherwise in the Construction Documents.

305.03.03 Pipe Connections. Inlet and outlet pipes at drainage structures shall be set or cut flush with the inside faces of the structures and shall extend a sufficient distance beyond the outside faces of these walls to provide ample room for making proper connections. The joint around the pipe in the structure wall shall be completely and neatly closed with mortar or other specified materials.

305.03.04 Inverts. Drainage structures containing two or more pipes shall have channeled inverts conforming to the Contract Documents.

305.03.05 Drainage Structures. Inlets and manholes shall contain two 6 in. minimum diameter underdrain stubs for future connections of underdrains or for erosion control. Precast drainage structures may substitute two precast knockouts as shown on the Standard Details for the underdrain stubs. The drainage structures shall be backfilled with CR-6 for a width of 1.5 ft outside of the structure and extend from the bottom of the structure to the subgrade. Stone around underdrains and knockouts for underdrain are not required for precast manholes unless otherwise shown on the Plans or directed by the Engineer.

CR-6 or CR-1 shall be used for the top 10 ft of backfill below the road sub-base around manhole and inlet structures in roads. Where the structure is less than 10 ft in depth, this material shall be used for the full depth of structure. With the Engineer's approval, recycled concrete meeting CR-1 or CR-6 gradations (RC-1 or RC-6) may be substituted.

Extend backfill to undisturbed earth on all sides of structure (18 inches minimum typical) in all present or future road rights-of-way. A maximum 3 feet of aggregate is required for structures having 3 or more pipes.

See Standard Detail G-2.

305.03.06 Precast Drainage Structures. Precast drainage structures shall conform to the more restrictive of M199 or the Contract Documents. Working drawings for structures not detailed in the Contract Documents shall be submitted to the Engineer for approval prior to fabrication. Designs for precast drainage structures that vary in dimension or reinforcement from those shown on Baltimore County's Standard Details shall be submitted with supporting design calculations to the Engineer for approval. The submission documents shall be signed and sealed by a Professional Engineer registered in the State of Maryland.

Certification from the manufacturer for each shipment of precast units shall be required at time of receipt. Each unit shall be marked by indentation or with waterproof paint showing station location, Specification designation or intended use, the date of manufacture, the name or trademark of the manufacturer (this information shall be noted on the unit, near the top inside). Each unit shall include a certification that shall contain a copy of the actual test results indicating that the unit conforms to the Contract Documents. Absence of test is basis for rejection of items and revocation of plant certification.

No precast unit shall be shipped unless the unit has been tested and is shown to be in full compliance with the Contract Documents.

The placement and consolidation of the required bedding under the unit shall be a minimum 6 in. of No. 57 aggregate unless otherwise directed by the Engineer.

Pre-installed steps in precast manhole/inlet units shall align correctly with access openings and with adjacent precast units and shall arrive on the work site in undamaged condition. Precast sections with steps that fail to align, have improperly spaced steps when assembled with another section or are otherwise unsatisfactory shall be rejected and removed from the work site.

305.03.07 Encasement. Where specified in the Contract Documents or directed by the Engineer, the pipe shall be encased using Mix No. 2 Concrete.

305.03.08 Precast Structures - Lifting Devices. Lifting devices for precast concrete manholes, inlets and valve vaults shall be designed in accordance with ASTM C890-06, Section 8.4 that states:

Lifting inserts which are embedded or otherwise attached to the structure will be designed for four (4) times the maximum load transmitted to the inserts.

305.03.09 Clean Existing Inlets. Clean existing inlets and dispose of the material. Reset and anchor existing grates as directed.

305.03.10 Inlet and Manhole Adjustment. This work shall consist of permanent vertical adjustment of inlets and manholes to match changes in elevation of street paving. The inlet or manhole frame shall be adjusted using approved methods such as a rubber riser ring (Standard Detail G-3B), precast concrete grade adjustment ring (Standard Detail G-3) or poured-in-place concrete, or other methods as approved by the Engineer for the particular project.

305.03.11 Inlet and Manhole Connection. This work shall consist of making a connection to an existing inlet or storm drain manhole for purposes of extending the drain system upstream in accordance with Contract Documents. The work will include any necessary adjustments to the structure walls and invert in order to accommodate the new connection.

305.03.12 Grate and Frame Replacement for Inlets. This work shall consist of replacement of existing cast iron parallel bar grates, broken cast iron frames and all reticular grates and frames. This work shall apply to all inlets located within road right-of-way and within the limits of work of any Baltimore County capital project that involves street improvements. Reticular grates and frames to be removed include NR and WR grates and frames and replacement Type E and S reticular grates. These items shall be replaced with cast iron curved vane grates and cast iron frames in accordance with the Standard Details.

All existing cast iron grates and frames to be retained shall be visually inspected and determined to be free of cracks and breakage before reinstallation.

Rejected frames and grates shall be salvaged and returned to the nearest Bureau of Utilities yard.

Inlet wall adjustment to include masonry removal or saw-cutting of concrete walls shall be performed to adjust an NR inlet with reticular frame to match the street elevation due to the greater depth of the replacement type E frame.

Curved vane grates shall be installed in the frame so that the directional arrow on the top of the inlet grate matches the direction of flow of storm water in the gutter to the inlet. In the case of sumped multiple grate inlets, the cast-in directional arrows shall point to the center of the inlet, with vanes directed outward.

The Engineer shall check each installation to be certain that grates do not “rock” or rattle within their frame under a moving wheel load prior to approving the work. If a frame is encountered that doesn’t allow the grate to sit properly, and this condition cannot be corrected as evidenced by improper fit, rocking or rattling under load, that frame shall be

removed and replaced with a new frame that performs satisfactorily.

Where existing inlets are encountered that have frames and grates that would require replacement under this Section but do not match either the Type E or the Type S frames and grates in size, the Engineer shall determine if an adjustment to the inlet box to fit the Standard frames is feasible. If this is not the case, the Engineer shall, with assistance from BCBECDesign, determine whether replacement of the inlet box with a standard inlet box is suitable.

305.03.13 Inlet and Manhole Repair. This work shall consist of repair to existing County-maintained inlets and manholes to include repair to brickwork and replacement of concrete components that have failed. Manhole frames and covers and inlet grates and frames shall be thoroughly inspected for cracks, breakage or other signs of excessive wear requiring replacement. Inlet grates and frames that require replacement shall be replaced in accordance with 305.03.12.

Prefabricated concrete pieces delivered to the site shall be thoroughly inspected for cracks, breakage and for compliance with the applicable Standard Details. Prefabricated curb pieces shall have a visible steel angle embedded in the top lip of the curb piece per Standard Detail D-2.08. Type A and B inlet slabs shall be measured upon delivery to confirm exact fit in accordance with contract documents.

Where sidewalk is not placed behind Type A and B inlet slabs, the Engineer shall direct that concrete be poured behind the slab to assist with preventing movement in the event that the slab is bumped by a tire on a parking vehicle. See the Top Slab Anchor Detail on Standard Detail D-2.03.

Longitudinal reinforcement in monolithic concrete curb and gutter for Type A and B inlets as shown in Details D-2.01A, D-2.01B, D-2.02A, D-2.02B and D-2.03 shall extend at least 12” inches beyond both ends of the inlet and shall not be spliced.

Damaged inlet/manhole brickwork shall be removed to a depth where a complete course of brick has intact mortar. This layer shall be cleaned of mortar debris and leveled. The inlet or manhole shall be reconstructed using a prefabricated riser section (or using new or clean unbroken salvaged brick with new mortar). Brick salvaged from the removed structure shall comply with Section 424, Brick Masonry.

The Contractor shall saw cut frame flanges or make other adjustments as directed by the Engineer to ensure a horizontal gap of 1” or less between the inlet frame and the inlet top piece. The vertical opening between the inlet frame or lip and the top piece/top slab shall not exceed the opening height specified for new inlets on the applicable Standard Details.

305.03.14 When directed by the Engineer, or when shown on Construction Documents, radial grates may be installed as a replacement for a storm drain manhole cover in order to collect street drainage or to prevent drain system back pressure from blowing off a normal drain manhole cover. Prior to installation of the radial grate, the Contractor shall verify in

writing to the Engineer that the location of the proposed radial grate is a storm drain manhole, specifying the size of all incoming and outgoing pipes. A radial grate shall NEVER be installed on a sewer system manhole for any reason.

305.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all excavation, concrete, masonry, special or precast units, reinforcement, ladder rungs, drip stones, CR-6 or No. 57 aggregate, underdrain stubs, frames, grates and covers, grade and slope adjustments, backfill and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

305.04.01 *Standard Inlets, Precast Inlets, Standard Manholes and Precast Manholes* specified in the Contract Documents will be measured and paid for at the Contract unit price per each. When a structure exceeds the standard minimum depth specified in the Contract Documents (3 feet unless shown otherwise on the Standard Details), an additional payment will be made for the excess vertical depth at the Contract unit price per linear foot of vertical depth.

305.04.02 *Standard Endwalls, Standard End Sections* and Special Structures will be measured and paid for at the Contract unit price per each.

305.04.03 Nonstandard (special design) endwalls and other miscellaneous structures such as steps, spring boxes, junction boxes and pipe encasements, will be measured and paid for at the Contract unit price per cubic yard of brick masonry or concrete for the mix specified unless otherwise specified in the Contract Documents.

305.04.04 No separate or additional measurement will be made for any precast concrete units, metal or castings used in the construction of any of the items noted in 305.04.01, 305.04.02 or 305.04.03.

305.04.05 *Cleaning Existing Inlets* shall be measured and paid for at the Contract unit price per each, regardless of type, size, or depth of the inlet. ***Clean Existing Pipe Any Size*** shall be measured and paid for per Section 303.04.12.

305.04.06 When an existing drainage structure is to be removed and replaced with a new drainage structure in the same location, the cost to remove the existing drainage structure and a section of the existing pipe will be incidental to the cost of the new drainage structure.

305.04.07 *Adjust Existing Inlet* and ***Adjust Existing Manhole*** shall be measured and paid for at the Contract unit price per each.

305.04.08 Storm drain manhole items:

***30" Heavy Traffic Manhole Frame & Cover,
Replacement 30" Heavy Traffic Manhole Cover,
24" Shallow Heavy Traffic Manhole Frame & Cover,
Sidewalk Frame and Cover,***

Replacement Cover For Sidewalk Frame,
Precast Rubber Grade Adjustment Ring – 24"Manhole,
Precast Rubber Grade Adjustment Ring – 30"Manhole,
Replacement Grade Adjustment Ring - 2" Thick,
Replacement Grade Adjustment Ring - 3" Thick,
Replacement Grade Adjustment Ring - 6" Thick,
Adjustable Riser Ring - 24" Heavy Traffic Manhole Frame & Cover, and
Replacement Manhole Steps – Miscellaneous Structures
shall be measured and paid for at the Contract unit price per each.

305.04.09 *Replacement 24" Dia. Radial Grate, Radial Grate In 24" Std. Heavy Traffic Manhole Frame and Radial Grate In 24" Shallow Heavy Traffic Manhole Frame* shall be measured and paid for at the Contract unit price per each.

305.04.10 Replacement grates shall be measured in kind complete in place and paid for at the Contract unit price per each, as *Replacement Type E Curved Vane Grates* or *Type S Curved Vane Replacement Grate*. Replacement frames and grates shall be measured in kind complete in place and paid for at the Contract unit price per each matching set, as *Type E Frame with Type E Curved Vane Grates* or *Type S Frame with Curved Vane Grate*. The costs for cutting flanges shall be included as part of the cost of the frame, as applicable.

305.04.11 Replacement inlet headpieces and top slabs shall be measured in kind complete in place and paid for at the Contract unit price per each, as *Replace Type E Combination Inlet Headpiece, Replace Double Type E Combination Inlet Headpiece, Replace Type S Combination Inlet Headpiece, Replace Double Type S Combination Inlet Headpiece, Replace Type A-1 Inlet Top Slab, Replace Type A-2 Inlet Top Slab, Slab Width As Specified On Plan, Replace B-1 Inlet Top Slab, or Replace B-2 Inlet Top Slab, Slab Width As Specified On Plan.*

305.04.12 Brickwork required for repair of existing brick inlet boxes or for adjusting existing brick inlet boxes to accept standard inlet frames shall be measured and paid for at the Contract unit price per cubic yard of *Brick Masonry for Miscellaneous Structures*.

Cost of adjusting existing NR inlet walls to accept standard E inlet frames shall not be measured but shall be included as part of the cost of frame and grate.

In accordance with Section 305.04.03, concrete required to repair or replace broken concrete inlet components in place (such as Type A and B Inlet monolithic curb and gutter section) shall be measured and paid for at the Contract unit price per cubic yard of *Mix #3 Concrete for Inlet Repair*. This payment shall be full compensation for saw cutting, removal, excavation, bedding, forming, reinforcement as specified, cutting, bending, placement, supports and tying of reinforcement, placement of concrete, concrete finishing and for all labor, tools, equipment, and materials necessary to complete the work.

305.04.13 Concrete placed behind A or B inlet top slabs shall be measured and paid for at the Contract unit price per cubic yard of *Mix #2 Concrete for Miscellaneous Structures*.

305.04.14 Support Post Installation for Type A and Type B Inlets shall not be measured and will be included as part of the cost of replacing the concrete gutter pan for these inlets when gutter replacement is done. When these posts are installed into an existing gutter pan, the work shall not be measured and will be included as part of the cost of a new top slab to be replaced at the same time.

SECTION 306 - UNDERDRAINS, SUBGRADE DRAINS AND SPRING CONTROL

306.01 DESCRIPTION. Construct underdrains, subgrade drains, underdrain for spring control, underdrain pipe outlets, and blind drains using pipe, geotextile, and granular material. Clean existing underdrain outlets.

306.02 MATERIALS.

No 57 Aggregate	901.01	
Concrete Mix No.2	902.10	
Pipe	905	
Geotextile, Class as specified	921.09	
Securing Pins or Staples	921.09	
Flexible Delineator Post and Rodent Screens		As approved by BCBECC

306.03 CONSTRUCTION. Coordinate the field installation of traffic barrier, signs, lighting, and landscaping with the Engineer to avoid any damage to the underdrains, subgrade drains, or outlet pipes. Correct any damage to the underdrains, subgrade drains, or outlet pipes.

306.03.01 Excavation. Excavate trenches to the specified dimensions and grade. Ensure that the sides and bottom of trenches are smooth and uniform to prevent tearing of the geotextile when backfilling. For excavated material, refer to 404.03.01.

306.03.02 Geotextile. Place geotextile when specified. Place it with the machine direction parallel to the longitudinal direction of the trench. Ensure that it is of sufficient width to completely enclose the underdrain trench, including specified overlaps.

Place the geotextile tightly against the underdrain trench to eliminate voids beneath the geotextile. Avoid wrinkles and folds. Maintain at least a 24 in. overlap at joint ends or breaks. Pin joints and overlaps to securely hold the geotextile in place until placement of the cover material. Pin longitudinal joints, overlaps, and edges no more than 50 ft on center.

Replace or repair damaged geotextile.

The geotextile design, the materials used and its placement in the field shall be reviewed, inspected and certified by a geotechnical engineer as described in Section 314, except that an As-Built plan is not required.

306.03.03 Pipe Placement. Slope the underdrain pipe to maintain positive drainage toward the outlet. Place perforated pipes with the perforations down and arranged symmetrically about the vertical axis. Plug the ends of trunk lines, wyes, tees, or ells as directed. Make joints and connections in accordance with the manufacturer's recommendations.

306.03.04 Outlets. Outlet the underdrains into drainage structures whenever possible. Outlets that empty into a drainage structure shall be at least 9 in. above the normal flow line in the structure and be constructed of normal underdrain outlet pipe. Maintain at least 18 in. of cover over the pipe. Rodent screens are not required when an underdrain outfalls into a drainage structure.

When a pipe outfalls into a slope or ditch, slope the outlet pipe at least three percent. Use Type 'S' (smooth interior wall) polyethylene (PE), or smooth-wall polyvinyl chloride (PVC) as specified in Section 905. Construct a sloped concrete headwall with a removable rodent screen at the end of the outlet pipe. Place a flexible delineator post on the slope headwall.

Space outlets for longitudinal underdrains at intervals no more than 250 ft and at the lowest elevation on all vertical curves. When changing the direction of the longitudinal underdrain or outlet pipe, all bends shall have a radius of at least 3 ft.

306.03.05 Backfill. Trenches shall be backfilled to the specified dimensions and grades. Underdrain and outlet trenches shall be backfilled as the work progresses.

(a) **Underdrain.** Lightly tamp aggregate backfill, and screed or rake to provide proper thickness and grade.

(b) **Outlets.** Backfill per Section 210.

Replace geotextile, underdrain pipe, and outlet pipe damaged by excessive tamping.

Cover longitudinal underdrain with the next pavement layer within 72 hours. Cover all other underdrain within 48 hours. Protect underdrain, including the geotextile, from contamination by soil fines. Replace or repair clogged geotextile and any underdrain trench that becomes contaminated.

306.03.06 Video Inspection and Acceptance. Subject to the direction of the Engineer, perform a video inspection of all new longitudinal underdrain and outlets in the presence of the Engineer, as part of final acceptance. Correct all damage as directed.

306.03.07 Cleaning Existing Outlets. Clean existing underdrain pipe outlets and dispose of the material. Remove and replace existing rodent screens. Where there are no screens, install

them as directed.

306.03.08 Permanent Subgrade Drains. Construct permanent subgrade drains when specified. Subgrade drains consist of trenches excavated through the shoulder and roadside grading from the edges of the road pavement to a side ditch, embankment slope, or other approved outlet and filled with aggregate. Locate subgrade drains at low points, and space them at 25 ft intervals for a distance of 125 ft on each side of the low point, then at intervals of 100 ft to within 125 ft of the high point. Before placing the road pavement and before completion of the shoulder paving or final roadside grading areas, cut and shape trenches to a width of 24 in. Place No. 57 aggregate to the underside of the shoulder material and to the underside of the specified topsoil thickness in the roadside grading area. The portion of the trench within the roadside grading area shall be completely wrapped in geotextile. The bottom of the trench at the end adjacent to the road pavement shall be at least 2 in. below the subgrade.

306.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all excavation, pipe, coupling bands, aggregate, backfill, geotextile, video inspection, and all material, labor, equipment, tools, and incidentals necessary to complete the work.

306.04.01 *Underdrains, Underdrain Pipe Outlets, Subgrade Drains, and Underdrain Pipe for Spring Control* will be measured and paid for at the Contract unit price per linear foot.

Slope headwalls, rodent screens, and marker posts will not be measured but will be incidental to the cost of the *Underdrain Pipe Outlet*.

306.04.02 When an underdrain pipe is not used for spring control, all excavation and backfill for spring control will be measured and paid for at the Contract unit price per cubic yard for *Class 3 Excavation for Incidental Construction* and *Aggregate Backfill for Underdrains*.

306.04.03 When directed by the Engineer, excavation for underdrains, subgrade drains, and underdrain for spring control required to lower the trench to an elevation deeper than specified in the Contract Documents will be measured and paid for at the Contract unit price per cubic yard for *Class 3 Excavation for Incidental Construction* and *Aggregate Backfill for Underdrains*.

306.04.04 When measuring the length of a manufactured connection (tee, elbows, etc.) other than coupling bands, each actual linear foot will be doubled and payment made at the Contract unit price per linear foot for the appropriate underdrain pipe item specified in the Contract Documents.

306.04.05 *Clean Existing Underdrain Outlets* will be measured and paid for at the Contract unit price per each. The payment will be full compensation for locating outlets, removing and replacing the existing rodent screens, removal and disposal of material removed from the pipe, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

306.04.06 Geotechnical Engineer. The Geotechnical Engineer’s work involved in review, inspection and certification of the geotextile design, materials used and their placement in the field shall not be measured or paid for as part of the construction contract. The work shall be considered a part of the design function and shall be contracted and paid for by Baltimore County.

SECTION 307 – PREFABRICATED EDGE DRAINS

307.01 DESCRIPTION. This work shall consist of constructing a prefabricated edge drain system and underdrain pipe outlets as specified in the Contract Documents.

307.02 MATERIALS.

Outlet Pipe	905
Select Borrow	916
Prefabricated Edge Drain	922
Fittings	922

307.03 CONSTRUCTION. Prefabricated edge drains shall be installed in conformance with the manufacturer’s recommendations. Drains with support on only one side shall have the support side placed away from the pavement edge.

307.03.01 Trenches For Prefabricated Edge Drains. Trenches shall be excavated with a trencher and shall be as narrow as possible yet wide enough to allow insertion of the prefabricated edge drains at the required elevation. The maximum width of the trench shall not exceed 10 in. The exposed edge of the pavement shall be free of soil to insure direct contact between the drain and pavement. The excavation of the trench, placement of the edge drain and placement of the first lift of backfill shall be accomplished in a single continuous operation, unless otherwise directed by the Engineer.

307.03.02 Splices. Splices shall be made prior to placement of the prefabricated edge drain in the trench and in conformance with the manufacturer’s recommendations. The Engineer shall approve all splices.

Solid, Central Cores (nonconnected two sided flow). Crossover couplings shall be used at all splices and at 200 ft intervals.

307.03.03 Connections to Outlets. The prefabricated edge drain shall be connected to the outlets using fittings recommended by the manufacturer.

Outlets shall be spaced at 200 ft intervals and at the lowest elevation on all vertical curves.

Outlets shall be constructed in conformance with 306.03.04.

307.03.04 Backfilling of Trenches. Unless otherwise specified in the Contract Documents, material for backfilling trenches shall be the material generated from the trenching operation, as approved by the Engineer. Additional backfill material, if needed, shall conform to Select Borrow.

Backfilling shall be completed in two layers with the first layer being placed simultaneously with the drain, holding the drain flush against the side of the pavement. Backfill material shall be compacted using a vibratory shoe compactor.

307.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

307.04.01 Prefabricated Edge Drains and Outlet Pipe will be measured and paid for at the Contract unit price per linear foot.

307.04.02 Additional backfill material authorized by the Engineer will be measured and paid for at the Contract unit price per cubic yard for Select Borrow Excavation.

SECTION 308 - EROSION AND SEDIMENT CONTROL

308.01 DESCRIPTION. This work shall consist of the application of measures throughout the life of the project to control erosion and to minimize the siltation of rivers, streams, and impoundments (lakes, reservoirs, bays and coastal waters) as specified in the Contract Documents or as directed by the Engineer.

308.01.01 Erosion and Sediment Control Manager (ESCM). Unless otherwise specified, the Contractor shall assign to the project an employee to serve in the capacity of ESCM. This employee shall be thoroughly experienced in all aspects of construction and have satisfactorily completed the MDE “Responsible Personnel Training for Erosion and Sediment Control” or an equivalent Erosion and Sediment Control Training Program either conducted by or authorized by the Maryland Department of the Environment pursuant to the appropriate article published in the Annotated Code for the State of Maryland. The ESCM shall have the primary responsibility and sufficient authority for the implementation of the approved erosion and sediment control schedules and methods of operation, including both on-site and off-site activities.

308.01.02 Standards and Specifications. Construct and maintain all erosion and sediment control measures and devices in accordance with the latest “*Maryland Standards and Specifications for Soil Erosion and Sediment Control*” (MDE), “*Maryland Stormwater Design Manual, Volumes I and II*” (MDE), and “*1999 Policy and Guidelines Manual*” as updated (Baltimore County Soil Conservation District).

308.02 MATERIALS.

Aggregate on upstream side of stone outlet structure	901, Table 901A, CA-PCC, Size No. 57.
Riprap	901.02
Pipe	905
Gabion Wire	906.01
Steel Plate	909.02
Welding Material	909.03
Seed, Mulch, Fertilizer, Soil Conditioner and Other Materials for seeding, soil stabilization and matting	920
Straw Bales	921.08
Geotextiles, Class as Specified	921.09
Fence Fabric, Tie Wires, & Posts	914
Lumber	921.05
Number 1 Stone	M43 No.1
4 to 7 In. Stone	901.05
2 to 3 In. Stone	M43 No.2
¾ to 1-1/2 In. Stone	M43 No.4
No. 57 Stone	Table 901A

Soil Stabilization Matting replaces Erosion Control Matting, and AASHTO M-288 Geotextile Class SE replaces Filter Cloth and Geotextile Class C where they appear in the 1994 “*Maryland Standards and Specifications for Soil Erosion and Sediment Control*”.

308.03 CONSTRUCTION.

308.03.01 Contractor Responsibilities. Prior to beginning any earth disturbing activity, the contractor shall complete the following in accordance with the sequence of construction shown on the approved sediment control plans:

- (a) Demarcate all wetlands, wetland buffers, floodplains, Waters of the United States, tree protection areas, and the Limit of Disturbance (LOD) as specified Section 107.
- (b) Have all demarcated wetlands, wetland buffers, floodplains, water of the United States, tree protection areas, and LOD inspected and approved by the Engineer.
- (c) Construct all erosion and sediment control measures in conformance with 308.01.02.
- (d) Have all control measures inspected and approved by the Engineer.

Ensure that all runoff is directed from disturbed areas to the sediment control measures.

Do not remove any erosion or sediment control measure without the approval of the Engineer and the Sediment Control Inspector. Refer to GP 7.12 for unforeseen conditions.

Ensure that dewatering practices do not cause any visible change to stream clarity.

308.03.02 Erosion and Sediment Control Plan (E & S Plan) and Sequence of Construction. Implement the E & S Plan and Sequence of Construction as shown on the approved Sediment and Erosion Control Plan. Minor adjustments to the sediment control locations may be made in the field with the approval of the Engineer and the Sediment Control Inspector. Major revisions, deletions, or substitutions to the E & S Plan require a formal review and approval by the Design Engineer, BCBEC and the Soil Conservation District (SCD), and, if applicable, MDE. Submit changes to the approved E & S Plan to the County in writing at the earliest possible time. Obtain BCBEC and SCD approval for changes to the E & S Plan or Sequence of Construction prior to implementing the change.

308.03.03 Erosion and Sediment Control Manager (ESCM). At least 10 days prior to beginning any work, submit the name and credentials of the ESCM for approval. Any substitutes for the ESCM will be subject to approval. Time the substitution to ensure that an ESCM is assigned to the project at all times. The County reserves the right to request a reassignment of the ESCM duties to another individual for any reason.

Ensure that the ESCM is thoroughly experienced in all aspects of construction and has the required certifications. The ESCM is primarily responsible for and has the authority to implement the approved erosion and sediment control plans, schedules and methods of operation for both on-site and off-site activities. The ESCM's duties include:

- (a) Inspect the erosion and sediment controls on a daily basis to ensure that all controls are in place at all times and to develop a list of activities and schedules to ensure compliance with the Contract Documents.
- (b) Maintain a daily log of these inspections, including actions taken, and submit a written report at the end of the work day.
- (c) Conduct after storm inspections with the Engineer both during and beyond normal working hours and submit a written report.
- (d) Have the authority to mobilize crews to make immediate repairs to the controls during working and nonworking hours.
- (e) When requested, accompany the Engineer on Quality Assurance Inspections and inspections made by the regulating agencies.
- (f) Coordinate with the Engineer to ensure that all corrections are made immediately and that the project is in compliance with the approved plan at all times.

308.03.04 RESERVED

308.03.05 Preconstruction Conference. Prior to issuance of a grading permit, the project will have a complete set of Sediment and Erosion Control plans that have been approved and signed by the Baltimore County Soil Conservation District as meeting all applicable requirements. All plans will have an approved “Sequence of Construction” that will specify a sequence of clearing and grubbing operations, use of perimeter controls and sediment traps, road grading, placement and use of utilities, drains and storm water management facilities, final grading, stabilization, and removal of controls. A pre-Construction Conference will be held by the Engineer to discuss the approved Erosion and Sediment Control “Sequence of Operations” if the County requests such a conference.

308.03.06 Meetings. Reserved

308.03.07 Infiltration Devices. At sites where infiltration devices are used for the control of storm water, prevent runoff from unstabilized areas from entering the infiltration devices. Ensure that bottom elevations of sediment control devices placed in infiltration areas are at least 2 feet higher than the finish grade bottom elevation of the infiltration device. When converting a sediment trap to an infiltration device, remove and dispose of all accumulated sediment prior to final grading of the device.

308.03.08 Stabilization Requirements. Permanently or temporarily stabilize areas flatter than 3:1 and stockpile areas as soon as possible, but not later than fourteen days after grubbing and grading activities have ceased in the area. Permanently or temporarily stabilize trap embankments and slopes, earth dikes, temporary swales, perimeter dike/swales, ditches, and slopes 3:1 or steeper as soon as possible, but not later than seven days after grubbing and grading activities have ceased in the area. The seven and fourteen day requirements mean that the stabilization operation is complete within the applicable seven or fourteen day time frame.

When the excavation or embankment reaches the bottom of the subgrade, those areas in which paving will be placed are exempt from the stabilization requirements. Areas between temporary berms, except median areas, need not be stabilized during incremental stabilization. When permanently stabilized areas are disturbed by grading operations or other activities not specifically approved, restabilization will be at no additional cost to the County.

Stabilization requirements may be reduced to less than seven days for sensitive areas. Perform maintenance as necessary to ensure continued stabilization.

Track all slopes within five days of establishment with cleated type equipment operating perpendicular to the slope.

308.03.09 Dewatering. Dewatering is considered an elective practice. Ensure that dewatering activities do not cause any visible change to stream clarity. If a sediment plume is visible, immediately cease the dewatering activity.

308.03.10 Maintenance. Maintain all erosion and sediment control devices during the construction season, the winter months, and other times when the project is inactive. All sediment control devices shall be left in good operating order before leaving the construction site for the night. Maintain access to all erosion and sediment controls until the controls are removed. Lack of maintenance as required by the Engineer and Sediment Control Inspector will be considered as noncompliance with the E & S Plan and grounds for a shutdown of the project.

Inspect controls immediately following storm events. Clean out as necessary and repair all damage as the first order of business after the storm event.

Direct any pumping activity, including dewatering sediment traps and basins, through a dewatering device approved by MDE and/or Baltimore County Soil Conservation District.

308.03.11 Waste Areas. Off-site waste areas on State or Federal property require MDE approval. The Baltimore County Soil Conservation District shall approve all other off-site waste areas. All waste areas and stockpile areas shall be protected by erosion and sediment control measures and stabilized in accordance with the seven or fourteen day stabilization requirement.

308.03.12 Inspections. The Baltimore County Sediment Control Inspector will conduct frequent field inspections. If the Inspector finds noncompliance with erosion and sediment control provisions, the Engineer will be notified that corrective action is required. This corrective action may require a shutdown of construction activities until the noncompliance is satisfactorily corrected. No claims against the County will be considered due to either a shutdown of the grading operations or the entire project due to sediment control violations.

308.03.13 Reserved.

308.03.14 Removal of Controls. Do not remove erosion and sediment control measures until all previously disturbed areas are vegetated with at least a 3 in. growth of grass. The removal of all sediment control measures is subject to approval by the Engineer and the Sediment Control Inspector. No removals shall occur without these approvals. Backfill, grade, and stabilize the areas where sediment controls have been removed.

308.03.15 Erosion and Sediment Control Original Excavation. Excavate, construct embankments, grade, and backfill for sediment traps, sediment basins, and other sediment controls.

Ensure that excavation and embankments meet the dimensions for each sediment control as specified. Stockpile excavated material and use for backfill when the sediment controls are removed.

308.03.16 Erosion and Sediment Control Cleanout Excavation. Remove accumulated sediment from sediment controls or other areas during routine maintenance of sediment

controls, or as directed.

Clean out sediment traps as necessary to ensure that at least 50 percent of the wet storage capacity is available at all times. Ensure that riprap outlet sediment traps have at least 75 percent of the wet storage capacity available at all times. Remove sediment from silt fence, super silt fence, stone outlet structures, stone check dams, and straw bales when it reaches 50 percent of the height of the device.

Place removed sediment in an approved waste site either on or off the project. Material stored on-site may be reused once it is dried and it meets embankment requirements.

308.03.17 Earth Dike. Do not use sod as stabilization unless specifically approved. Construct in accordance with MDE Detail 1, page A-1-6, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

308.03.18 Temporary Swale. Do not use sod as stabilization unless specifically approved. Construct in accordance with MDE Detail 2, page A-2-4, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

308.03.19 Perimeter Dike Swale (PD/S). Do not use sod as stabilization unless specifically approved. Construct in accordance with MDE Detail 3, page A-3-3, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

308.03.20 Pipe Slope Drain (PSD). When slope drains are placed on grade, construct interceptor berms to direct flow into the flared end section. Construct in accordance with MDE Detail 4, page B-5-4, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

308.03.21 Riprap Inflow Protection (RRP). Gabions shall not be used. Construct in accordance with MDE Detail 5, page B-6-2, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

308.03.22 Gabion Inflow Protection (GM). Construct as specified in Section 312. Construct in accordance with Detail 6 as modified by Baltimore County Soil Conservation District, Appendix 8, *1999 Policy and Guidelines Manual*, latest edition.

308.03.23 Stone Check Dam (CD). Space as specified. Construct as applicable in accordance with MDE Detail 7, page B-8-3, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition, or with #2 Stone Check Dam Detail provided as Appendix 14A of *1999 Policy and Guidelines Manual*, latest edition.

308.03.24 Sediment Traps (ST-I through ST-IV). Excavate sediment traps to the specified length, width, and depth as shown on approved sediment control plans. Construct in accordance with MDE Detail 8, 9, 10 or 10A, as applicable, pages C-9-7, C-9-10, C-9-13, or C-9-16, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

When converting a sediment trap to an infiltration device, remove and dispose of all accumulated sediment prior to final grading of the device. See Section 308.03.07.

When grading and paving operations have been completed and vegetation has been established on the slopes and channels to the satisfaction of the Engineer, refill the sediment traps with suitable materials, and shape and treat them as specified.

308.03.25 Stone Outlet Structure (TSOS). Stabilize the area immediately after removal of the structure. Construct in accordance with Baltimore County Soil Conservation District Detail, latest edition.

308.03.26 Removable Pumping Station (RPS). Furnish the standpipe, pump, hoses, and connections required to perform dewatering activities. Excavate a pit to the dimensions required. Construct in accordance with Detail 20A, Appendix 14B, as modified by Baltimore County Soil Conservation District in *1999 Policy and Guidelines Manual*, latest edition.

308.03.27 Sump Pit (SP). Furnish the standpipe, pump, hoses, and connections required to perform dewatering activities. Excavate a pit to the dimensions required. Construct in accordance with Detail 20B, Appendix 9, as modified by Baltimore County Soil Conservation District in *1999 Policy and Guidelines Manual*, latest edition.

308.03.28 Portable Sediment Tank. Furnish the standpipe, pump, hoses, and connections required to perform dewatering activities. Determine the dimensions necessary to provide the required storage volume. Construct in accordance with MDE Detail 21, page D-14-2, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

308.03.29 Silt Fence (SF). Trench the geotextile at least 8 in. vertically into the ground and extend to at least 16 in. above ground. Drive fence posts at least 16 in. into the ground and extend at least 20 in. above the ground. Construct in accordance with MDE Detail 22, page E-15-3, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

Remove and reset silt fence when and as directed, per the requirements for the original placement.

308.03.30 Inlet Protection (SIP, AGIP, CIP, MIP). Install standard inlet protection, at grade inlet protection, curb inlet protection, or median inlet protection. Construct in accordance with MDE Detail 23A (Yard/Ditch/"Standard" inlets), Detail 23B (At-Grade/Grate Inlets), 23C (Curb Inlets), 23D (Median Inlets), pages E-16-5, 5A, 5B and 5C, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

308.03.31 Stabilized Construction Entrance (SCE). Construct stabilized construction entrances at the specified locations. Construct in accordance with Details 24 (SCE) and 24A (associated mountable berm-Appendix 5), as modified by Baltimore County Soil Conservation District in *1999 Policy and Guidelines Manual*, latest edition.

Rehabilitate stabilized construction entrance consists of periodic top dressing with additional

aggregate, replacement of pipe, or other repairs to the entrance and sediment trapping devices.

308.03.32 Super Silt Fence(SSF). Construct in accordance with Detail 33 Appendix 11 of *1999 Policy and Guidelines Manual*, latest edition), as modified by Baltimore County Soil Conservation District in *1999 Policy and Guidelines Manual*, latest edition.

Remove and reset super silt fence when and as directed, per the requirements for the original placement.

308.03.33 Temporary Asphalt Berm. Reserved.

308.03.34 Straw Bales for Sediment Control (SBD). Use straw bales for temporary control of erosion and sedimentation in side ditches and where the placement of a stone outlet structure is not practical. Do not use straw bales in median ditches.

Use straw bales consisting of undecayed firmly packed straw, approximate size 14 x 18 x 36 in. as prepared by a standard baling machine, and firmly bound by at least two separate circuits of rope or band material that will withstand weathering for the length of time the bale is functioning as a sediment control device. Ensure that the binding tension on the baling machine is sufficient to produce a bale with voids no greater than the nominal thickness of the straw. Embed the bales to a depth of at least 4 in., and anchor in place with two No. 4 reinforcement bars, steel pickets, or 2 x 2 in. wood stakes, 36 in. length. Locate the anchoring devices at approximate third points along the longitudinal center line of each bale, driven through the bale and into the ground to a depth of 12 to 18 in. Construct in accordance with MDE Detail 32, page H-25-2, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition. Bales shall be placed along a contour in a row with ends tightly abutting adjacent bales. Bales shall be inspected frequently and after each rain event and maintained as directed by the Engineer and the Sediment Control Inspector. All bales shall be removed upon stabilization of upgrade areas.

308.03.35 Stone for Sediment Control. Place No. 57 stone, 3/4 to 1-1/2 in. stone, 2 to 3 in. stone, 4 to 7 in. stone, and riprap for sediment control as specified.

308.03.36 Maintenance of Stream Flow. Maintain the continuous flow of waterways during all operations for the locations indicated.

Upon completion of construction and after temporary drainage devices have served their purpose, remove and dispose of the devices in an acceptable manner.

Stream diversion details included in the Contract Documents will show a system and a location that is approved by the Maryland Department of the Environment.

The stream diversion system as shown may not be capable of blocking the flow of water through the soil beneath the system. Approved plans shall provide an effective means of diverting the water away from the designated areas. Ensure that all excavation performed

within the diverted stream is performed in a dewatered condition, which may require additional pumps, sheeting, shoring, cofferdams, etc. If the proposed system does not perform satisfactorily or additional material and equipment are required to dewater the site and excavated areas, adjust the stream diversion system and obtain approvals at no additional cost to the County.

Securely anchor the stream diversion system in place to prevent movement during high water events. Submit the proposed method of anchoring to the Engineer and the Sediment Control Inspector for approval. Anchors shall not go beyond the limits of disturbance shown on the Plans or infringe on the channel area available for stream flow. Do not install the diversion system in the stream without the approval of both the Engineer and the Sediment Control Inspector. All costs associated with the anchoring of the stream diversion system are incidental to the *Maintenance of Stream Flow* item.

308.03.37 Sediment Basins. Construct baffles in accordance with Detail 18 Appendix 18 of *1999 Policy and Guidelines Manual*, latest edition), as modified by Baltimore County Soil Conservation District. Basin drawdown devices shall be constructed in accordance with Detail shown on Appendix 20 or 21 of *1999 Policy and Guidelines Manual*, latest edition), as modified by Baltimore County Soil Conservation District.

308.03.38 RESERVED.

308.03.39 RESERVED.

308.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work. The maintenance, repair, resetting, and final removal of all erosion and sediment control devices will not be measured, but the cost will be incidental to the Contract price to construct the device unless otherwise specified in the Contract Documents.

308.04.01 Erosion and sediment control manager will not be measured but the cost will be incidental to Erosion and Sediment Control items specified in the Contract Documents.

308.04.02 Implementation of the Erosion and Sediment Control Plan by the Contractor will not be measured but the cost will be incidental to the Erosion and Sediment Control items specified in the Contract Documents.

308.04.03 *Erosion and Sediment Control Original Excavation* will be measured and paid for at the Contract unit price per cubic yard. The payment will also include excavation, backfill, and grading.

308.04.04 *Erosion and Sediment Control Cleanout Excavation* will be measured and paid for at the Contract unit price per cubic yard. The payment will also include excavation and disposal.

308.04.05 *Earth Dikes* will be measured and paid for at the Contract unit price per linear foot. When 4 to 7 in. stone, temporary seeding, and soil stabilization matting are required, they will be measured and paid for as specified in 308.04.22, 704.04, and 709.04, respectively.

308.04.06 *Temporary Swales* will be measured and paid for at the Contract unit price per linear foot. When 4 to 7 in. stone, temporary seeding, and soil stabilization matting are required, they will be measured and paid for as specified in 308.04.22, 704.04, and 709.04, respectively.

308.04.07 *Perimeter Dike/Swales* will be measured and paid for at the Contract unit price per linear foot. When temporary seeding and soil stabilization matting are required, they will be measured and paid for as specified in 704.04 and 709.04, respectively.

308.04.08 *Pipe Slope Drain* will be measured and paid for at the Contract unit price per linear foot. The payment will also include excavation, backfill, flared end section, geotextile, anchors, coupling bands, and pipe elbows.

Outlet protection will be measured and paid for as specified in 308.04.22.

308.04.09 Riprap inflow protection will be measured and paid for as specified in 308.04.22.

308.04.10 Gabion inflow protection will be measured and paid for as specified in 312.04.

308.04.11 Stone check dam will be measured and paid for as specified in 308.04.22.

308.04.12 Sediment traps will be measured and paid for at the Contract unit price for one or more of the items listed below:

- (a) ***Erosion and Sediment Control Original Excavation*** as specified in 308.04.03.
- (b) ***Pipe*** per linear foot based upon size, type and gauge of pipe.
- (c) Stone as specified in 308.04.22.
- (d) Inflow protection as specified in 308.04.09 and 308.04.10.
- (e) Baffle board and stakes will not be measured but the cost will be incidental to the other items.

308.04.13 Stone outlet structure will be measured and paid for as specified in 308.04.22. The baffle board and stakes will not be measured but the cost will be incidental to the Contract price.

308.04.14 Removable Pumping Station will be measured and paid for at the Contract unit price per each. The payment will also include excavation, pipe, geotextile, wire mesh, steel plate, hose, pump, and connections.

No. 57 stone will be measured and paid for as specified in 308.04.22.

308.04.15 Sump Pit will be measured and paid for at the Contract unit price per each. The payment will also include excavation, pipe, geotextile, wire mesh, steel plate, hose, pump, and connections.

No. 57 stone will be measured and paid for as specified in 308.04.22.

308.04.16 Portable Sediment Tank will be measured and paid for at the Contract unit price per each. The payment will also include pipe, geotextile, wire mesh, steel plate, hose, pump, and connections. No adjustments will be made for resizing or relocating portable sediment tanks to meet stream clarity discharge requirements.

308.04.17 Silt Fence will be measured and paid for at the Contract unit price per linear foot. **Remove and Reset Silt Fence** will be measured and paid for at the Contract unit price per linear foot.

308.04.18 Super Silt Fence will be measured and paid for at the Contract unit price per linear foot. **Remove and Reset Super Silt Fence** will be measured and paid for at the Contract unit price per linear foot.

308.04.19 Stabilized Construction Entrance and **Rehabilitate Stabilized Construction Entrance** will be measured and paid for at the Contract unit price per Square Yard or, if specified in the Contract Documents, per Each. When pipe is required, it will not be measured but the cost will be incidental to the Contract price.

308.04.20 Inlet Protection will be measured and paid for at the Contract unit price per each based upon the type specified.

308.04.21 Straw Bales will be measured and paid for at the Contract unit price per linear foot measured along the approximate center line of the row of bales. Excavation and anchoring the straw bales will not be measured but the cost will be incidental to the Contract price.

308.04.22 Stone for Sediment Control will be measured and paid for at the Contract unit price per ton for the pertinent Stone for Sediment Control item. Geotextile, excavation, and backfill will not be measured but the cost will be incidental to the Contract price.

308.04.23 Maintenance of Stream Flow will not be measured but will be paid for at the Contract lump sum price. The payment will also include designing and providing diversion structures regardless of the type required to satisfactorily divert the stream flow, excavation, backfill, dewater the site and excavated areas within the stream diversion area, maintenance of the diversion system, sandbags, polyethylene sheeting, diversion pipes, pumps, hoses,

connections, and portable sediment tanks. This price will not be adjusted when consideration is given to an alternative stream diversion system regardless of any changes in quantities from that shown in the Contract Documents. The provisions of GP-4.05 will not apply to this work.

308.04.24 Temporary Mulching will be measured and paid for as specified in 704.04.02.

308.04.25 Temporary Seeding will be measured and paid for as specified in 704.04.01.

308.04.26 Temporary Wood Cellulose Fiber will be incidental to **Temporary Seeding**.

308.04.27 Soil Stabilization Matting will be measured and paid for as specified in 709.04.

308.04.28 Turfgrass Sodding will be measured and paid for as specified in 708.04.01.

308.04.29 Temporary earth berms and interceptor berms for incremental stabilization will not be measured, but the cost will be incidental to the excavation items specified in the Contract Documents.

SECTION 309 - CONCRETE SLOPE AND CHANNEL PROTECTION

309.01 DESCRIPTION. This work shall consist of protecting slopes and channels with cast-in-place concrete and cutoff walls as specified in the Contract Documents or as directed by the Engineer.

309.02 MATERIALS.

Crusher Run Aggregate CR-6	901.01
No. 57 Aggregate	901.01
Curing Materials	902.07
Form Release Compounds	902.08
Concrete Mix No. 2	902.10.03
Welded Steel Wire Fabric	908.05
Joint Sealer	911.01
Prefomed Joint Fillers	911.02
Roofing Paper	911.07
Borrow	916

309.03 CONSTRUCTION.

309.03.01 Excavation. Excavation, including excavation for cutoff walls shall conform to

Section 609.

309.03.02 Cast-In-Place Concrete. Cast-in-place concrete slope protection shall be constructed in alternate strips so that construction joints are all in one direction and that tooled joints run perpendicular to the construction joints. The result shall be a checkerboard pattern having squares not less than 3 ft or more than 5 ft. The size of the squares and the size of squares around curved surfaces shall be as directed by the Engineer. Joints and cutoff walls shall be constructed as specified in the Contract Documents or as directed by the Engineer.

309.03.03 Forms. Forms shall conform to Section 609.

309.03.04 Concreting. Concrete mixing shall conform to 915.03.04. Volumetric batching and continuous mixing will be permitted on this work. Areas subject to the infiltration of water shall be dewatered by methods acceptable to the Engineer prior to placing the concrete. The concrete shall be spread, tamped or otherwise consolidated to secure maximum density as it is placed. It shall be struck off with an approved screed to the elevation of the top of the forms. The surface shall have a broomed finish. No plastering of the surface will be permitted. All edges and all joints shall be edged with a 1/4 in. edging tool.

309.03.05 Cold Weather Construction and Curing. Refer to 520.03.02 for cold weather construction and to 520.03.12 for concrete curing.

309.03.06 Backfill. After the forms have been removed, backfill shall be placed and compacted as directed by the Engineer.

309.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all concrete, forms, excavation, curing, joint sealer and filler, backfill, disposal of excess or unsuitable material, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

309.04.01 Concrete Slope and Channel Protection and Concrete Slope Protection for Streams will be measured and paid for at the Contract unit price per square yard of finished surface.

309.04.02 Cutoff Walls will be measured and paid for at the Contract unit price per linear foot.

309.04.03 The removal and disposal of unsuitable material below the subgrade will be measured and paid for at the Contract unit price per cubic yard for **Class 2 Excavation**. The payment will include the cost of replacing the unsuitable material with suitable material acceptable to the Engineer.

309.04.04 When **Borrow** or **Selected Backfill using No. 57 Aggregate** or **Selected Backfill using Crusher Run Aggregate CR-6** is approved by the Engineer as replacement material for

the *Class 2 Excavation*, it will be measured and paid for at the Contract unit price per cubic yard for the respective items as specified in the Contract Documents.

SECTION 310 - RIPRAP DITCHES

310.01 DESCRIPTION. This work shall consist of constructing riprap ditches and riprap ditches with capping as specified in the Contract Documents or as directed by the Engineer.

310.02 MATERIALS.

Riprap	901.02 and 901.03
Geotextile, Class as specified	921.09
2 to 4 inch stone	M43, No. 1

310.03 CONSTRUCTION.

310.03.01 Excavation. Excavation shall conform to the line and grade specified in the Contract Documents. Ditch sides and bottom shall be smooth and firm. Ditch sides and bottom shall be free from protruding objects that would damage the geotextile. Ditch sides and bottom shall be constructed in a manner acceptable to the Engineer.

310.03.02 Geotextile Placement. Geotextile coverings shall be installed on prepared surfaces, with higher layers overlapping lower ones, in roofing fashion. The material must overlap by at least two feet. Torn or damaged geotextile covering shall be replaced or repaired at the Contractor's expense and in a manner acceptable to the Engineer.

310.03.03 Riprap Placement. Stones shall be placed by mechanical or other acceptable methods to produce a reasonably graded mass of stone. Placing the stones by methods that cause extensive segregation will not be permitted. The depth of the riprap shall be as specified in the Contract Documents.

310.03.04 Backfill. Any excavation voids existing along the edges and ends of the placed riprap shall be backfilled with suitable material to blend in with contiguous slopes, ditch lines or existing ground. Riprap placed in the clear recovery area shall be capped with a layer of 3 to 5 in. stone.

310.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all stone, excavation, geotextile, backfill, disposal of excess material, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

310.04.01 Riprap Ditches and Riprap Ditches with Capping will be measured and paid for at

the Contract unit price per square yard of finished surface. Area measurements will be actual surface measurements.

310.04.02 Bottom Cutoff Walls and Side Cutoff Walls for Riprap will be measured and paid for at the Contract unit price per linear foot.

SECTION 311 - RIPRAP SLOPE AND CHANNEL PROTECTION

311.01 DESCRIPTION. This work shall consist of protecting slopes and channels with a covering of geotextile and stone and an aggregate filter blanket as specified in the Contract Documents or as directed by the Engineer.

311.02 MATERIALS.

Aggregate Filter Blanket (Crusher Run Aggregate CR-6)	901, Table 901 A
Stone	901.02
Geotextile, Class SE	921.09
Staples/Securing Pins	921.09.03

311.03 CONSTRUCTION.

311.03.01 Excavation. Excavation for riprap and cutoff walls shall conform to the lines and grades specified in the Contract Documents. The subgrade shall be smooth and firm, free from protruding objects that would damage the geotextile and constructed in a manner acceptable to the Engineer.

311.03.02 Geotextile. Geotextile coverings shall be installed on prepared surfaces, with higher layers overlapping lower ones, in roofing fashion. The material must overlap by at least two feet. Torn or damaged geotextile covering shall be replaced or repaired in a manner acceptable to the Engineer at the Contractor's expense.

At the option of the Engineer, the geotextile shall be held in place with staples or securing pins approved for size and type based upon field conditions, soils, etc.

311.03.03 Aggregate Filter Blanket. When an aggregate filter blanket is specified, it shall conform to the lines and grades specified in the Contract Documents and shall be compacted in a manner acceptable to the Engineer.

311.03.04 Riprap Placement. The ground surface upon which the slope and channel protection is to be placed shall be free of brush, trees and stumps and shall be acceptable to the Engineer.

The first section of riprap placed shall consist of a minimum of 5 tons and will be inspected by the Engineer for conformance to gradation and placement requirements. This first section shall be used to evaluate quality control for the remainder of the project, following approval by the Engineer. If the material is rejected, it shall be removed from the project and additional sections, each consisting of a minimum of 5 tons, shall be placed.

The placement of the riprap shall begin with the bottom cutoff walls or toe sections. The larger stones shall be placed in the cutoff walls and along the outside edges of the limits of slope and channel protection. The riprap shall be placed with equipment that produces a uniformly graded mass of stones. Placing the stones by methods that cause segregation is prohibited.

The surface elevation of completed riprap installations shall be flush with adjacent channel bed or bank slope elevations, and shall not create an obstacle to the flow. The outer riprap surfaces shall be even and present a generally neat appearance. The plus or minus tolerance of the surface of the finished riprap installation shall be 3 inches for Class I Riprap and 5 inches for Class II and III Riprap from the lines and grades shown on the Contract Documents when measured perpendicular to the exterior surface of the stonework.

Placed material not conforming to the specified limits shall be removed and replaced as directed by the Engineer at no additional cost to the County.

The stone shall be placed and distributed so the resulting layer will contain a minimum of voids and there will be no pockets of same size material. The stone shall be placed to its full course thickness in one operation in a manner that the underlying material will not be displaced or worked into the course of riprap being placed. When an aggregate filter blanket is used, placement of the riprap shall proceed in a controlled manner to avoid disruption or damage to the layer of bedding material.

Imbricated riprap shall be placed and fitted together as specified by the Contract Documents.

311.03.05 Backfill. Any excavation voids existing along the edges of the completed slope and channel protection shall be backfilled in a manner acceptable to the Engineer.

311.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all stone, excavation, geotextile, backfill, disposal of excess material, prewashing when required by the Engineer or the Contract Documents, preparation of quality control section, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

311.04.01 Riprap Slope and Channel Protection will be measured and paid for at the Contract unit price per square yard. Area measurements will be actual surface measurements.

311.04.02 Cutoff walls will be measured and paid for at the Contract unit price per linear foot.

311.04.03 Riprap For Scour Protection will be measured and paid for at the Contract unit price per ton for the item *Class II Riprap For Scour Protection*.

311.04.04 *Aggregate Filter Blanket* will be measured and paid for at the Contract unit price per square yard for the depth specified in the Contract Documents.

311.04.05 *Imbricated Riprap* will be measured in place and paid for at the Contract unit price per ton for the depth specified in the Contract Documents.

SECTION 312 - GABIONS

312.01 DESCRIPTION. This work shall consist of protecting slopes and channels with stone filled wire baskets as specified in the Contract Documents or as directed by the Engineer.

312.02 MATERIALS.

Stone	901.05
Wire for Gabions	906.01
Geotextile, Class as specified	921.09

PVC Coating for Gabions shall be in accordance with 906.01.02 and shall be colored as indicated on the Plans, except that if no color is indicated on the Plans, the color shall be gray color No. 26440, Federal Standard 595.

312.03 CONSTRUCTION.

312.03.01 Excavation. Excavation, including excavation for cutoff walls, shall conform to the lines and grades specified in the Contract Documents. The subgrade shall be smooth, firm and free from protruding objects or voids that would affect the proper placement of the wire baskets or damage the geotextile.

312.03.02 Geotextile. Geotextile shall be required for all gabions and shall be placed on the prepared subgrade. Adjacent strips shall be overlapped a minimum of 2 feet. Care shall be exercised in placing and anchoring the empty basket units to ensure proper alignment and to avoid damage to the geotextile. If the geotextile should be damaged, it shall be replaced or repaired at the Contractor's expense as directed by the Engineer.

312.03.03 Wire Baskets. Placement of the units shall begin with the cutoff walls. The empty units shall be set on the geotextile and the vertical ends bound together with wire ties or interlocking fasteners spaced to permit stretching of the units to remove kinks. Stretching methods will be optional with the Contractor. Stakes, pins or other approved methods shall

be used to insure a proper alignment.

312.03.04 Stone. The empty basket units shall be filled carefully with stone placed by hand or machine to assure good alignment with a minimum of voids between stones, avoiding bulging of the mesh. The maximum height from which the stone shall be dropped into the units shall be 36 inches. The stone shall be placed so as to provide a minimum of two courses. Care shall be taken in placing the top layer of stone to assure a uniform surface to avoid any bulging of the lid mesh. After a basket unit has been filled, the lid shall be bent over until it meets the ends of the unit. The lid shall then be secured to the sides and ends with wire ties or interlocking fasteners. When a complete basket unit cannot be installed on slopes or channels because of space limitations, the basket unit shall be cut to fit as directed by the Engineer.

312.03.05 Backfill. Any excavation voids existing along the edges of the completed gabions shall be backfilled in a manner acceptable to the Engineer.

312.04 MEASUREMENT AND PAYMENT. *Gabions*, including cutoff walls will be measured and paid for at the Contract unit price per cubic yard of stone filled wire baskets complete in place. The payment will be full compensation for all stone, excavation, geotextile, ties or fasteners, backfill, disposal of excess material, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

SECTION 313 - FLOWABLE BACKFILL FOR UTILITY CUTS

313.01 DESCRIPTION. This work shall consist of furnishing, hauling and placing a flowable cement stabilized backfill material as specified in the Contract Documents or as directed by the Engineer. The material shall be used as utility cut backfill, pipe trench backfill or for filling abandoned pipes and shall set up to a stabilized mass.

313.02 MATERIALS. The flowable backfill shall consist of a mixture of sand, cement and water and shall be certified by the manufacturer.

Cement	902.03
Fine Aggregate for Portland Cement	
Concrete	901, Table 901A
Water	921.01

313.02.01 Fillers. Fillers, if required, shall be natural aggregates with a maximum size not to exceed 3/4 in. and may include sands. Bottom ash shall not be used as filler.

313.02.02 Components. Toxic or deleterious components shall not be used in the backfill mixture. The mixture shall have a 28 day, unconfined compressive strength of 100 psi to 300

psi maximum based on the manufacturer's certification. Certification shall include the actual test data for each mixture to be used.

313.03 CONSTRUCTION. Placement of the flowable backfill material shall conform to the manufacturer's recommendations or as directed by the Engineer. Utility trenches shall be backfilled full depth to the top of the subgrade using the mixture as specified in the Contract Documents or as directed by the Engineer.

The mixture shall fill all voids during the backfill operation.

The backfilled utility cut shall be protected from freezing and traffic for 24 hours. Paving operations shall not begin for at least 24 hours after backfilling is completed and has been approved by the Engineer.

The Contractor shall keep detailed records of all flowable backfill placed. These records shall be submitted to the Engineer.

313.04 MEASUREMENT AND PAYMENT. *Flowable Backfill for Utility Cuts* will be measured and paid for at the Contract unit price per cubic yard. The payment will be full compensation for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

SECTION 314 - AS-BUILT REQUIREMENTS FOR STORM WATER MANAGEMENT PONDS AND FACILITIES

314.01 DESCRIPTION. During construction, the Design Engineer of record or a qualified Geotechnical Engineer shall make appropriate observations and measurements that are necessary to certify that all storm water management ponds and facilities are in compliance with the Construction Documents and meet the requirements of the Baltimore County Department of Environmental Protection and Sustainability, the Baltimore County Soil Conservation District (BCSCD), the Maryland Department of the Environment (MDE) and other concerned agencies. This work shall be performed independently of County inspection, but shall provide input to the Engineer regarding pond construction.

314.02 MATERIALS. N/A

314.03 CONSTRUCTION.

314.03.01 Geotechnical Engineer. Following award of a Contract for construction involving a storm water management or water quality facility, the Design Engineer shall designate a

Registered Professional Engineer to serve as Geotechnical Engineer charged with performing inspections and preparation of As-Built Plans and records for submittal to the interested agencies. The designated Geotechnical Engineer shall be qualified by education and experience to inspect the proposed facility and to prepare required As-Built drawings for submittal to the reviewing agencies as follows:

- (a) The Geotechnical Engineer shall be a Professional Engineer licensed to practice engineering in Maryland.
- (b) The Geotechnical Engineer shall have documented prior experience in preparation of As-Built plans within Maryland and preferably in Baltimore County.
- (c) The Geotechnical Engineer shall present evidence of having liability insurance to cover errors and omissions in an amount to exceed the costs of the work to be inspected and certified.
- (d) The Geotechnical Engineer shall be expert in geotechnical, hydrologic, hydraulic and biotechnical aspects of stormwater management facility design and construction.

The Geotechnical Engineer shall be subject to approval of the Construction Contracts Administration Division prior to Notice to Proceed.

314.03.02 Responsibilities of Geotechnical Engineer. The Geotechnical Engineer shall be responsible for verification that storm water management and water quality facilities are constructed in accordance with Construction Documents. Where variations from approved Construction Documents occur, the Geotechnical Engineer shall work with the County Engineer (and with the design engineer as required) to obtain a constructed facility that meets all applicable requirements. Tasks shall include but not be limited to the following:

- (a) Prior to beginning construction, the Geotechnical Engineer and the Design Engineer shall meet with the Contractor and the County Engineer at the Pre-Bid Meeting to clarify the measurements and observations necessary for successfully preparing As-Built drawings and documentation. At the conclusion of this meeting, all four parties shall have a clear understanding of the information necessary for this purpose and shall establish a schedule and procedure to be certain that the Geotechnical Engineer or his representative is onsite at appropriate times to obtain the necessary field information. The County Engineer shall advise the Design Engineer promptly if the Geotechnical Engineer or his representative is not present during significant operations.
- (b) During construction, the Geotechnical Engineer (or a qualified employee) shall be onsite during placement of control structures, pipe, embankment, selected backfill for cutoff trench and impermeable core, graded aggregate drainage, plants, etc. in order to verify materials used, methods of compaction, elevations and dimensions as constructed.
- (c) The Geotechnical Engineer shall advise the County's Engineer immediately when work is done that varies from approved Plans and Specifications. The County Engineer shall direct that the Contractor make immediate corrections, with no further work to be performed and no payments to be made to the Contractor until the corrections made are satisfactory to both the Geotechnical Engineer and to the County Engineer.
- (d) The Geotechnical Engineer shall prepare a red-lined print of the plans in accordance

with all requirements as shown on the current version of the checklist for As-Built plans.

- (e) The Geotechnical Engineer shall countersign all Contractor invoices for storm water management or water quality work prior to approval by the County Engineer.
- (f) The Geotechnical Engineer shall deliver As-Built plans for signature to the Design Engineer for signature as required by the Department of Environmental Protection and Sustainability and BCSCD in a timely manner following completion of construction.
- (g) The Geotechnical Engineer shall be responsible to the Design Engineer for obtaining all necessary agency approvals (Department of Environmental Protection and Sustainability, BCSCD, MDE, etc. as applicable) for the As-Built Plans.

314.03.03 Biotechnical Specialist. For water quality projects involving plants and a monitoring plan for plant growth, a biotechnical specialist with credentials acceptable to applicable Baltimore County, MD state and Federal agencies shall be hired as described above to provide the necessary inspection and reporting functions. The contents of the reports shall be in accordance with the requirements of the applicable agencies.

314.04 MEASUREMENT AND PAYMENT. The work involved in inspection for, preparation of and agency approvals of As-Built plans shall not be measured or paid for as part of the construction contract. The work shall be considered a part of the design function and shall be contracted and paid for by Baltimore County. Payment shall be made only after the Design Engineer receives a letter confirming that As-Built Approval has been received from the Department of Environmental Protection and Sustainability and BCSCD.

SECTION 315 — INFILTRATION TRENCHES

315.01 DESCRIPTION. Install infiltration trenches as specified.

315.02 MATERIALS.

Class I Riprap	901.02
Geotextile, Class as specified	921.09
PVC Pipe, Schedule 40	D 1785
Stone	M 43 No. 2

315.03 CONSTRUCTION. Do not place infiltration trenches in service until all of the contributing drainage area has been stabilized and approved. Restrict heavy equipment and traffic from the proposed infiltration trench location.

315.03.01 Excavation. Remove excavated material from the trench site. Ensure that trench walls and bottom are free of protruding objects that could damage the geotextile. When necessary, slope the trench walls. Ensure that the bottom dimensions and stone depth are as

specified. Roughen the side walls of the trench. Grade the bottom of the trench flat.

Use all suitable excavated material for backfill or store for future use. Excavated material shall not be wasted without the approval of the Engineer. Remove any unsuitable material prior to using excavated material as backfill. Dispose of unsuitable material in an approved disposal area.

315.03.02 Installation. Place geotextile on the sides of the trench and the top of the No. 2 stone. Do not cover the bottom of the trench. The geotextile for the sides of the trench shall overlap the top geotextile by 6 to 8 in. Extend the top geotextile the full width and length of the trench. All longitudinal joints in the top geotextile shall overlap at least 6 in. The upstream roll shall overlap the downstream roll by at least 2 ft, for a shingled effect.

Place an observation well vertically in the longitudinal center of each infiltration trench. Use 6 in. diameter perforated PVC pipe, Schedule 40. Place the pipe on a base plate at the bottom of the trench. Cap the well using a threaded PVC fitting and a vandal proof sewer cap. Set the cap 6 in. above ground, and mark the depth of the trench on the cap. Provide a plastic collar with ribs to prevent rotation of the well when removing the cap. When soil capping is used, construct the observation well using perforated PVC pipe within the No. 2 stone and non-perforated pipe through the soil capping.

All stone shall be clean and free of all soil and fines. Place the No. 2 stone in 12 in. lifts with no compaction. Avoid any intermixing of the soil and fines with the stone aggregate. Remove and replace contaminated aggregate. Cap the trench with at least 12 in. of stone or soil as specified.

The infiltration trench design, the materials used and placement in the field shall be reviewed, inspected and certified by a Geotechnical Engineer as described in Section 314.

315.04 MEASUREMENT AND PAYMENT. Infiltration Trenches will be measured and paid for at the Contract unit price per cubic yard. The payment will be full compensation for all excavation, stone, capping, riprap, geotextile, PVC pipe, fittings, cap, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Geotechnical Engineer. The Geotechnical Engineer's work involved in review, inspection and certification of the infiltration trench design, materials used and their placement in the field shall not be measured or paid for as part of the construction contract. The work shall be considered a part of the design function and shall be contracted and paid for separately.

SECTION 351 - WATER MAIN CONSTRUCTION

351.01 DESCRIPTION. This section provides specifications pertaining to construction of water mains and appurtenances thereto. Sanitary sewer and storm drain construction are addressed elsewhere in Section 300 of this document. Specifications common to both highway and utility construction are found in other portions of this volume as applicable and as referenced.

Developer Projects. 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. The County does not require a hold harmless agreement for UA and RA contracts.

351.02 MATERIALS:

Ductile Iron Pipe & Fittings	905.02
Steel Pipe	905.03
Prestressed Concrete Cylinder Pressure Pipe	905.04
High Density Polyethylene Pipe & Fittings	905.05

351.03 CONSTRUCTION:

351.03.01 GENERAL REQUIREMENTS FOR HANDLING PIPES, FITTINGS, VALVES & HYDRANTS.

1. Care shall be exercised in handling and delivery of pipe, its fittings, valves and hydrants to prevent damage to these items and their coatings and linings. Under no circumstances shall pipe, fittings, valves or hydrants be permitted to drop, roll or skid against another pipe section or fitting. Belt slings shall be used as directed by the Engineer for handling pipe, fittings, valves and hydrants. Dropped pipe, fittings, valves or hydrants and items with apparent damage shall be removed from the work site. Pipe, fittings, valves and hydrants shall be placed for storage in an area away from roads, traffic and unrelated construction activity.
2. Stored materials shall be kept safe from damage. Pipe, fittings, valves and hydrants shall not be stacked higher than manufacturer's recommended limits and wood spacers shall be utilized as recommended by the manufacturer or required by the Engineer. Meter settings and (non-sectional) meter vaults shall not be stacked. Pipe, fittings, hydrants and valves shall be kept from contact with the ground through use of supporting rails, timbers or other suitable support materials. Pipes, fittings, valves and hydrants shall not be stored within a designated flood area.
3. Pipe, fitting, valve and hydrant interiors shall be kept free of soil, and other foreign

- matter at all times. Watertight plugs shall be used in pipes when pipe is not in the process of being placed, as applicable. Fire hydrants and valves shall be drained and stored so that they are protected from damage by freezing.
4. Under no circumstances shall any portion of a valve shaft, actuator or waterway be used to lift or position a valve or hydrant. Storage instructions from the manufacturer shall accompany gate and butterfly valves and be retained by the Engineer. The Contractor shall follow these instructions at all times when storing and handling these valves.
 5. Gaskets stored for use with mechanical joints, push-on joints, and flanged joints shall be kept in a cool location out of direct sunlight, as shall rubber/resilient seats for valves and hydrants. Gaskets and seats may not come into contact with petroleum products, ozone sources, engine exhaust, sanitary waste or cleaning solvents. Gaskets shall be used on a first-in-first-out basis.
 6. During construction, pipe, fittings, valves and hydrants shall be placed as near as practical to the joint where it will be laid, with sufficient support so that neither end touches the ground and so that movement is prevented.
 7. The Contractor shall provide proper and suitable tools for the safe and convenient handling and laying of pipes and fittings.
 8. Pipe, fittings, valves and hydrants shall be handled and installed only by experienced workers with pipe laying experience.
 9. The Contractor shall not operate valves. The Contractor shall contact Baltimore City to make arrangements for City personnel to open and close valves.

351.03.02 General Installation of Water Mains.

1. Clearing and grubbing and storage of removed materials shall be in accordance with Section 101 of these Specifications. Excavation, bedding and backfill shall conform with the manufacturer's recommendations for the type of pipe to be used. Pipes shall be well bedded on a solid foundation. The Contractor shall correct any defects in the pipe foundation due to settlement at his sole expense. Pipe shall not be allowed to rest upon rock. Excavation shall be by open cut except where and to such extent the Engineer permits, authorizes or requires that the Contractor excavate by tunneling. Bell holes shall be excavated large enough to insure the making of proper joints where bell and spigot pipe is used. No extra compensation is allowed for tunneling over the cost of open cut unless provided for in the bid item or negotiated 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. 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. 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.
2. The Contractor shall remove the paving only for such width as is necessary for the excavation of the trench as shown on Standard Detail G-6. 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:
- a. Paving is removed to a width greater than is deemed necessary by the Engineer;
 - b. Removing or distributing paving on account of settlement, slides or caves; or
 - c. Removing or distributing paving as a result of excavation outside the lines of the work without written order of the Engineer.
3. Before beginning excavation for the new installation, the Contractor shall locate the connection to the existing utility by excavating for the end of the existing water main at the point of the proposed tie-in.
 4. All pipe and fittings shall be inspected and approved by the Engineer prior to placement. Defective pipe shall be removed from the work site. Pipe shall be cleaned as directed by the Engineer prior to installation. Damaged coatings shall be repaired as directed by the Engineer in accordance with the manufacturer's recommendations.
 5. Defective pipe discovered after installation shall be removed and replaced with sound pipe in accordance with direction from the Engineer. The Contractor shall be responsible to keep pipe clean during and after installation. Open ends of installed pipe shall be closed with watertight plugs when pipe installation is not in progress.
 6. Sufficient backfill shall be placed to prevent pipe flotation of plugged pipe. The Contractor shall not install additional pipe sections until trench is clear of standing water.
 7. Installed pipe shall have sufficient cover at all times to protect it from the equipment that will cross it. The Contractor shall replace pipe that, in the opinion of the Engineer, has been subjected to excessive loading at the sole expense of the Contractor.
 8. Pipe shall be laid to the required horizontal and vertical locations as shown in the Contract Documents. The pipe shall be uniformly supported, bedded and backfilled along its entire length in accordance with approved plans, special provisions and manufacturer's requirements.
 9. The Engineer shall direct placement of additional fittings in addition to those shown on the Contract Plans as required to avoid existing utilities or obstructions encountered when opening the trench.
 10. Pipe may be cut only with approval of the Engineer. Cuts shall be made by machine and shall be at right angles to the axis of the pipe. When cut ends are to be used with a matching bell end, the cut ends shall be beveled to conform to the manufactured spigot end. Where applicable, cement lining shall be undamaged.
 11. Joints shall be assembled in strict accordance with the manufacturer's recommendations and with applicable sections of AWWA Standard Specifications for the type of pipe used, except as modified by these Specifications.
 12. "Springing" of bell and spigot joints in order to effect a change in direction is not permitted. Crimping is allowed within the limits shown on the Standard Details.
 13. 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 trench or tunnel excavation that settles.
 14. If obstructions would hold up the work of laying pipe, the Contractor may, with permission of the Engineer, leave a gap and return to fill the gap following removal of

the obstructions.

15. Any damage to existing utilities caused by the work shall be immediately repaired to the satisfaction of the Engineer at the Contractor's expense.
16. 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, respective owners will brace their utility poles at no expense to the Contractor. 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.
17. 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.
18. Bolts on mechanical joints and tie rods shall be tightened to the manufacturer's specified torque value using a calibrated torque wrench in the presence of the Engineer. No other tools may be used for this purpose.
19. Full compaction shall be required for all trenches. See Section 300.03.04(h)(4) of these Specifications for compaction requirements.
20. 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.
21. Pipe joints shall be located a minimum of five (5) feet, measured horizontally, from sewer mains at crossings.

351.03.03 Ductile Iron Pipe. In addition to the general requirements referenced above, water main projects utilizing Ductile Iron Pipe shall include the following:

1. The gasket position in a **"push-on" joint** shall be verified immediately after making the joint and compressing the gasket by going completely around the circumference with a feeler gage. If the gasket isn't in the proper position, the joint must be pulled apart and reassembled using a new gasket.
2. All **push type joints with welded-on lock rings** shall be fully extended during installation.
3. **Push type joints with integral restraint gaskets** shall not be used to restrain pipe that has a thick coating or tape wrap on the outside diameter of the pipe. Such a coating or wrap shall be removed from the spigot end of the pipe before joint assembly. Coatings shall be no more than 6 mils thick on the spigot end of the pipe; tape wrap shall be removed or held back cleanly from the spigot end of the pipe. After the joint is pushed together, the joint shall be pulled apart slightly to ensure that the teeth of the locking segments bite into the pipe.
4. **Mechanical Joints:** The contractor shall ensure that the bells, spigots and rubber gaskets are free of foreign material before making up joints. To install, (1) position a

- cast iron gland on the spigot end of the pipe, then install a fully lubricated rubber gasket with tapered side facing the bell. (2) Fully insert the spigot into the bell and push the gasket flush with the face of the bell. (3) Place the gland against the face of the rubber gasket and insert and finger-tighten the bolts. (4) Draw the bolts up evenly on alternating sides, beginning at the top while making certain that the gland stays parallel to the bell at all times. (5) Tighten all nuts uniformly to the manufacturer's specified torque.
5. Deflections to restrained joints utilizing either **ductile iron set screw retainer glands** or **ductile iron wedge-action retainer glands** shall be made after joint assembly but before tightening bolts.
 6. **Fifteen degree deflection ball and socket joints:** See Contract Special Provisions.
 7. Arrange **flanged joints** so that all bolt holes straddle a common centerline.
 - a. Before assembly, verify that all flanged pipe and fittings to be joined together have the same bolt circle and bolt hole diameters; Class 125 flanges cannot be joined to Class 250 flanges.
 - b. Clean flange faces prior to installing gaskets. Gaskets shall be assembled dry; do not use joint or gasket compounds with flanged joints. For large diameter gaskets, the gasket may be glued to the face of the flange to keep the gasket in place during joint assembly. Glue, if used, shall have no deleterious effect on the gasket and shall be NSF61 certified safe for contact with potable water.
 - c. Install flanged joints by first bringing adjacent sections into alignment, inserting the bolts, and hand-tightening the nuts. Keep the gap between the flanges approximately uniform during tightening. Tighten the bolts to the torque recommended by the manufacturer in several steps, alternating from one side to the other. After joint completion, a minimum of one (1) complete bolt thread shall project beyond each nut.
 8. **Flanged joint adapters:** See Contract Special Provisions.
 9. **Grooved joints:** See Contract Special Provisions.
 10. **Couplings:** Slide coupling over pipe ends after cleaning. Center coupling sleeve over pipe ends while maintaining manufacturer's recommended gap dimensions. Gradually tighten nuts to recommended torque in an alternating pattern to keep flanges parallel and to compress the gasket evenly. Pressurize the line to check for leaks and recheck bolt torque. Bolts shall not be over-torqued. Coupling shall be removed and re-installed if a leak persists following application of the recommended torque.

Standard flexible couplings shall not be used to connect restrained joint pipe. Contact the Water Design Section of the Bureau of Engineering and Construction for coupling requirements when restrained joint pipe is involved.
 11. **Tie rods** designed to restrain against axial pipe movement shall be installed parallel to the pipe axis. Tie rods designed to restrain pipe movement due to thrust generated by vertical or horizontal pipe deflections shall be installed perpendicular to the pipe axis to the fullest possible extent.
 12. **Coat** all bare steel shapes, plates and bars with two (2) coats of heavy mastic containing synthetic elastomeric additives in a mixed solvent. The mastic shall bond firmly to dry, clean and contaminant-free steel surfaces (to be wire brushed before coating) without the use of a primer; shall have high electrical resistance; and shall be

totally resistant to aliphatic hydrocarbons. Apply the first coat of mastic to a dry film thickness of 10-12 mils. Allow this coat to dry for one hour, or until it is dry to the touch. Apply a second coat to the same dry coat thickness as the first. Backfill only after the second coat is dry to the touch.

351.03.04 Installing Tapping Sleeves for Iron Pipe:

1. Maintain a minimum separation of 24 inches from the near end of sleeve to adjacent joints or fittings.
2. Clean any dirt, corrosion, or foreign material from pipe.
3. Lubricate gasket and install sleeve.
 - a. For ductile iron body mechanical joint sleeves, insert side gasket into back half of gasket grooves. Make sure ends are flush with or slightly protrude into the end gasket seating area. Bolt sleeve halves together and trim side gaskets as necessary. Make sure sleeve will rotate freely on pipe. Install end gaskets, locating cut ends 90-degrees from side gasket. If pipe outer diameter is at the maximum of the sleeve range, stretch gasket to make certain cut ends match with no gap in between. Install glands and bolts and rotate sleeve to desired position, making sure pipe is centered inside the sleeve.
 - b. For stainless steel body full circumferential band sleeves, lubricate the pipe and gasket with a thin coating of pipe joint lubricant. Place the saddle section of the sleeve on the pipe and lightly lubricate the outside surface of the exposed gasket. Mate the band section with the saddle section on the pipe making sure that the tapered ends of the gasket are not folded or rolled against the pipe. Make sure no foreign material is trapped between the pipe and the gasket. Loosely install the lug bolts, position the sleeve, and hand tighten the nuts to hold the sleeve in place.
 - c. For epoxy-coated stainless steel tapping sleeves, lubricate the pipe and gasket with a suitable gasket lubricant. Place the outlet half of the sleeve on the pipe and move into position. Do not slide outlet half of sleeve around pipe. Make sure that the gasket is correctly positioned and that no foreign material is trapped between the pipe and the gasket. Bring the back half of sleeve into position and insert the bolts. Install washers (plastic first and then steel) and nuts.
4. Tighten sleeve bolts in accordance with manufacturer's recommendation using a torque wrench that has been properly calibrated.
 - a. For ductile iron body mechanical joint sleeves, tighten gland bolts using an alternating pattern. (If subsequent pressure testing indicates additional tightening is required, release pressure and relax tension on gland bolts before tightening side bolts. Retighten side bolts and then retighten gland bolts.)
 - b. For stainless steel body full circumferential band sleeves, begin tightening the bolts on alternating sides and moving from inside bolts to outside bolts. Make sure the gap between the sleeve sections is equal on top and bottom and equal from end to end. Do not attempt to apply all the torque to the bolts in one occurrence; instead, tighten all the bolts several times with incremental torque settings, up to the recommended torque. (If subsequent pressure testing indicates additional tightening is required, relieve the pressure and retighten the bolts to the recommended torque.)

- c. For epoxy-coated stainless steel tapping sleeves, tighten nuts uniformly to the manufacturer's recommended torque. The gap between sleeve halves should be equal on both sides and from end to end when the nuts are fully torqued. Do not attempt to apply all the torque to the nuts in one occurrence; instead, tighten all the nuts several times with incremental torque settings, up to the recommended torque. (If subsequent pressure testing indicates additional tightening is required, relieve the pressure and retighten the nuts to the recommended torque.)
5. Install tapping gate valve to sleeve using the appropriate gasket, nuts, and bolts. Apply blocking to support the valve's suspended weight, as shown in Standard Detail W-9. The tapping sleeve and valve flanges shall mate properly to ensure a straight centerline axis.
6. Test the valve and sleeve assembly using the tapping sleeve test port. Using potable water as the test medium, bring the pressure up to the test pressure indicated by the Contract Documents and hold for a period of 5 minutes. No leakage shall be permitted during the test period.
7. After attaching the sleeve to the existing main, but prior to making the tap, disinfect all surfaces to be in contact with potable water by swabbing with a 50 ppm chlorine solution.
8. Attach the drilling machine to the tapping valve and provide proper mating and alignment between the valve and the machine by using blocks and shims secured in place.
9. Perform the tap. Stresses induced during tapping may relax bolt torque; recheck tapping sleeve bolt torque and recheck torque on bolts connecting sleeve and valve. Tapping equipment shall be supported so that the sleeve does not support the weight of the equipment.
10. Provide buttress in accordance with Standard Detail W-4.
11. Make connection between new main and tapping valve. To prevent undue stress on the tapping sleeve and valve assembly, the new main shall be installed such that it rests on a well-compacted bed with its centerline axis matching the centerline axis of the tapping valve.
12. Provide valve vault in accordance with the appropriate Standard Detail (W-9 or W-10) and the requirements of Section 352.03.03 of these Specifications.

351.03.05 Steel Pipe. In addition to the general requirements referenced above, Steel Pipe for water main projects shall be installed in accordance with the requirements of AWWA C206 and C604 and the guidelines of AWWA Manual M11 except as modified by the Special Provisions provided by the Water Design Section of the Bureau of Engineering and Construction.

351.03.06 Prestressed Concrete Cylinder Pressure Pipe. In addition to the general requirements referenced above, water main projects utilizing Prestressed Concrete Cylinder Pressure Pipe shall be installed in accordance with the guidelines given in AWWA M9 except as modified by the Special Provisions provided by the Water Design Section of the Bureau of Engineering and Construction.

Tapping Sleeves for PCCP: Per manufacturer's recommendations.

351.03.07 High Density Polyethylene (HDPE) Pipe and Fittings. In addition to the general requirements referenced above, water main projects utilizing High Density Polyethylene Pipe and Fittings shall be constructed in accordance with the guidelines given in AWWA M55 and those Special Provisions provided by the Water Design Section of the Bureau of Engineering and Construction.

351.03.08 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. Baltimore City forces shall operate all valves involved in the work. The Contractor must complete the connections with the greatest possible speed in order to minimize public inconvenience. 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.

351.03.09 Buttresses, Anchorages and Thrust Blocks. Where restrained joints are not used, place buttresses behind all caps, horizontal bends and branches unless otherwise directed by the Engineer. Anchorages shall be placed beneath vertical bends. Place thrust blocks at reducers, as required by the Contract Documents. Buttresses, anchorages and thrust blocks 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. The Contractor shall coat bare steel in accordance with the requirements of Section 351.03.03, item 12.

351.03.10 Chlorination, Bacteriological, Hydrostatic and Leakage Tests.

(a) Responsibility.

(1) Engineer. The Engineer will perform the chlorination and bacteriological tests on new water main installations, relined water mains and bypass water mains 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 hydrostatic and leakage tests on all new water main installations.

(b) Water Samples. Baltimore City Bureau of Water and Wastewater will perform bacteriological testing for the disinfection of water mains and storage facilities according to ANSI/AWWA C651, Section 5.1.1, 5.1.2, 5.1.4 and 5.2. Two consecutive sets of samples shall be taken at least 24 hours apart and deemed acceptable by bacteriological standards before a water main or storage facility can be placed into service.

The Engineer will collect water samples and provide for their analysis for bacteriological quality. Samples must arrive at the Water Quality Lab no later than 6 hours after being taken. Because bacteriological analysis will be run on samples received in the lab by 1:00 PM, all field sampling must be completed by 12:00 noon. Results will be available after 3:00 PM the following day, as the results require a full 24-hour incubation period.

- (c) **Requests for Testing.** Requests for chlorination and bacteriological testing of new water mains shall be made to the Bureau of Engineering & Construction (Construction Contracts Administration Division), 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 Division, 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 isolate 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 hypochlorite of lime or chlorine gas into the main near the point where the main is charged using the **continuous-feed method** found in AWWA C-651. This solution shall be of such strength and quantity as necessary to provide a minimum residual of 10 parts per million by weight of free chlorine everywhere along the main after a contact duration of 24 hours. If the required residual is not obtained, the Contractor shall repeat the chlorination process until he obtains this residual.
- (f) **Hydrostatic and Leakage Tests.** While the main is filled with water, the Contractor shall raise the pressure at the lowest point in the main to the Test Pressure, as specified on the Contract Drawings, not exceeding this amount by more than 10%. All mains shall be subjected to the Test Pressure for 30 minutes duration.
- (1) To pass the leakage and pressure tests, all mains with a nominal diameter of 24 inches and less (regardless of pipe material or joint type) and all welded steel pipe and all fused plastic (HDPE or PVC, if allowed per Contract) pipe, are required to maintain the test pressure, without the addition of water, for the 30-minute duration.
 - (2) Mains with a nominal diameter greater than 24 inches and incorporating gasketed joints passing the 30-minute hydrostatic test without the addition of water have passed the leakage and pressure tests.
 - (3) All mains with a nominal diameter greater than 24 inches and incorporating gasketed joints that are unable to maintain the Test Pressure for the 30-minute

duration, without the addition of water, shall be retested over a 24-hour duration. To pass the leakage and pressure tests, the Test Pressure shall be maintained over the entire 24-hour duration; and water may be added at a rate not to exceed 10.0 gallons per inch of nominal diameter per mile of pipe. (Note: Contact the Design Division of the Bureau of Engineering and Construction for the allowable addition of water if large diameter ductile iron pipe is to be tested at a Test Pressure other than 150 psig.)

- (4) If the test requirements were not met within the time frames set above, the Contractor shall make any repairs necessary, at his own expense, to remedy the defects and to retest the main as specified.
- (g) **Flushing.** After successfully passing the 24-hour (minimum) disinfection period and the hydrostatic and leakage tests, the Contractor shall flush the water main until the chlorine residual is comparable to the source of the water.
 - (1) It shall be the responsibility of the Contractor to properly dispose of any water containing chlorine. No water containing measurable chlorine residual may be released, directly or indirectly, into any stream. The Contractor shall submit a proposed plan for the method of disposal or neutralization of chlorinated water to the Engineer for approval prior to proceeding.
 - (2) Following the flushing procedure, the Contractor shall assist the Engineer in obtaining water samples for bacteriological analysis.
- (h) **Tying In.** Once the main has passed the bacteriological standards determined by Baltimore City's Water Quality Lab and they release the main for active service, the Contractor shall make the necessary connections, as shown on the Contract Drawings, to tie the main into the distribution system and install services.
- (i) **Labor and Equipment.** The Contractor shall furnish all labor, water, material, and equipment necessary for making the tests and chlorinating the mains.

351.04 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 size and type of pipe specified on the Plans or directed by the Engineer. The contract price bid shall include 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 buttresses, fittings and appurtenances exclusive of valves, vaults and fire hydrants, chlorination field testing, and all labor, equipment and work necessary to complete the item.

The excavation and the refill necessary to locate the end of an existing water main for a tie-in shall be paid for under the Fixed Price Contingent Item *Test Pit Excavation*.

SECTION 352 - WATER VALVES AND VAULTS

352.01 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.

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

Valves 905.07

352.03 CONSTRUCTION METHODS.

352.03.01 Delivery, Storage, Handling and Operation: See 351.03.01.

352.03.02 General: refer to Section 351.03 and the following:

352.03.03 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.

The placement and consolidation of the required bedding under the unit shall be a minimum 6 inches of No. 57 aggregate unless otherwise directed by the Engineer.

352.03.04 Valve Installations (General):

1. All butterfly valves and all vertical, horizontal, and tapping gate valves, 16 inches in diameter and greater, shall be tested by Baltimore City before their installation in the pipeline. Baltimore City shall check the direction of opening, the number of turns to open/close, and freedom (apparent torque) of operation. The Contractor shall contact Baltimore City as soon as the valves arrive at the job site or local (i.e., Baltimore City or Baltimore County) storage yard. The Contractor shall not be entitled to any compensation for loss of production should it be determined that valves are unacceptable. Valves found to be unacceptable shall be repaired or replaced and shall be retested before installation. Under no circumstances shall the Contractor modify and/or repair in place valves that have failed the Baltimore City test.
2. In no case shall valves be used to bring misaligned pipe into alignment during installation.
3. Valves initially shall be installed in the closed position. Valves shall be installed with the valve stem perpendicular to the finished road or finished ground surface, as applicable.
4. Following installation, the Contractor shall provide to the Engineer "as built" survey data for each valve installed. For butterfly valves, the required survey data shall consist of horizontal coordinates in feet for the center of each access cover directly above their respective valve operator. For gate valves and tapping gate valves, required survey data shall consist of horizontal coordinates in feet for the center of each valve cover. Butterfly valve and gate valve coordinates shall be based upon NAD83/91 standards and shall be accurate to 0.10 feet in each application.

352.03.05 Installing Gate Valves:

1. Install gate valves in accordance with the *Standard Details for Construction* and at the locations shown on the Contract Drawings or as directed by the Engineer. Orient gate valves as follows:
 - Gate valves 12 inches in diameter and smaller: in the vertical position.
 - Gate valves 16 inches in diameter and larger: in vertical or horizontal position as shown or described in the Contract Documents.
2. All gate valves 4 inches in diameter and larger shall be housed in valve vaults; roadway boxes are not acceptable for use at gate valves unless expressly approved by the Engineer.
 - a. The operating nut for the valve shall be readily accessible for operation through the opening in the top slab of the valve vault.
 - b. The top slab shall be set in accordance with the *Standard Details for Construction*.
 - c. Backfill around valve vaults in paved sections shall be in accordance with Standard Detail G-2.

3. Every gate valve shall be properly supported so that the adjacent pipe is not required to support the weight of the valve. All adjacent pipe shall be properly supported so that no loading is transferred to the gate valve.
4. All inline (non-tapping) gate valves, 16 inches in diameter and greater, shall have 1-inch corporation stops suitable for pitometer use installed on each side of the gate valve, as shown in the *Standard Details for Construction*.
5. After installation, but prior to pressurization of the valve, the Contractor shall use a calibrated torque wrench, adjusted to the manufacturer's recommendations, to inspect all pressure-containing bolting (bonnet, seal plate, packing gland, and end connections).

352.03.06 Installing Butterfly Valves:

1. All butterfly valves shall be housed in valve vaults; butterfly valves shall not be direct buried. All butterfly valves operated using an AWWA operating nut shall be oriented during installation so that the valve shaft is horizontal and the operating nut is vertical.
2. All butterfly valves shall be provided with an access assembly immediately adjacent to the valve. See Section 905.07.02 for specific requirements.
3. Provide a concrete foundation or support under all butterfly valves. Width of foundation or support is to be determined by the Engineer. Provide a 1/8-inch thick felt bond breaker between the valve body and the concrete.
4. Provide pipe supports under valve inlet and valve outlet piping as near to the valve as practical or as directed by the Engineer. Piping, including any access assemblies, shall be supported independently of the valve.
5. Install the butterfly valve such that the seat-adjustment side is adjacent to the access.
6. Prepare pipe ends and install valves in accordance with the pipe manufacturer's instructions for the joint used.
7. The Contractor shall demonstrate to the Engineer that valve, valve appurtenances, and vault have been installed properly. Also, the Contractor shall demonstrate to the Engineer that the operating nut, along with all appropriate appurtenances, is fully accessible from above.
8. Following installation, the Contractor shall arrange to pay for the Field Certification described in Section 905.07.02.

352.03.07 Installing Tapping Gate Valves

1. Tapping gate valves 12 inches in diameter and smaller: install in the vertical position.
2. Tapping gate valves 16 inches in diameter and larger: install in vertical or horizontal position as shown or described in the Contract Documents.
3. Tapping iron pipe: See 351.03.04.
4. Tapping PCCP: See 351.03.06.

352.03.08 Installing Valve Extension Stems and Stem Guides:

1. Attach stem guides to vault walls using stainless steel expansion anchors with a minimum embedment length of 4 inches. Number and diameter of bolts shall be as recommended by the stem guide manufacturer.
2. Use a set screw to secure the female socket coupling to the valve operating nut.
3. Extension stems and stem guides shall be accurately aligned to eliminate distortion and undue stress.
4. Extension stems and stem guides shall be oriented such that they do not hinder access to the vault interior.
5. Payment for valve extension stems and stem guides shall be included in the price paid for valve and vault. Payment for valve and vault shall not be made until the Contractor demonstrates to the Engineer that valve extension stems and stem guides function properly and with minimum effort.

352.03.09 Replacing Existing Gate Valves:

1. General: See 351.03, 352.03.03, 352.03.04 and 352.03.05.
2. Work shall consist of removing existing gate valves located along ductile or cast iron water mains and replacing them with new gate valves at the same locations. For information and requirements regarding replacement of gate valves along PCCP mains and replacement of tapping gate valves, contact the Water Design Section of the Bureau of Engineering and Construction.
3. For gate valves installed in pre-cast vaults per Standard Details W-14 and W-15, the Contractor shall:
 - a. cut and remove existing pipe on one side of the existing valve as required to remove valve, and remove the valve vault in its entirety;
 - b. remove concrete grade rings or masonry as applicable;

- c. provide new pipe stub and gate valve;
- d. restrain gate valve to both the adjacent existing main and the new pipe stub;
- e. provide new restrained coupling to connect new pipe stub to outboard (far side) existing main;
- f. provide a new valve vault and new concrete grade rings or masonry as applicable.
- g. salvage existing frame and cover and reinstall on new valve vault.

With approval of the Engineer, the Contractor may substitute sleeve and spacer with ductile iron wedge-action retainer glands on each end for the required restrained coupling.

- 4. For gate valves installed in cast-in-place vaults per Standard Details W-16, W-16A and W-17 or as shown on the Contract Drawings, the Contractor shall:
 - a. remove and safely store the top slab, frame and cover safely away from the work area;
 - b. remove concrete grade rings or masonry as applicable;
 - c. cut and remove the existing pipe on one side of the valve as required to remove the valve, without damaging the vault;
 - d. remove the valve and the brick pier under the valve;
 - e. provide and install new pipe stub and gate valve;
 - f. restrain gate valve to both the adjacent existing main and the new pipe stub;
 - g. provide new restrained coupling to connect new pipe stub to outboard (far side) existing main;
 - h. provide new brick pier under new valve;
 - i. remove any pre-molded expansion joint material disturbed by valve replacement, and shall provide new pre-molded expansion joint material per 911.02;
 - j. re-install top slab using new joint sealer per 911.01 between top slab and vault walls;
 - k. provide new concrete grade rings or masonry as applicable.
 - l. re-install existing frame and cover.

(1) With approval of the Engineer, the Contractor may substitute sleeve and spacer with ductile iron wedge-action retainer glands on each end for the required restrained coupling.

(2) Where the existing valve is supported by a cast-in-place concrete pier, and the pier is sound and compatible with the replacement valve, the pier may remain in place. The Contractor shall install new roofing paper per 911.07 as a bond-breaker between valve and pier.

(3) As part of gate valve replacement, the Contractor is permitted to remove one existing pitometer corporation as shown on the referenced Standard Details. If both pitometer corporations are damaged or removed by replacement operations, the Contractor shall replace one pitometer corporation at no cost to the County.

5. Existing vertical gate valves shall be replaced with new vertical gate valves. Existing horizontal gate valves shall be replaced with new horizontal gate valves.

352.04 MEASUREMENT AND PAYMENT. *Gate Valve and Vault - Vertical, Gate Valve and Vault - Horizontal, Butterfly Valve and Vault, Tapping Gate Valve and Vault, Vertical, Tapping Gate Valve and Vault, Horizontal, and Replace Existing Gate Valve* are measured on the basis of the number of each type and size built or replaced as shown on the Plans or as directed by the Engineer.

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

1. For tapping gate valves, price shall also include cost to measure diameter of parent pipe prior to tapping; cost of furnishing and installing tapping saddle; cost of tapping operations and equipment; pressure testing; disinfection; and all costs associated with hiring tapping specialists and/or pipeline representatives. Test pits for accessing the parent pipeline prior to tapping to determine pipeline diameter and location of existing joints and fittings shall be paid for under the appropriate Test Pit pay item and shall be performed only with the prior approval of the Engineer.
2. For replacing existing gate valves, price shall also include the pipe stub, restrained joints, restrained coupling or equivalent, cutting and removal of existing pipe, preparation of existing pipe for re-connection, rigging and all vault work.

Payment for butterfly valves and vaults installed shall not be made until all items have been demonstrated in the presence of the Engineer to function properly and the Engineer has accepted the Field Certification.

Payment for gate valves and vaults installed, payment for tapping gate valves and vaults installed, and payment for replacing existing gate valves shall not be made until the Contractor demonstrates to the Engineer that each valve and vault has been installed properly and the operating nut is fully accessible from above.

SECTION 353 - WATER HOUSE SERVICE, WATER METER SETTING, AND VAULTS

353.01 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.

353.02 MATERIALS.

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

353.03 CONSTRUCTION METHODS.

353.03.01 Delivery, Storage, Handling and Operation: See 351.03.01.

353.03.02 Installing Water Services and Water Meter Settings (2 inches and smaller):

1. All services shall be laid to the grade and lines in accordance with the Contract Documents or as directed by the Engineer.
2. All meter vaults shall be set at the location shown in the Standard Details, unless directed otherwise by the Engineer.
3. Special care shall be taken to insure that the service lines are well bedded on a solid foundation. Extreme care shall be taken during installation to ensure that copper tubing is not crimped, gouged or otherwise detrimentally damaged. Copper tubing shall not be installed near sharp stones or ledge that could cause damage to the tubing. The Contractor shall repair any defects resulting from settlement at the Contractor's expense.
4. Copper tubing between tap and water meter (or factory-assembled meter setting) shall be installed as one continuous length of tubing (no intermediate joints or connections), unless otherwise approved by the Engineer. Similarly, copper tubing between water meter and cap or plug at service end shall be installed as one continuous length of tubing.
5. Copper tubing shall be installed without sharp turns or bends. Smooth vertical bends are required for installations shown in Standard Details W-21, W-22, and W-23. Smooth horizontal bends are required for installation as shown in Standard Detail W-28A. Contractor shall have available and shall utilize a pipe bending mandrel to bend copper tubing at no additional cost to the County, if so directed by the Engineer.
6. Only proper tube cutters shall be used to cut copper tubing; hacksaws and other similar equipment that result in rough edges are strictly prohibited.
7. Flared connections shall be provided only where indicated in the Standard Details. Contractor shall prepare the tubing end to be flared by using a reamer to remove burrs from the inside of the tubing. Then the Contractor shall utilize a flaring tool to create the flare on the end of the tubing.
8. Compression type couplings shall be provided where indicated in the Standard Details or as directed by the Engineer. Copper tubing ends to receive compression couplings shall be properly prepared to ensure strong, water-tight connections.

- a. Contractor shall de-burr copper tubing ends using tools designed for the work.
 - b. Contractor shall re-round copper tubing ends using proper rounding tool.
9. Soft set pipe thread compound shall be used on all threaded connections to ensure a drip tight seal. Pipe thread compound shall be NSF61 approved for contact with potable water.
 10. Only smooth jawed wrenches are permitted to tighten fittings and connections.
 11. Water service connections may be installed by open-cut or by boring at the Contractor's option except when a method is specified by the Engineer.
 12. All pipe and fittings shall be thoroughly cleaned before being installed and shall be kept clean until acceptance of the completed work.
 13. All services shall be thoroughly flushed with potable water in the presence of the Engineer.
 14. All service ends not immediately connected to house service shall be provided with either a cap or plug (see Standard Details) to prevent any foreign matter from entering the pipe. The Contractor shall mark the end of each water service not immediately connected to house service by providing a 2" x 6" wood post painted with blue paint. Post shall be approximately 4 feet long and driven into the ground approximately 18 inches.
 15. Meters and meter settings shall be installed level and with the long axis of the meter installed perpendicular to the curb and gutter (existing or proposed) or edge of pavement (existing or proposed). Where the meter or meter setting is remote from the roadway, the long axis of the meter shall be aligned with the centerline of the water service.
 16. Meter vaults shall be installed in non-traffic areas only; do not locate in driveway unless otherwise noted on the Contract Drawings or directed by the Engineer.
 17. All meter vaults shall be bedded on firm undisturbed earth in combination with bricks or pre-cast vault bottom sections. Meter vaults shall be installed level. For circular meter vaults, vaults shall be centered over meter valves and fittings such that there is a uniform gap between meter valves and fittings and the inside surface of the vault. In no case shall any vault be installed such that the inside surface of the vault is in direct contact with any meter valve, fitting, or tubing.

353.03.03 Installing Corporation Stops:

1. General
 - a. Protect the threads on corporation stops at all times.

- b. Use a good thread sealant on the inlet threads to provide a leak-proof connection. Petroleum-based products that might damage seals or o-rings are strictly prohibited.
 - c. Use only a smooth jawed wrench to handle the corporation stop. Grip the corporation stop by using the flats provided nearest the thread being installed. Pipe wrenches with serrated jaws are strictly prohibited and shall be cause for rejection of the corporation assembly.
2. Orientation and Location
- a. Corporations used for standard water service connections ($\frac{3}{4}$ inches to 2 inches) to either iron pipe or prestressed concrete cylinder pipe shall be installed at a 45-degree angle up from the horizontal. Additionally, maintain a minimum separation (as measured along the pipe centerline) of 18 inches between other service connections or pipe joints.
For service connections to other pipeline materials, consult the Design Division of the Bureau of Engineering and Construction.
 - b. Corporations used in pitometer, pipeline monitoring, blow off, or air release applications shall be installed in the vertical position.
 - c. Corporations used to install small domestic meters in FM meter vaults shall be installed in the horizontal direction, unless directed otherwise by the Engineer.
3. All connections to the water distribution system shall be made under full water service pressure unless otherwise approved by the Engineer. Install corporation taps in water mains only after they are chlorinated and tested according to Section 351.03.10.
4. Tapping pipe shall be performed using a tapping machine specifically designed for that purpose. Follow tapping machine instructions and these Specifications.
- a. For iron pipe, use a service saddle to tap the pipe where required by the Standard Details. Corporation stop shall be assembled with the machine until it feels solid; do not attempt to force the corporation stop to its permanent tightness with the machine. After tapping the pipe, remove the machine and provide final tightening of the corporation stop using an appropriate wrench.
For applications utilizing a service saddle, begin assembly by cleaning pipe surface thoroughly. Mount the saddle on the pipe with the outlet in the required orientation. Using a calibrated torque wrench, tighten the saddle nuts in accordance with the manufacturer's recommendation. Install the corporation; after installation, recheck the saddle torque and retighten if necessary.
 - b. Threaded Service Connection up to 2 inch diameter for PCCP:
 - 1) Consult the Water Design Section of the Bureau of Engineering and Construction to determine the approximate static pressure in the pipe to be tapped.
 - 2) Nuts and bolts shall be tightened to the manufacturer's recommended torque value only with a torque wrench that has been calibrated to the satisfaction of the Engineer.

- 3) Expose the pipe at the location where the tap is to be made. Maintain a minimum separation of 18 inches from the near end of any joint band or fitting to the tap location.
 - 4) Remove the cement mortar coating from an area slightly larger than the base of the tapping assembly gland to expose the prestressing wires and steel cylinder. Be sure that there is no cylinder weld seam in the area where the saddle gasket will seat.
 - 5) Cut and remove prestressing wires from the opening in the mortar coating, taking care not to damage the steel cylinder. Remove any dust or debris from the exposed steel cylinder.
 - 6) Position the saddle with inserted outlet bolts over the hole in the coating. Secure the saddle around the pipe in accordance with the manufacturer's recommendations.
 - 7) Install the gland gasket, the gland and the outlet nuts. Tighten the outlet nuts to the recommended torque in an alternating pattern in accordance with the manufacturer's recommendations to attain a seal between the cylinder and gland gasket. The outlet nuts shall not be tightened beyond the recommended torque values.
 - 8) Tighten the corporation stop into the gland. Perform a pressure test to ensure that the seal is water-tight. Test pressure shall be equal to the greater of either the approximate static pressure or 75 psi.
 - 9) Connect the tapping machine to the corporation stop. A carbide steel tipped drill bit is recommended for tapping. Coordinate drill bit size with size of tap.
 - 10) Open the corporation stop fully. Advance the drill bit and drill through the cylinder and concrete core.
 - 11) Retract the drill bit completely. Close the corporation stop and remove the tapping machine.
 - 12) Open the corporation stop and flush away the cuttings.
 - 13) With the aid of a joint wrapper, apply a protective coating of cement mortar at least 1 inch thick over all exposed surfaces of the tapping assembly, including straps, strap bolts and gland bolts. All voids between the pipe and tapping assembly shall be filled with cement mortar.
 - 14) Remove all cement above the inlet threads on the corporation stop.
 - 15) The joint wrapper shall remain in place during all backfill operations. After the cement mortar has stiffened, install backfill around the exposed pipe and tapping assembly following approval by the Engineer.
5. Provide special insulating corporation stops where required by the Contract Documents.
- a. When installing an insulating corporation stop, engage the flats on the base of the assembly and bring it to its permanent tightness. Then proceed by tightening the nylon insert and outboard (terminal) end of assembly only enough to provide a watertight connection. Attempting to tighten the entire assembly at one time by engaging only the nylon insert or the outboard end of the assembly is prohibited as it may lead to failure of the nylon insert.

- b. Insulating corporation stops shall be coated after verification of proper electrical isolation and prior to backfill. Completely coat the entire corporation stop assembly (including service saddle body if so equipped) and extend the coating a minimum of 12 inches along the service line.
- c. Contractor shall submit coating system to the Engineer for approval. Coating system shall consist of the following:
 - 1) Primer – a primer containing moisture displacing corrosion inhibiting compounds with a solids content greater than 98-percent, a specific gravity of 1.08 and a specific volume of 26 cubic inches per pound.
 - 2) Filler mastic – a cold-applied self-supporting molding mastic consisting of a petrolatum compound containing beads of closed-cell, cellular polymer with flow control additives. Filler mastic shall have a solids content of 100-percent, a specific gravity of 0.605, and a specific volume of 45.9 cubic inches per pound.
 - 3) Innerwrap – a nonwoven synthetic fabric carrier fully impregnated with a neutral compound based on saturated petrolatum and inert siliceous fillers. Innerwrap shall have a thickness of 46 mils, a breaking strength of 22.5 pounds per inch, a water vapor transmission of 0.006 perms average, and a resistance to cathodic disbonding of 0.28 square inches average.
 - 4) Outerwrap – a plasticized polyvinyl chloride sheeting coated on one side with a rubber resin, pressure sensitive adhesive. Outerwrap shall have a thickness of 10 mils and a minimum breaking strength of 25 pounds per inch.
- d. Clean the surface of the corporation and adjacent components by removing all loose scale, rust or other foreign matter in accordance with Steel Structures Painting Council SP2 (Hand Tool Cleaning) or SP3 (Power Tool Cleaning).
 - 1) Apply a uniform coat of the primer to the corporation and adjacent components.
 - 2) Apply mastic filler to all irregular surfaces of the corporation assembly so as to assure a smooth profile for application of the inner tape coating.
 - 3) Apply innerwrap to the corporation assembly and adjacent components in a spiral fashion with a minimum overlap of 55-percent.
 - 4) Apply outerwrap, under tension, to the corporation assembly and adjacent components in a spiral fashion with a minimum overlap of 1 inch.

353.03.04 Installing Water Services and Water Meter Settings 3 Inches and Larger (Including FM Meters and Detector Checks):

- 1. All meters shall be procured from Baltimore City. Contractor shall coordinate work efforts with meter procurement.
- 2. All services shall be laid to the grade and lines in accordance with the Contract Documents or as directed by the Engineer. Service leads shall have a minimum 4 feet of cover from the top of the curb.
- 3. All meter vaults shall be set at the vertical depth shown in the Standard Details and at the location shown in the Contract Documents. Meter vaults shall be installed in non-traffic areas only; do not locate in driveways unless otherwise noted in the Contract Documents or directed by the Engineer.
- 4. All meters shall be installed level and shall be installed with a minimum length of

straight and level pipe on the inlet side equivalent to 8 pipeline diameters. Meters shall be properly supported using brick piers or other methods approved by the Engineer.

5. Meter vaults shall be installed using a minimum compacted bedding of 6 inches of No. 57 aggregate unless otherwise directed by the Engineer.
6. Refer to City of Baltimore Department of Public Works Standard Details for detector check installation requirements.

Meter Type	Standard Details Reference
FM meters	W-27A and W-27B
FM meters with Small Domestic Meters	W-28A and W-28B
FM meters with Large Domestic Meters	City of Baltimore Std Details
FM meters with Reduced Size Large Domestic Meters	City of Baltimore Std Details

7. Install a restrained mechanical joint cap(s) on the tailpiece(s) of the meter setting, as shown in the appropriate Baltimore County or Baltimore City Standard Details. Mark the location of the cap(s) as specified in Section 353.03.02.14.
8. Perform chlorination, bacteriological, hydrostatic and leakage tests on service leads from parent main to required pipe joint outside of meter vault. Chlorination and tests shall conform to requirements specified in Section 351.03.10.
9. All pipe between service valve and meter vault shall be ductile iron and shall be installed as specified in Section 351.03.
10. Service isolation valves shall be gate valves, horizontal or vertical, as indicated in the Contract Documents. Install gate valves as specified in Section 352.03.05.
11. Tapping sleeves, if required for service connection, shall be installed as specified in Section 351.03.

353.03.05 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 as shown on Standard Details. Tail pieces on 3/4-inch to 2-inch service lines must extend 5 feet past right-of-way line unless otherwise noted.

353.04 MEASUREMENT AND PAYMENT.

353.04.01 Water house services and fittings 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 size and type of pipe involved. This price shall include all material, fittings, pavement cutting, driving sleeves, unclassified excavation and refill, removal, storage and re-handling of excavated materials, bracing, pumping and other disposal of water, labor and all incidentals necessary to complete the work.

353.04.02 Meter Settings and Vaults for Meters 2 Inches and Smaller are measured on the basis of the number actually built and accepted and are paid for at the contract unit price per Each for the pertinent meter type and size involved. This price shall include tapping of the main, vaults, frames and covers, fittings as shown on the Standard Details or Plans and all labor and incidentals necessary to complete the item.

Payment for ***Meter Settings and Vaults*** for Meters 2 Inches and Smaller installed shall not be made until the Contractor demonstrates to the Engineer that each meter installation and vault has been installed properly. Additionally, payment shall not be made until the required survey data has been provided.

353.04.03 *Meter Settings and Vaults* for Meters 3 Inches and Larger are measured on the basis of the number actually built and accepted. Meter settings and vaults are paid for at the contract unit price per Each for the pertinent meter type and size involved. This price shall include furnishing and installing the vault, engineering design of the vault, coordination with Baltimore City, surveying, frames and covers, fittings and pipe inside vault and out to required pipe joint on inlet side, tail piece with restrained cap, supports (piers), excavation, bedding, and compaction.

1. Service line between parent main and pipe joint on inlet side of meter vault shall be measured and paid for separately.
2. Service valve with associated vault shall be measured and paid for separately.
3. For small domestic meters installed in conjunction with FM meters, as shown on Standard Detail W-28A, price paid shall include tapping of blind flange with corporation stop and small meter installation but shall not include the price for copper water service and associated small diameter fittings. Copper water service and fittings shall be measured and paid for separately.
4. For small domestic meters installed in conjunction with Detector Check meters, as shown on Baltimore City Standard Details, price shall include tapping the companion flange and small meter installation with brass pipe and brass nipple but shall not include the price for copper water service and associated small diameter fittings. Copper water service and fittings shall be measured and paid for separately.

353.04.04 *Meter Relocations* are measured on the basis of the number actually relocated. Payments for relocating single meters are made at the contract unit price per Each for the pertinent meter type and size involved. Payment for relocating twin meters are made at the contract unit price per Pair for the pertinent meter type and size involved. If new meter vaults, frames and covers, meter settings, meter yokes, or fittings are required, they are paid 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 354 - FIRE HYDRANTS

354.01 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.

354.02 MATERIALS. Only fire hydrants and restrained joints approved by the Baltimore City Department of Public Works are accepted. See Section 905.

354.03 CONSTRUCTION REQUIREMENTS.

354.03.01 Delivery, Storage, Handling and Operation: See 351.03.01.

354.03.02 Installing and Commissioning Fire Hydrants:

1. Submit **Certificate of Compliance** to the Engineer as described in 905.07.01(1) of these Standard Specifications.
2. Fire hydrants shall be installed and restrained in accordance with Plate W-3A of the Standard Details. Hydrants shall be set within a stone drainage well (No. 57 stone) extending the full width of the trench. Stone shall be placed at least six inches (6") above the connection between the base (shoe) and the lower barrel.
3. **Elevation.** Install hydrants at an elevation recommended by the manufacturer for replacement of the breakaway bolts, in accordance with the requirements shown on Standard Detail W-3A. Install extension pieces if necessary.
4. **Hydrant leads** shall be laid level on a firm foundation, and the hydrant shall be set plumb. Backfill around the hydrant shall be compacted to 92-percent of AASHTO T-180 density.
5. Install hydrants with a **concrete collar** 6-inches thick, 2-feet wide by 2-feet long (6" x 2' x 2') around the hydrant barrel at or near the ground line. Install expansion joint material between the concrete collar and the hydrant barrel. Concrete collar shall be cast monolithically.
6. Unless indicated otherwise on the Contract Documents, install fire hydrant such that the 4.5-inch outlet (pumper outlet) faces the adjacent curb or edge of pavement.
7. When thrust blocks are installed behind the hydrant base (shoe), drain holes shall not be blocked or plugged.
8. Hydrant operating nut and hydrant outlet caps shall be operated using an appropriately sized 5-sided wrench only. Hydrant nuts and/or caps that have been damaged due to the use of inappropriate tools (including, but not limited to, pipe wrenches) shall be replaced as directed by the Engineer at no additional cost to the County.
9. Following installation, all fire hydrants shall be given a flush test performed by the Contractor in the presence of the Engineer. The Contractor shall install a diffuser on the 4.5-inch nozzle and shall open the hydrant to demonstrate that the hydrant is functioning properly and to demonstrate that there are no obstructions or debris in the

hydrant lead. Following the flush test, the Contractor shall remove the diffuser and shall reinstall the outlet cap.

354.03.03 Relocating Hydrants. This work consists of relocating a fire hydrant by extending or shortening the hydrant lead while preserving the hydrant valve, vault and the connection to the parent main. See 354.03.02.

1. The Contractor shall determine whether the hydrant valve has been restrained to the tee or tapping saddle before removing the hydrant. If the valve is not restrained to tee or saddle, or if use of restrained joints cannot be verified, the Contractor shall (1) block the hydrant valve in the valve vault before arranging with Baltimore City to close the valve, or (2) make arrangements with Baltimore City to isolate the entire hydrant lead by isolating the parent main.
2. The Contractor shall remove the entire hydrant, existing stone drainage well, filter fabric, brick support, buttress, and concrete shock slab or sidewalk section, as applicable. The Contractor shall remove existing hydrant lead pipe as required. The Contractor shall provide a new hydrant, restrained to lead pipe, shall provide any necessary new hydrant lead pipe, and shall provide a new stone drainage well, new filter fabric, new brick support, a new buttress and a new concrete shock slab or sidewalk section.

354.03.04 Remove Existing Fire Hydrant and Replace with New Fire Hydrant. This work consists of removing a fire hydrant and replacing it with a new fire hydrant at the same location. See 354.03.02.

1. See 354.03.03, #1 for requirements prior to removing hydrant.
2. The Contractor shall remove the entire hydrant, existing stone drainage well, filter fabric, brick support, buttress, and concrete shock slab or sidewalk section, as applicable. The Contractor shall provide a new hydrant, restrained to lead pipe, shall provide any necessary new hydrant lead pipe, and shall provide a new stone drainage well, new filter fabric, new brick support, a new buttress and a new concrete shock slab or sidewalk section.

354.04 MEASUREMENT AND PAYMENT. *Furnish and Install 6 In. Fire Hydrant or Relocate Existing 6 Inch Fire Hydrant or Remove Existing Fire Hydrant and Replace with New Fire Hydrant* is measured on the basis of the number of hydrants installed, relocated or removed and replaced as shown on the Plans or as directed by the Engineer.

Hydrants, complete in place, are paid for at the contract unit price per Each for the 6 inch size installed, relocated or removed and replaced. This price paid shall include all excavation and refill, bracing, pumping and other disposal of water, concrete buttresses, and material, tools and labor necessary to complete the item. Extension pieces that were not included on the Plans, but required due to field conditions, are paid for as extra work. The hydrant valve and

vault, connection to the parent main, and new or replacement hydrant lead pipe and fittings shall be paid for as part of other bid items in the Contract.

Payment for fire hydrants installed shall not be made until a satisfactory flush test has been performed.

SECTION 355- FOUR-INCH DEWATERING VALVE & VAULT

355.01 DESCRIPTION. This work involves providing a 4-inch flanged gate valve connected to the crown of a water main 48 inches in diameter or less for the primary purpose of dewatering the main. See Standard Detail W-2.

355.02 MATERIALS.

Meter Vaults	Std. Detail W-2
Gate Valve	905.07.03

355.03 CONSTRUCTION.

1. Flanged gate valve shall be operated by hand-wheel and shall meet the requirements given in Section 905.07.02. Gate valve used for dewatering shall be installed in a pre-cast manhole riser with a 'doghouse' configuration to fit over the parent main. Pre-cast manhole riser shall be centered over the parent main with a minimum clearance of 2 inches.
 - a. See Section 352.03.03 for bedding requirements under base slab.
 - b. Subject to approval of the Engineer, a cast-in-place vault may be provided as an alternative to the pre-cast manhole riser.
2. The manufacturer shall provide a parent main (ductile iron, steel, or PCCP) with a 4-inch flanged outlet oriented in the vertical position to accept the 4-inch flanged gate valve. Contractor shall provide a 4-inch blind flange bolted to outlet end of gate valve.
3. Contractor shall provide a 24-inch frame and cover at all dewatering valve vaults. For dewatering valve vaults with limited vertical clearance, as shown on Standard Detail W-2, Contractor also shall provide a 7-inch access with 7-inch frame and cover centered above dewatering valve outlet.
4. Following installation of 4-inch dewatering valve and vault, and following commission of water main, Contractor shall demonstrate to the Engineer proper operation of the dewatering valve. Following this demonstration, Contractor shall re-install blind flange.

355.04 MEASUREMENT & PAYMENT. *4-Inch Dewatering Valve And Vault* is measured on the basis of the number of each built as shown on the Plans or as directed by the Engineer. Four-inch dewatering valves and vaults are paid for at the contract unit price per Each for units installed, which price shall include all unclassified excavation and refill; removal storage and re-handling of excavated material; pumping and other disposal of water; 4-inch flanged outlet on parent main; vault work; survey data; and all materials, tools and labor necessary to complete the item.

SECTION 356 – AIR RELEASE VALVE & VAULT

356.01 DESCRIPTION. This work involves providing a hand-wheel-operated gate valve connected to the crown of a water main for the primary purpose of releasing air that has accumulated at a high point along the main. See Standard Detail W-8.

356.02 MATERIALS.

Meter Vaults	Std. Detail W-8
Gate Valve	905.07.03

356.03 CONSTRUCTION.

1. Connection to water mains 30 inches in diameter and less shall be made to the crown of the pipe using a corporation stop. Contractor shall provide brass pipe threaded into corporation stop, followed by gate valve threaded onto brass pipe. Brass pipe with matching threaded cap shall be threaded into gate valve.

Where a service saddle is used to connect the corporation stop to either iron pipe or PCCP, Contractor shall follow the requirements of Section 353.03.03 except that the corporation stop for air release applications shall be installed at the crown of the pipe.

See the following requirements: Corporation stop: Section 905.07.04(a)1.
Gate valve: Section 905.07.04(c)
Brass pipe: Section 905.07.04(d)
Service saddle, iron pipe: Section 905.07.03(b)
Service saddle, PCCP: Section 905.07.03(c)

2. Connection to water mains 36 inches in diameter and greater shall be made to the crown of the pipe using a flanged outlet provided by the pipeline manufacturer. The Contractor shall provide a flanged resilient wedge gate valve bolted to the pipeline outlet, followed by a blind flange (with corporation stop) bolted to the gate valve.

See the following requirements: Gate valve: Section 905.07.02(a)

Corporation stop: Section 905.07.04(a)2.

3. Vaults

- a. Vaults for air release installations along mains 16 inches in diameter and less shall be large pre-cast sectional vaults as shown in Standard Detail W-15.
- b. Vaults for air release installations along mains 20 inches in diameter and larger require approval by the Engineer and shall be either cast-in-place or precast with 'doghouse' openings. Precast vaults with 'doghouse' openings shall be centered over the parent main and shall have a minimum clearance of 2 inches between main and opening. Cast-in-place and precast vaults shall be provided with an 8-inch diameter sump in the base slab. See Section 352.03.03 for bedding requirements under base slab.

- 4. Following installation of air release valve and vault and commissioning of the water main, Contractor shall demonstrate to the Engineer proper operation of the air release valve; valve shall be opened until all air is exhausted.

356.04 MEASUREMENT & PAYMENT. *Air Release Valve And Vault* is measured on the basis of the number and size of each built as shown on the Plans or as directed by the Engineer. Air release valves and vaults are paid for at the contract unit price per Each for units installed, which price shall include all unclassified excavation and refill; removal, storage and rehandling of excavated material; pumping or other disposal of water; 4-inch or 6-inch flanged outlet on parent main or corporation stop and service saddle, as applicable; vault work; survey data; and all materials, tools, and labor necessary to complete the item.

SECTION 357- BLOW-OFF & VAULT

357.01 DESCRIPTION. This work involves providing a handwheel-operated gate valve connected to a dead end water main 12 inches in diameter or less for the primary purpose of flushing the main. See Standard Detail W-11.

357.02 MATERIALS.

Meter Vaults	Std. Detail W-11
Gate Valve	905.07.03

357.03 CONSTRUCTION.

- 1. Connection to water main shall be made to the crown of the pipe using a corporation stop. Contractor shall provide a brass pipe threaded into the corporation stop, followed by gate valve threaded onto brass pipe. Brass pipe with matching threaded cap shall be

threaded into gate valve.

Where a service saddle is used to connect the corporation stop to iron pipe, Contractor shall follow the requirements of Section 353.03.03 except that the corporation stop for blow-off applications shall be installed at the crown of the pipe.

Where a blow-off is to be installed on HDPE pipe, the Contractor shall use an electrofusion service saddle to connect the corporation stop to the crown of the pipe. Contractor shall install the service saddle in accordance with Special Provisions to be provided by the Water Design Section of the Bureau of Engineering and Construction.

See the following requirements: Corporation stop: Section 905.07.04(b)
Gate valve: Section 905.07.04(c)
Brass pipe: Section 905.07.04(d)
Service saddle, iron pipe: Section 905.07.03(b)
Service saddle, HDPE pipe: see Water Design Section
Special Provisions

2. Contractor shall provide cap and standard concrete buttress on end of parent main. Concrete buttress shall be poured against undisturbed soil and shall be installed in accordance with Standard Detail W-5.
 - a. Use a buttress sized for a 6-inch cap for both 6-inch cap and 4-inch cap applications.
 - b. For HDPE applications, cap shall be butt-fusion welded to parent main. See Special Provisions provided by the Water Design Section.
3. Vaults for blow-off installations shall be small precast sectional vaults as shown in Standard Detail W-14.
4. Following installation of blow-off valve and vault and commissioning of water main, Contractor shall provide temporary hose for connection to the blow-off piping and shall demonstrate to the Engineer proper operation of the blow-off assembly.

357.04 MEASUREMENT & PAYMENT. *Blow-Off And Vault* is measured on the basis of the number and size of each built as shown on the Plans or as directed by the Engineer. Blow-offs and vaults are paid for at the contract unit price per Each for units installed, which price shall include all unclassified excavation and refill; removal, storage, and re-handling of excavated material; pumping or other disposal of water; cap and buttress; vault work including service saddle as applicable; survey data; and all materials, tools, and labor necessary to complete the work.

SECTION 358 - PLUG & CLAMP

358.01 DESCRIPTION. This work involves providing a plug restrained to the bell end of an iron pipeline using steel angle straps and eyebolts. See Baltimore City Standard Detail No. BC 858.01.

358.02 MATERIALS.

Plug	See Baltimore City Std. Detail BC 858.01
Clamp	See Baltimore City Std. Detail BC 858.01

358.03 CONSTRUCTION.

1. Pipeline sizes utilizing plugs and clamps shall be limited to 8 inches maximum; consult the Water Design Section of the Bureau of Engineering and Construction if larger sizes are required.
2. See Section 351.03 for requirements pertaining to the installation of the pipe plug.
3. Unless indicated otherwise by the Engineer, torque eyebolts as follows:
 - $\frac{3}{4}$ -inch diameter eyebolts (4-inch and 6-inch mains): 155 ft-lbs
 - $\frac{7}{8}$ -inch diameter eyebolts (8-inch mains): 205 ft-lbs
4. After installation of plug and clamp, Contractor shall pressure test the installation as required by the Contract documents. If any leaks are detected, the Contractor shall re-torque the eyebolts or disassemble and reassemble the installation as necessary to effect repairs.
5. Following successful pressure testing of the plug and clamp assembly, Contractor shall encase the assembly as shown on the referenced detail. Bottom of concrete encasement shall be poured against undisturbed or compacted soil, as directed by the Engineer.

358.04 MEASUREMENT & PAYMENT. *Plug And Clamp, Furnish And Install* shall be measured on the basis of the number and size of each built as shown on the Plans or as directed by the Engineer. Plugs and clamps are paid for at the contract price per Each for units installed, which price shall include all unclassified excavation and refill; removal, storage and re-handling of excavated material; pumping or other disposal of water; and all materials, tools, and labor necessary to complete the item.

SECTION 359 - ABANDONMENT OF WATER APPURTENANCES

359.01 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.

359.02 MATERIALS. N/A

359.03 CONSTRUCTION.

1. 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.
2. The Contractor shall remove water meters which are to be abandoned and return them to Baltimore City as directed.
3. The Contractor shall remove the top portions of valve vaults, meter vaults and roadway boxes and remove lower hydrant barrels to be abandoned to a depth of 18 inches below final grade and backfill the area.
4. The Contractor shall restore the surface with materials appropriate to the site as directed by the Engineer.
5. Remove Existing Fire Hydrant and Valve. Contractor shall: remove the existing tee or existing tapping sleeve, the existing hydrant valve and the valve vault and hydrant as described in 356.03(c). Contractor shall provide the necessary sleeves, spacers and pipe stub along the parent main.

359.04 MEASUREMENT AND PAYMENT.

- a. *Remove Existing Fire Hydrant and Valve* is measured based upon the number of fire hydrants and valves removed, as shown on the construction drawings or as directed by the Engineer. Pipe and fittings installed along the parent main are paid for as part of other bid items in the Contract.
- b. All other work under this item is not measured. Costs of Abandonment of Appurtenances are included in the price bid for items of new construction.
- c. 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.

SECTION 361 - SANITARY SEWERS AND SANITARY SEWER HOUSE CONNECTIONS

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

361.02 MATERIALS.

Ductile Iron Pipe for Sanitary Sewers	905
PVC Plastic Pipe	905
Reinforced Concrete Pipe for Sanitary Sewers	905
Prestressed Concrete Cylinder Pressure Pipe	905

361.03 CONSTRUCTION METHODS.

361.03.01 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 shall keep them clean until the completed work is accepted. The Contractor shall keep dirt and other substances from entering.
- (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 that will accommodate 6-inch VCPX, unless otherwise noted on the Plans. House connections shall be placed in accordance with Standard Detail S-12A.
- (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) **Branches.** The Contractor shall locate in the position designated by the Engineer of 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.
- (j) **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.
- (k) **In-Use Deflection Limit.** The maximum allowable in-use deflection limit is 5%.
- (l) **References.** See section 351.03 for additional information on laying ductile iron and concrete pipe that is applicable to this work also. Refer to ASTM Designation D-2321 for installation requirements of PVC sewer pipe. Also refer to the manufacturers' recommendations.

361.03.02 Acceptance Testing.

- (a) **Examination.** The Contractor shall 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 shall 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, 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.

(e) TV Inspection. Refer to Section 300.03.06.

361.03.03 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 shall 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 shall also furnish water for leakage tests.

361.03.04 House Connections. All house connections to existing sewers shall be unobstructed, watertight, and capable of passing an air pressure test as described in Section 361.03.02, 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 four (4) feet above grade, as an incidental to the house connection.

361.04 Measurement and Payment. *Sanitary Sewers* shall be measured horizontally along the centerline of the trench from center-to-center of manholes and through fittings.

Sewer House Connections shall be measured 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 (Standard Detail S-12A).

Sanitary Sewers and *Sewer House Connections*, complete in place, are paid for at the Contract unit price bid per linear foot for the particular type and size of pipe specified in the

Contract Documents. This price includes and covers cutting paving, unclassified excavation and refill removal, storage and re-handling of excavated materials, bracing, pumping and other disposal of 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 in accordance with Contract Documents to the grade indicated, testing, and incidentals and related work as shown, specified, and directed.

SECTION 362 - SANITARY SEWER MANHOLES

362.01 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.

362.02 MATERIALS.

362.02.01 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. Un-reinforced concrete shall be Mix No. 1, air-entrained, unless noted otherwise.

362.02.02 Materials.

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

362.02.03 Manhole Steps. Manhole steps shall be constructed in accordance with Standard Details G-4 and G-4A.

362.02.04 Precast Concrete Manholes. These manholes must meet the requirements of ASTM C 478. See Standard Details S-4 and S-5.

362.03 CONSTRUCTION.

362.03.01 Precast Concrete Manholes shall be installed as shown on the Plans and Standard Details. The placement and consolidation of the required bedding under the unit shall be a minimum 6 inches of No. 57 aggregate unless otherwise directed by the Engineer.

362.03.02 Weather Restriction (Brick Manholes). Do not lay brick when the temperature is below 40 F or when lower temperatures are predicted within 24 hours unless the Engineer

approves a method for protection of brickwork. Take such measures as may be approved to prevent brickwork from being exposed to freezing temperatures for no less than 5 days after laying.

362.03.03 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.

362.03.04 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.

362.03.05 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.

362.03.06 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.

362.03.07 Manhole Frames, Covers and Steps. Furnish and set these items as work progresses. Insure that the frames are installed in accordance with Construction Documents or per instructions of the Engineer. Space steps vertically, with alignment as shown on the Standard Detail Drawings.

362.03.08 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.

362.03.09 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.

362.03.10 Watertight Manhole Frames and Covers. Watertight manhole frames and covers shall be provided where the manhole location is subject to flooding over the top of the manhole cover and at locations indicated on construction plans. Use of watertight manhole frames and covers is allowed to control surcharging of the sanitary sewer if the frame is firmly anchored to the manhole in accordance with MdSHA Standard Details concerning

anchoring of frames to manhole. Anchoring of frames is not required except when the manhole is subject to surcharging.

The Contractor shall use precast rubber grade adjustment rings per Standard Detail G-3B when the cover of a sanitary sewer watertight manhole frame and cover is below the designated 100-year floodplain elevation at the manhole location.

Twenty-four inch (24") diameter watertight manhole frame and its cover shall comply with Standard Details S-13A and S-13B for off-road and in-road use as noted on the Standard Details. These watertight frames and covers shall be used only for those locations as specified on the Standard Details. The Contractor shall present the manufacturer's certification that manhole frames and covers to be used in public roads and other areas subject to vehicular traffic have traffic-bearing capacity exceeding HS-27 loading to the Engineer upon delivery of the watertight frames and covers to the work site.

Where construction plans require a 30-inch diameter frame and cover for access, the Contractor shall provide a frame and cover in accordance with Baltimore County Standard Details or Special Provisions.

Care shall be taken so that the machined surfaces of the cover and frame are not damaged when the manhole frame is open. Watertight frames and covers damaged during contractor operations shall be replaced by the Contractor at no additional cost to the County at the sole discretion of the Engineer.

Watertight manhole covers shall be labeled as "Sanitary Sewer" in all cases. The cover shall be labeled as "Baltimore County Sanitary Sewer" only when construction plans indicate that the manhole is located in either a public road right-of-way or a public utility easement.

362.04 MEASUREMENT AND PAYMENT.

362.04.01 The bid item *Sanitary Sewer Manhole* shall be measured in vertical feet from the bottom of the frame to the invert of the channel at the center of the manhole.

The bid item *Sanitary Sewer Manhole* shall be paid for at the contract unit price per vertical foot constructed for the specified manhole diameter. The price bid per vertical foot shall include and cover furnishing and placing all concrete and brick masonry and appurtenances, excluding frame and cover, and building manholes complete as shown, specified or directed.

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 in accordance with Section 361.04.

362.04.02 Sanitary Sewer Frame and Cover. Measurement for the bid item *Cast-iron Frame and Cover* or *Ductile Iron Watertight Frame and Cover* of the size specified is based on the number installed and accepted. Payment for furnishing and placing these items

is made at the unit price per each for the number of frames and covers furnished and set as shown, specified, and required. Payment for the ***Ductile Iron Watertight Frame and Cover*** shall include the costs of anchoring the frame and the costs of the adjustable rubber riser ring as applicable.

362.04.03 Building Drop Connection. Measurement for a ***Drop Connection*** 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 per each of the several types and various sizes of ***Drop Connection*** constructed as shown, specified, and directed.

362.04.04 Contingent Items. Payment is based on trench width as specified.

SECTION 363 - SANITARY SEWER FORCE MAINS

363.01 DESCRIPTION. This work consists of construction of sanitary sewer force mains (a pipeline that conveys wastewater under pressure from the discharge side of a pump to a discharge point) of Ductile Iron or Prestressed Concrete Cylinder 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.

363.02 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 Pressure 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.

363.03 CONSTRUCTION METHODS. Follow the methods outlines in Subsection 351.03 for Water Mains, except that chlorination is not required for testing force mains after installation of the pipe.

363.04 MEASUREMENT AND PAYMENT. Measurement for ***Sanitary Sewer Force Mains*** shall be 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.

Sanitary Sewer Force Mains shall be 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 shall include cutting and paving, unclassified excavation, 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 371 - TRENCHLESS EXCAVATION / TUNNELING

371.01 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). This excavation shall 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.

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

371.02.01 Design. The trenchless excavation method shall be designed for the earth, construction, and other loads present plus AASHTO HS-27 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, MOSHA, and all federal, state, and local regulations.

371.02.02 Steel Tunnel Liner Plates. Steel tunnel liner plates shall be galvanized in accordance with ASTM A123, latest version if under a state highway or if the steel tunnel liner is to be the conduit itself.

371.03 Construction.

371.03.01 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. These Specifications intend 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.

371.03.02 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.

371.03.03 Grout. Mortar for grouting shall not be chemically reactive with tunnel liner plate materials and 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, shall not be chemically reactive with tunnel liner plate materials, 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.

371.03.04 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. The company selected to perform this pre-construction survey shall demonstrate acceptable previous experience to the satisfaction of the Engineer and shall be governed by GP-8.01, Subcontractors. The prepared survey and analysis shall be sufficient to document the absence of, or presence and existing condition of any cracks, settlement, upheaval, spalls, or other existing deficiencies in existing buildings, structures, or roadways within the distance from the excavation noted above. If the trenchless excavation is under wetlands or other surface, the complete condition of the wetlands or other surface over the proposed trenchless excavation shall be documented. The pre-construction survey and analysis shall be made before any trenchless excavation is done in the field.

371.03.05 Line and Grade. All trenchless excavations shall be constructed to the line and grade specified on the Plans without exception. 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.

371.04 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, pre-construction survey and analysis, 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.