

CECIL COUNTY  
DEPARTMENT OF PUBLIC WORKS



STANDARD SPECIFICATIONS  
AND DETAILS FOR  
WATER MAINS & SEWER MAINS

November 3, 2009

# CECIL COUNTY

## DEPARTMENT OF PUBLIC WORKS



### STANDARDS SPECIFICATIONS AND DETAIL FOR WATER MAINS & SEWER MAINS

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November 3, 2009

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SECTION 01000  
GENERAL PROVISIONS

**1.0**      **DEFINITIONS**

Whenever the words defined in this section, or pronouns used in their stead occur in these Standard Specifications, they shall have the meanings given below. Whenever the words APPROVED, ACCEPTABLE, or words of like import are used in these Standard Specifications, it shall be understood that “Approved by” or “Acceptable to” the Director is intended, unless otherwise stated.

- A.      AASHTO – American Association of State Highway and Transportation Officials.
- B.      AREA – American Railway Engineering Association (Publishes the Manual for Railway Engineering).
- C.      ASTM – American Society for Testing and Materials.
- D.      COMMERCIAL ROAD - Any road which lies within or is contiguous to any area which has been recommended or approved for any class of commercial use in any zoning or master highway plan approved by the County Commissioners of Cecil County.
- E.      COMMISSIONERS – The Board of County Commissioners of Cecil County.
- F.      CONSTRUCTION DRAWINGS – Plans 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 and which also outlines the work and the materials to be provided for and placed, in accordance with such changes as may be approved from time to time during the progress of work, as hereinafter provided. Also referred to as Plans”.
- G.      CONSTRUCTION EASEMENT - The area secured for temporary use and or modification for the purpose of facilitating work to be accomplished during construction.
- H.      CONTRACTOR - The party contracted by the Project Owner to execute the approved construction drawings.
- I.      COUNTY - The Cecil County Department of Public Works. Also referred to as the Department.
- J.      DEDICATION PLAT - Any plat conforming to law, duly recorded among the land records of the County which describes one or more rights-of-way intended to be dedicated to public use.

- K. DEPARTMENT - Cecil County Department of Public Works.
- L. DESIGNER - An engineer or engineering company responsible for preparing the plans covered under these Standard Specifications.
- M. DEVELOPER - Person or organization proposing to develop, developing, or obtaining a building permit for a previously undeveloped parcel of property.
- N. DIRECTOR - Director of the Cecil County Department of Public Works or his duly authorized agents.
- O. EASEMENT - A right acquired by public authority to use or control property for a designated public purpose.
- P. EMERGENCY OVERTIME INSPECTION – Inspection of work that, in the sole determination of the Department, must continue beyond normal inspection hours to avoid substantial inconvenience, provide for safety of the public, or provide for a substantially better work product.
- Q. ENGINEER - Registered Professional Engineer in the State of Maryland or a duly authorized agent thereof.
- R. ESTABLISHED GRADE - Profile grade as anticipated and approved for future construction in order to meet geometric criteria approved by established standards of construction.
- S. GROUNDWATER - The water constrained in soil or rocks below the ground surface.
- T. INSPECTOR – A representative of the Department authorized to make any or all necessary inspections of work performed and material furnished by the Contractor.
- U. INUNDATED – Submerged under water.
- V. MD E&S MANUAL – Most correct edition of Maryland Standards and Specifications for Erosion and Sediment Control.
- W. MAINTENANCE AGREEMENT – Agreement executed between a Developer and the Cecil County Department of Public Works covering terms and conditions related to post-construction maintenance of private facilities by the Developer.
- X. PERMANENT MAINTENANCE EASEMENT – An easement providing permanent right to the Department and other applicable agencies for

maintenance of public facilities located in the easement.

- Y. PERMITTEE – A person, firm or corporation who has applied for and holds a valid permit in full force and effect, issued by the Director of the Department of Public Works, authorizing construction of facilities covered under these Standard Specifications.
- Z. PERSON – Includes an individual, association, firm, partnership, or corporation but does not include any governmental agency, whether County, Federal, State or Municipal.
- AA. PLANS, AS-BUILT – plans prepared by a surveyor after construction confirming or specifying changes to dimensions and elevations shown on the original plans.
- BB. PROFESSIONAL ENGINEER – As defined by the State of Maryland, Department of Labor, Licensing and Regulations, Division of Occupational and Professional Licensing.
- CC. PROJECT OWNER OR OWNER – The party in ownership of the property or project and who has received approved construction drawings for the project.
- DD. Public Utility – A private company approved by the Maryland Public Services Commission to own and operate water and waste water facilities in the county.
- EE. PUBLIC WORKS AGREEMENT – Agreement executed between Developer and Board of County Commissioners of Cecil County covering terms and conditions related to construction of facilities covered under these Standard Specifications.
- FF. RIGHT-OF-WAY – A general term denoting land, property, or interest therein, usually in a strip. Normally intended as fee simple ownership.
- GG. ROAD – Includes street, highway, avenue, lane, alley and viaduct, or any segment or part of the length thereof and is a general term denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way.
- HH. SPECIAL PROVISIONS - Special clauses supplemental to these specifications, setting forth requirements peculiar to the specific work included in the construction documents and right-of-way agreements.
- II. SPECIFICATIONS - The direction, provisions and requirements contained in these Standard Specifications, together with all written agreements made and/or to be made, pertaining to the method and manner of performing the work, or to the quantities and qualities of the materials to be furnished.

- JJ. STANDARDS – Design and construction standards as included in this Document.
- KK. STATE – State of Maryland.
- LL. STATE ROAD – A road that is operated and maintained by the State.
- MM. SUB-CONTRACTOR - Any individual firm or corporation undertaking the engineering or construction of a part of the work covered under these Standard Specifications by virtue of an agreement with the contractor.
- NN. SUBDIVISION – A division of land as defined in the Cecil County Subdivision Regulations.
- OO. SURETY - The corporate body approved by the County which is bound with and for the Project Owner who is primarily liable and which engages to be responsible for his payment of all debts pertaining to and for his acceptable performance of the work for which he has contracted.
- PP. VARIANCE – A modification of the requirements of these Standard Specifications granted by the Director.

**2..0 APPLICABILITY**

These Standards shall apply to all design and construction of public or private water and sewer main extensions and their appurtenances, regardless of whether same is intended for dedication to the Board of County Commissioners of Cecil County.

**3.0 PURPOSE**

The purpose of these Standards is to establish design and construction criteria for the planning, designing, construction, improvement, reconstruction, and repair of water and sewer mains and their appurtenances under the jurisdiction of these Standards pursuant to the Section entitled Applicability.

**4.0 AUTHORITY**

The Authority for these Standards is set forth under Chapter 67 of the Cecil County Code, specifically in Section 67-30.

**5.0 AMENDMENTS**

Any amendments to the provisions of these Standards, except for variances or use of alternative standards as prescribed herein, must be approved by the Board of County

Commissioners of Cecil County by means of adopting a resolution in public session. Prior to making a decision, the Board of County Commissioners of Cecil County shall hold a public hearing regarding the proposed amendment(s). The date and place of all public hearings shall be advertised for two consecutive weeks, at least 15 days prior to the hearing in at least one newspaper of general circulation.

## **6.0 AVAILABILITY OF STANDARDS**

- A. A copy of these Standards and the publications referred to in this Standards will be kept at all times at the office of the Commissioners, and at office of the Director.
- B. Copies of these Standards can be purchased at a price established by the Director.
- C. Copies of the Publications referred to in these Standards shall be purchased from the agencies responsible for selling them.

## **7.0 VARIANCES**

- A. Any party aggrieved by the decision of the Director or duly authorized agent regarding a variance may appeal said decision to the Board of Arbitration.
- B. A variance of the requirements of these Standards shall only be granted upon demonstration by the applicant that exceptional circumstances exist that were not the result of actions taken by the applicant which preclude the applicant from adhering to the requirements of these Standards, or where the granting of the variance will contribute to a better overall design of the facilities subject to the requirements of these Standards. A variance request shall be submitted in writing and shall be accompanied by any evidence, data or any other material that may be required by the Director or duly authorized agent for consideration of the variance. The burden of presenting sufficient evidence remains with the applicant seeking the variance.
- C. In the granting of the variance, the Director or duly authorized agent may prescribe such conditions or safeguards as he deems necessary and appropriate to comply with the provisions of these Standards. Violations of such conditions or safeguards when made a condition of the granting of the variance shall be deemed a violation of these Standards and shall be punishable as provided herein.
- D. The Board of County Commissioners shall annually appoint a County Arbitration Board which shall consist of three (3) members made up of a licensed professional engineer in the State of Maryland, a utility contractor licensed in the State of Maryland, a member of a Public Utility or operator/ owner of a private or

public water or wastewater facility and an alternate who must be a licensed professional engineer in the State of Maryland. Said County Arbitration Board shall meet within thirty (30) days of the Director's or duly authorized agent's denial, unless otherwise agreed by both parties. The decision of the Arbitration Board shall be deemed to be final, conclusive and binding.

**8.0**      **PENALTY**

Violations of these Standards shall be subject to the penalties prescribed in Chapter 67 of the Cecil County Code.

**9.0**      **EFFECTIVE DATE**

These Standards shall become effective 90 days after its adoption by the Commissioners. Administratively complete plans submitted in that 90 day time frame will be governed by the Cecil County Standards and Specifications dated October 1973 as amended, provided such plans are approved within 270 days of adoption of these Standards.

**10.**      **APPROVED PLANS AND PROCEDURES**

A.      PLAN APPROVAL PROCESS

Construction of private (public utility) or public water or sanitary sewer mains and/or their appurtenances shall not commence until the Cecil County Department of Public Works has approved engineered plans for the work. Said approval shall be evidenced by the signature of the Director of the Department of Public Works or duly authorized agent upon the Construction Drawings, thereafter known as the Approved Construction Drawings or Approved Plans.

Design and construction drawings and specifications shall be prepared in accordance with the latest department checklist by a Professional Engineer licensed in the State of Maryland and submitted to the Department for review. Unless directed otherwise, two copies of the submittal are required. The Department's Plans Reviewers will review the submittal and respond with required revisions, questions, and recommendations. Upon resolution of all Departmental questions and requirements, the Designer will be instructed to submit take-off quantity estimates to enable the preparation of a Public Works Agreement(s) between the Owner and the Board of County Commissioners of Cecil County. For water and sewer facilities which shall be owned and operated by a Public Utility, capital improvement projects shall be required to execute a public works agreement, pay inspection fees, and bond only that portion of the project that is to be constructed within the County road right of way or prescriptive right of maintenance. The fees and bonding shall be limited to the cost associated with road repair. For subdivision projects all water and/or sewer facilities shall be bonded and inspection fees paid reflective of the construction

cost of the facilities. Upon execution of the Public Works Agreement(s), payment of all required fees, and posting of required financial assurances, at the determination of the Director or duly authorized agent (see 10 L). The Designer will be instructed to submit final copies of the Construction Drawings, bearing the signature and seal of the licensed Professional Engineer, for signature by the Director. Upon distribution, the signed drawings will be considered the Approved Construction Drawings. **[Amended 03-16-2010]**

**B. DESIGNER'S RESPONSIBILITY FOR CORRECT SUBMITTAL**

The Department's Plans Reviewers' role is to verify the suitability of the proposed design to the satisfaction of the Department so that a positive recommendation for approval can be made to the Director. Review of submittals by the Department of Public Works does not constitute a "check" of the design; the accuracy of existing conditions and adequacy of design remain the responsibility of the Designer.

If, in the course of review, the Plans Reviewer determines that substantial omissions, inconsistencies, inaccuracies, or non-compliance with these standards is evident in a submittal such that productive comments cannot be made, the submittal shall be returned as Administratively Incomplete. Because of the substantial delay that this may cause a project, Designers are strongly encouraged to ensure that their submittals are Administratively Complete.

**C. AS-BUILT PLANS**

As-built plans shall indicate red line confirmation of the horizontal and vertical alignment of all utility structures (manholes, pipes and vaults), and other pertinent features as may be required by the Department. The Department may prepare a checklist that lists the applicable items required.

**D. FEES**

Fees for Plans Review and Inspection of proposed infrastructure shall be established from time to time by resolution of the Board of County Commissioners of Cecil County. Said fees shall be intended to cover the cost of all plans review and inspection staff, together with administrative support, overhead costs, incidental costs, and supervision of the Director or duly authorized agent.

A non-refundable Plans Review Fee shall be payable upon initial submittal of the proposed plans. This fee shall not be refunded if the project does not continue forward; or the Engineer fails to respond to the County comments within 120 working days from the date of the County's last response letter.

Plans Review and Inspection Fees anticipate the complete review and approval of the project inclusive of the preparation and execution of the Public Works Agreement.

E. INTERPRETATION OF APPROXIMATE QUANTITIES AND ESTIMATES

Project Owners and Contractors are cautioned that any estimates of quantities on the approved construction plans or executed instruments with the County are for estimating purposes only and shall not relieve the Project Owner or Contractor from constructing the designed infrastructure in a complete and thorough manner, as detailed on the approved construction drawings and as directed by the Inspector.

F. EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE

It shall be the Project Owner and Contractor's responsibility, jointly and separately, to make personal examination of the location of the approved work and the surroundings thereof; to thoroughly acquaint themselves with the details of the work to be performed and all the conditions and obstacles likely to be encountered in the performance and completion of the work; to inform themselves as to the facilities for the transportation, handling, and storage of equipment and materials; and to carefully study the plans, specifications, and binding agreements. Contractors are encouraged to test pit areas where certified as-built representations are unavailable and it shall be understood that the County makes no warranty or guarantees as to the location, nature, or limits of infrastructure or conditions for construction.

G. COMMENCEMENT OF WORK

Construction of the work shown on the Approved Construction Drawings shall not commence until all required permits are received from all appropriate agencies. Approval of the plans by the Department of Public Works shall not supercede approval from other local, state, or federal agencies.

Work shall not commence without two business day's notification of the Department of Public Works. Notification is encouraged in writing via facsimile or e-mail.

A preconstruction meeting must be held prior to starting construction. The following will be expected at that meeting: a list of materials, source of supply for materials, working hours and construction schedule. Contractors, developers, and other inspecting agencies should be present. The Point of Contact and emergency numbers will be given to the Cecil County Department of Public Works at this time as discussed in Section 01000-12.B.4.

## H. INSPECTION PROCEDURES AND HOURS

1. All construction activities shall be coordinated with the Department for inspection of materials, construction, and testings by the Inspector, in accordance with the Department's applicable policies and procedures. The degree to which Inspectors must be on-site for various activities of a given project will be determined in the Department on a project-specific basis.
2. Construction of facilities covered under these Standards shall not be carried out without inspection from the Department. Inspection will normally be available, with the 48-hour advance notice, Monday through Friday between 7:30 a.m. and 4:00 p.m. A contractor may request inspection beyond these hours in accordance with the following:
  - a. Contractor's request must be made in writing to the Supervisor of Construction Inspections at least five business days in advance. The written request must detail the additional times requested (including a one hour travel time for Saturdays or Holidays) and the activity to take place.
  - b. The Contractor must agree to pay, in advance, if the overtime is approved by the Director or duly authorized agent a fee reflective of the Inspector's salary, plus a fringe cost and an administrative fee (to be specified by the Director). Fee must be paid 3 working days prior to the overtime and shall be non-refundable.
  - c. The Supervisor of Construction Inspections shall determine whether the work is being otherwise conducted in a manner that such overtime inspection is necessary.
  - d. The Supervisor of Construction Inspections shall determine whether an Inspector is available for the time requested.
  - e. Upon recommendation from the Supervisor of Construction Inspections, the Director or duly authorized agent may approve the overtime, at his/her sole discretion, considering such factors as the nature of the work, the availability of the inspection staff, and other Departmental demands. The Director shall render his/her decision in writing.
  - f. In the event of Emergency Overtime Inspection, the advance arrangements noted above will be waived. Instead, the inspection staff shall notify the Director or duly authorized agent of the need as soon as possible. Payment of inspection fees will also apply to Emergency Overtime Inspection.

3. Work and material will be inspected promptly, but, if for any reason, delay should occur, the Contractor shall have thereby no claim for damages or extra compensation.
4. The Contractor shall furnish the Director or duly authorized agent with every reasonable facility for ascertaining whether or not the work performed and materials used are in accordance with the requirements and intent of these Standards. If the Director requests it, the Contractor shall, at any time before acceptance of the work, remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work as required by these Standards.
5. All compaction and testing shall be overseen by a professional engineer, licensed in Maryland, specializing in geotechnical work or a qualified soils technician. Reports shall be submitted to the Department on a weekly basis.
6. Testing technicians shall remain on site at all times during the work that they are monitoring.
7. The Inspector shall in no case act as foreman or perform other duties for the Contractor, nor interfere with the management of the work by the Contractor. Any advice which the Inspector may give the Contractor shall not be construed as binding the Director or duly authorized agent in anyway, or releasing the Contractor from fulfilling all of the requirements of the Approved Plans, or complying with these Standards or other applicable laws.
8. Where there is disagreement between the Contractor (or his representative) and the Inspector (such as refusal by the Contractor to use properly approved materials; for performing work not in compliance with the Approved Plans or these Standards; and/or refusing to suspend work until problems at issue can be referred to and decided by the Director or duly authorized agent) the Inspector will immediately notify the Director or duly authorized agent as to the issue of disagreement and if the Contractor still refuses to make corrections, comply or suspend work, the Director or duly authorized agent will prepare and deliver in writing to the Contractor, a Stop Work Order. As soon as the Inspector is advised of the delivery of the Stop Work Order, the Inspector shall immediately leave the site of the work and any work performed during the Inspector's absence will not be accepted.

#### I. APPROVED CONSTRUCTION DRAWINGS

These Standards shall govern except where specifically noted otherwise on the

Approved Construction Drawings.

J. MODIFICATIONS TO APPROVED PLANS

The Project Owner and Contractor are required to affect the construction in strict conformance with the Approved Plans. Minor field adjustments may be made with the approval of the Inspector, although documentation of any such approval, including the name of the Inspector who granted the change, shall be the responsibility of the Project Owner and Contractor. Any substantial changes to alignment, elevation, or materials shall only be approved with the submittal of revised engineering documents and/or plans.

K. PUBLIC WORKS AGREEMENTS

A Public Works Agreement (PWA) shall serve as a contract between the Board of County Commissioners of Cecil County and the Project Owner to ensure that the work will be completed in a timely and thorough manner. Once executed, the Director or duly authorized agent shall administer the PWA on the Commissioner's behalf. The Board of County Commissioners of Cecil County may elect to delegate administrative authority for execution of PWAs to the Director or duly authorized agent and the County Attorney as its agents; in such instances, the Board of County Commissioners of Cecil County relinquishes none of its rights under the agreement.

A PWA shall generally be required for all public and private infrastructure projects under the jurisdiction of these Standards. For minor projects, the Director or duly authorized agent, in his sole discretion, may waive the requirement for a PWA.

The required work addressed by the PWA shall be guaranteed by the Project Owner through a financial assurance instrument in accordance with the requirements herein. Alternatively, the PWA may allow the construction to be completed in accordance with the Approved Plans prior to the Department's approval of the Subdivision Plat or Site Plan.

For projects that will be owned, operated, and maintained by a Public Utility, the PWA will be executed in accordance with the requirements specified in 10(A) of the General Provisions

L. FINANCIAL ASSURANCES

Financial assurance by the Project Owner must be provided with the PWA except as noted herein. The guaranteed amount shall be 120% of the total estimated cost of the project addressed by the Public Works Agreement. The financial guarantee may be one of the following instruments:

- Irrevocable Letter of Credit

- Escrow Agreement
- Performance Bond
- Cash Performance Guarantee to be deposited with the Treasurer of Cecil County

Where applicable, the Department's standard forms for these instruments shall be used. The Department shall have the right to refuse use of certain institutions when it has experienced difficulties with said institutions in complying with the terms of financial guarantees in the past.

The financial assurance may be waived by the Department of Public Works and work allowed to commence prior to the final subdivision being recorded and/or building permit being approved. Prior to recordation of the plat and/or approval of the building permit the guaranteed amount shall be 120 % of the total estimated cost of the remaining work to be completed.

If the estimated cost of the proposed work is less than \$5,000, the Director, in his sole discretion, may waive the requirement for financial assurance if he determines that the public will not be exposed to unreasonable liability in so doing.

## **11.0 CONNECTION WITH EXISTING INFRASTRUCTURE**

### **A. EXISTING UTILITIES SHOWN ON DRAWINGS**

1. The Designer shall show all existing water mains, storm drains, sanitary sewers, gas mains, and other utilities on the drawings in accordance with the best information available. The County assumes no responsibility for accuracy or completeness of information shown. It is the responsibility of the Contractor to verify the actual location of existing utilities prior to beginning work, and to maintain any utility location markings at no additional cost to the County.
2. Existing mains, services and their connections shall be carefully protected and any damage to them caused by the work shall be immediately repaired using materials of the kinds damaged to the satisfaction of the Director or private/public utility by the Contractor at his expense.

### **B. MAKING CONNECTIONS TO EXISTING STRUCTURES**

The Contractor shall, at his own cost and expense and as part of his work, furnish all labor, materials, tools and appliances, and do all work required for making connections to existing water or sewer structures. Connections to existing structures shall be made only after all new lines are satisfactorily tested and approved by the Director and/or private/public utility. Actual dates and

times of connection shall be approved by the Director and/or private/public utility.

C. **CONSTRUCTION IN EASEMENTS AND RIGHTS-OF-WAY**

Perpetual easements or rights-of-way shall be secured by the Project Owner without cost to the County. The Project Owner shall also obtain permission from any property to be occupied during construction or temporary construction easements outside the limits of these perpetual easements or rights-of-way.

The Project Owner shall be responsible for confirming all necessary easements or rights-of-way and his Contractor's respect for their limits.

The Contractor shall so conduct his work in the easements and rights-of-way that there will be a minimum of disturbance of the properties crossed. Fences shall be disturbed as little as possible and if damaged or removed shall be replaced or restored at least equal to their original condition at the expense of the Contractor.

Upon completion of the work, the Contractor shall, at his own expense, clean up within the easements and rights-of-way and shall restore them at least to their original condition. Any damage to property outside the limits of the easements or rights-of-way shall be repaired or replaced by the Contractor at his own expense.

No arrangements will be made for any means of access to the perpetual easements, rights-of-way or construction easements by the County; the Contractor shall therefore be required to make his own arrangements for access to the work within these points.

Any damage alleged by an affected third party shall be considered a civil matter between the Project Owner, the Contractor, and the third party. The County shall bear no responsibility for the alleged damage, nor shall it be considered an adjudicatory body thereof.

**12.0 CONTROL OF WORK AND MATERIALS**

A. **RELATIONSHIP BETWEEN THE COUNTY, THE PROJECT OWNER, PUBLIC UTILITY AND THE CONTRACTOR**

The Contractor (and his subcontractors) shall be contracted directly with the Project Owner and/or public utility and shall have no relationship with the County. The County, in the course of inspection or directing corrections to work, shall not be liable to the Contractor for any payments or other liabilities. The County shall view the Contractor as the Project Owner's and/or public

utilities agent, unless directed in writing to do otherwise, and direction given to the Contractor shall therefore be considered as having been given to the Project Owner and/or public utility.

**B. SUPERVISION AND DIRECTION OF WORK**

1. The contractor shall supervise and direct the work efficiently using his best skill and attention in accordance to the County and/or Public Utility approved plans. He shall be solely responsible for the techniques and sequences of construction. The work shall be prosecuted by the Contractor in such a manner, and with sufficient materials, equipment and labor, as is considered necessary to insure completion on or before the time specified.
2. The contractor shall keep a competent supervisory staff on the work site at all times during its progress, to the satisfaction of the Director or the public utility. The superintendent and his designers shall be identified to the Inspectors at the beginning of the work and as those persons may change.
3. For County projects the Director shall not be responsible for the acts or omissions of the Contractor, or any subcontractor, or any of his or their superintendents, or employees. For Projects associated with a public utility, the contractor shall comply with all contractual agreements.
4. For County projects the Contractor shall maintain a local telephone at which a competent representative can be reached at all times, 7 days a week, 24 hours a day. Said contact shall be provided at the preconstruction meeting. This authorized representative shall have the capability of responding with positive corrective action to emergency calls from local officials (Sheriff's Dept., State Police and Department of Public Works personnel). For Projects associated with a public utility, the contractor shall comply with all contractual agreements.

**C. COMPETENCE OF LABOR**

At no time for either a County or Public Utility project shall any employee of the Contractor who shall use profane or abusive language to the Inspector or other employees of the County, or is otherwise disorderly and interferes with him in the performance of his duties, or who is careless and incompetent, shall be discharged on the request of the Director or duly authorized agent and shall not again be employed at the work site except with the Director's or duly authorized agent's consent.

**D. APPROVED PLANS PRESENT AT WORK SITE**

For all county and Public Utility projects at any and all times that work is being affected at the work site, a signed copy of the Approved Plans shall be present on site, together with adequate supervisory personnel and stakeout controls, in addition to plans and permits specified at the preconstruction meeting for sediment control, or the Inspector may issue a Stop Work Notice.

E. NOTICES TO CONTRACTORS

All notices and instructions to the Contractor shall be given by the Director or his Designee.

F. CONSTRUCTION STAKE-OUT

1. Stake-out is defined as security installing oak stakes in the ground with markings clearly identifying station, offset, cut, manhole number, valves, fittings, structures, roadways and other appurtenances. Stakes shall be at locations which will not be disturbed from construction activities. All references shall match those shown on the construction drawings. All markings on stakes shall be with indelible marker.
2. Survey benchmarks are provided on the construction drawings with the corresponding coordinates and elevations. The construction drawings also provide location information of the proposed utilities. The Contractor shall utilize the benchmark information in conjunction with the proposed utility location information to perform a field stake-out to accurately construct the proposed facilities to the necessary lines, grades and elevations shown on the construction drawings. All field stake-out and re-stake-out must be performed by a Land Surveyor registered in the State of Maryland. Any disturbed stakes shall be re-surveyed and located.
3. The party which performed the construction stake-out shall submit cut sheets to the County Inspector and/or inspector for the public utility prior to the pre-construction meeting. The Contractor may not begin construction until the inspector is in possession of the cut sheets. Cut sheets shall be signed and sealed by the registered Land Surveyor. Cut sheets shall indicate station number (with the same reference as that shown on the construction drawings) of manholes, valves, fittings, structures or other appurtenances. The following minimum information shall be shown on the cut sheet:
  - a. Surveyors Name, Address, Phone Number
  - b. Project Name and Contract No.
  - c. Location within Project that cut sheet pertains to (i.e. Type and size of utility and sheet number).
  - d. Pipe material and station if material changes.

- e. Size/Type of proposed utility
- f. Off-set hub distance from centerline.
- g. Station.
- h. Hub elevation of perpendicular offset.
- i. Grade elevation (invert) of proposed utility.
- j. Hub cut (vertical) distance from off-set hub to pipe invert)
- k. Centerline ground elevation (to nearest 0.1')
- l. Centerline cut (to nearest 0.1')
- m. Remarks column for indicating special conditions or other notes.

4. On straight pipeline alignments, stake-out and cutsheets shall be provided at intervals not to exceed 50-feet. On curved pipeline alignments the stake-out interval shall not exceed 25-feet. The cutsheets and stake-out shall also be provided for every manhole, valve, cleanout, water meter, curb stop, horizontal and vertical bend, continuity test stations, concrete encasement, sleeves and tunnels and other features if requested by the County.

For Public Utility projects cut sheet and stake out requirements shall be in accordance with the contracted agreement between the contractor and the Public Utility.

5. For County projects the Contractor shall preserve and maintain in proper position all stakes, grade-boards and lines until authorized to remove them. In case any are disturbed, they shall be immediately re-set in accordance with the requirements in paragraph 1 above. Any portions of the proposed utility which are constructed without the stake-out described above or with damaged or missing stake-out will not be approved and accepted.

#### G. DEFECTIVE WORK AND DEFECTIVE MATERIALS

1. For County projects and projects under construction by a Public Utility that are located within the County Road right of way and/or impact existing County facilities no inspection and no failure to inspect, nor the presence of any employees of the County during the execution of the work, and no approval or acceptance of any part of the work herein contracted for or of the materials and equipment used therein shall relieve the Contractor of any of his obligations to fulfill the requirements of the Approved Plans, or shall prevent the rejection of said work, materials and equipment, in whole or in part, at anytime thereafter, should said work, materials and equipment be subsequently found by the Director to be defective or not in accordance with the requirements of the contract documents.
2. For County projects and projects under construction by a Public Utility

that are located within the County Road right of way and/or impact existing County facilities all materials not conforming to the requirements of the Approved Plans shall be considered as defective and all such materials, whether in place or not, shall be rejected and shall be removed immediately from the site of the work, unless otherwise permitted by the Director. No rejected material, the defects of which having been subsequently corrected, shall be used until approval has been given.

#### H. SUSPENSION OF WORK

The County may suspend the whole or any part of the work under the Approved Plans, if in its judgment such action is necessary or advisable.

#### I. INTERPRETATIONS BY DIRECTOR

1. The Director or duly authorized agent shall make all necessary interpretations as to the meaning and intent of these Standards and the Approved Plans, and shall give all advice and assistance as contemplated therein or thereby, or in every case in which a difficult or unforeseen condition arises during the prosecution of the work. Should there be any discrepancies in or between, or should any misunderstanding arise as to the import of anything contained in these Standards and the Approved Plans, the interpretation of the Director or duly authorized agent shall be final and binding. Any errors or omissions in these Standards or on the Approved Plans may be corrected by the Director or duly authorized agent when such corrections are necessary for the proper fulfillment of their intent. The Director or duly authorized agent may, where appropriate, refer questions to the Designer of record.
2. The Director or duly authorized agent shall in all cases determine the amount, quality and acceptability of the work and shall decide all questions in relation to said work. His decision and estimate shall be final and conclusive.
3. Interpretations will be rendered by the Director or duly authorized agent as promptly as possible but should delay occur for any reason, the Contractor shall have thereby no claim for damages.

#### J. ALTERATIONS OF PLANS OR OF CHARACTER OF WORK

1. The Director or duly authorized agent reserves the right to change the lignment, elevation, grade, form, length, dimensions or materials of the work under the contract, whenever any conditions or obstructions are met that render such changes necessary.

2. Any changes and/or alteration to the approved contract documents shall be submitted and approved by the Director or duly authorized agent prior to beginning work on that item. Minor alterations may be noted on the as-built drawings if approved by the Director or duly authorized agent.

K. UNAUTHORIZED MODIFICATION OF THE WORK

Work done without lines and grades being given, work done without field stakeout and cut sheets, work done without required supervision, work done without required inspection, or work done beyond the lines and grades shown on the plans shall be considered as unauthorized and/or unapproved. Work so done may be ordered by the County to be removed and replaced at the Project Owner's expense.

L. SOURCE OF SUPPLY AND QUALITY OF MATERIALS

1. The source of supply of each of the material shall be approved before the delivery is started. Representative preliminary samples of the character and quantity prescribed shall be submitted by the Contractor or producer, said samples being taken under the observation of the Director, for examination, and tested in accordance with the methods referred to herein. Only materials conforming to the requirements of these Standards and approved by the Director or duly authorized agent shall be used in the work. No materials which, after approval, have in any way become unfit for use, shall be used.
2. Shipping packets must be given to the inspector for all material, including the name of the manufacturer, date of construction, packing lot and production time.
3. Unless a material has a satisfactory record of performance, the Director reserves the right to withhold approval of a new source of supply, even though it meets the specification requirements, until its qualities have been verified and proved in actual service.
4. Tests of all materials specified will be made in accordance with the latest official approved methods. When A.S.T.M., A.A.S.H.T.O., A.S.A., A.W.W.A., or Federal Specification standard specifications and serial numbers are stipulated, the reference shall be construed to be the latest effective specification. If material previously certified is subsequently declared substandard or unfit for the intended use by the certifying agency, the Director or duly authorized agent may declare the unused materials unsatisfactorily or unfit for use.
5. The Contractor shall furnish every facility for the verification of all

scales, measures and other devices which he operates.

M. STORAGE OF MATERIALS

Materials shall be stored so as to insure the preservation of their quality and fitness of the work.

N. PIPELINES TO BE KEPT CLEAN

1. During the progress of the work and until the completion and final acceptance thereof, pipelines and their appurtenances shall be kept thoroughly clean throughout. Obstructions or deposits, at any time discovered, shall be removed at once by the Contractor. After the completion of the work, the pipelines and their appurtenances shall be left clean, free and in good order.
2. At no time shall the Contractor allow stormwater runoff or other flow to enter pipelines once connected in whole or in part to the County's system. The Contractor shall take active steps to ensure this.

O. CLEANING UP

1. The Contractor shall, at his own expense, keep the site of his operations clean during the construction and remove all rubbish as it accumulates.
2. On or before the completion of the work, the Contractor shall tear down and remove all temporary structures built by him, shall remove rubbish of any kind from any grounds which he has occupied, and shall restore site of the work, curbs, drains, gutters, sidewalks, roadways and other surfaces to a clean and neat condition.

P. WATER SUPPLY

The Contractor shall provide, at his expense, such quantities of clean water as may be required for any and all purposes under these Standards. He shall take particular care to furnish his employees with potable drinking water.

Q. SANITARY ARRANGEMENTS

Approved sanitary conveniences for the use of laborers and others employed on the work, properly secluded from public observation, shall be constructed and maintained by the Contractor, at his own expense, in such manner and at such points as are appropriate for the work.

R. CARE AND PROTECTION OF WORK

From the commencement of the work until its completion and acceptance by the County, the Contractor shall be solely responsible for the care of the work, and all injury or damage to the same, from whatever cause, shall be repaired or replaced at the Contractor's expense. The County reserves the right to direct the Contractor to repair or replace said items. He shall provide suitable means of protection for all materials intended to be used in the work in progress, as well as for completed work.

S. FINAL ACCEPTANCE

Upon completion of the work and supply of an approved as-built survey, the County will make a final inspection of the work and if at such inspection all construction provided for and contemplated by the Approved Plans is found completed, such inspection shall constitute the final inspection and the County shall make the final acceptance as of that date and the Contractor shall be notified of such acceptance. Said acceptance shall not be binding between the Project Owner and Contractor. If not part of a Private or Public Utility project, upon delivery by the Project Owner of a Maintenance Bond in the amount of 10% of the total estimated construction cost, the Director or duly authorized agent will then prepare a deed for acceptance of the facilities, where public dedication is planned or required. Upon execution by the Project Owner, the Director or duly authorized agent will present the deed for consideration of the Board of County Commissioners of Cecil County. After final acceptance, via deed by the Board of County Commissioners, the County will assume responsibility for maintenance, repairs, and/or replacement. If the project is to be owned and operated by a private or public utility company and the system is located in part or in whole within a proposed or existing County right of way or prescriptive right of maintenance, an Easement Agreement must be executed by the project owner at their expense. Upon execution by the project owner, the Director or duly authorized agent will present the easement for consideration by the Board of County Commissioners of Cecil County. After final acceptance, the Easement shall be recorded at the County Courthouse.

**13.0 LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC**

A. LAWS TO BE OBSERVED

The Contractor shall at all times observe and comply with all Federal, State and/or local law ordinances, rules and regulations in any manner affecting the conduct of the work, and all such orders or decrees as exist at present and those which may be enacted later, by bodies or tribunals that have jurisdiction or authority over the work, and shall indemnify and save harmless the County, its agents or servants against any claims or liability arising from or based on violations of any such law, ordinance, regulation, order or decree, whether by himself or by his employees.

## B. PERMITS AND LICENSES

Such permits, licenses, insurance policies, etc., as may be necessary in order to comply with Federal, State or local laws in conducting the work, shall be provided by the Contractor/Developer at his own expenses, except as otherwise provided.

## C. PUBLIC CONVENIENCE AND SAFETY

1. The Contractor at all times shall conduct the work in such a manner as to ensure the least obstruction to traffic practicable. The convenience and services of the general public and of the residents along and adjacent to the improvement shall be provided for in an adequate and satisfactory manner. Material stored along the improvement shall be placed so as to cause, as little obstruction to the traveling public as is considered necessary. The Contractor shall, unless otherwise specified, provide and maintain in passable condition such temporary highways and bridges as may be necessary to accommodate the traffic diverted from the roadbed affected by the construction, and he shall provide and maintain in a safe condition temporary approaches to, and crossing of, intersecting highways. On highways occupied by a railway, vehicle access shall be provided and maintained by the Contractor in an approved manner. Fire hydrants on or adjacent to the improvement shall be kept accessible at all times to fire fighting personnel and equipment.
2. A “maintenance of traffic” plan prepared in accordance with SHA Standards shall accompany all applications submitted to the Department for construction activities on existing roads. This plan will be considered an integral part of the permit, and no construction activities shall commence until this plan has been implemented for safety of the workers and drivers, to the satisfaction of the Department. Notices regarding road closures shall be placed in local newspapers and other media, as well as on the road to be closed at least 30 days prior to the date of starting the closure. All components of the traffic maintenance plan including signs shall be removed promptly after completion of the work.
3. Approval of a maintenance of traffic plan, and/or additional suggestions or requirements by an inspector, does not imply any liability on the part of the Department. The contractor is solely responsible for safety of its employees as well as the public-at-large.
4. Where the maintenance of traffic plan includes a local road closure, the Department of Emergency Services of the county shall be notified at

least 5 working days in advance of said closure.

5. In the performance of their work, all contractors shall comply with all applicable Local, State, and Federal safety and health laws and regulations.

D. **PRESERVATION AND RESTORATION OF PROPERTY, TREES, MONUMENTS, ETC.**

The Contractor shall not enter upon private property for any purpose without obtaining permission, and shall be responsible for the preservation of all public and private property, trees, monuments, etc., along and adjacent to the work and shall use every precaution necessary to prevent damage or injury there to. He shall use adequate precautions to prevent damage to tracks or pipes, conduits and other underground structures, and shall protect carefully from disturbance or damage all land monuments and property markers until an authorized agent has witnessed or otherwise referenced their location and shall not remove them until directed, and replacement of same shall be borne by the Contractor. The Contractor shall not willfully or maliciously injure or destroy trees or shrubs and he shall not remove or cut them without proper authority. He shall be responsible for all damage or injury to property of any character, during the prosecution of the work, resulting from any act, omission or misconduct in his manner or method of executing said work or due to the non-execution thereof on the part of the Contractor; he shall restore, at his own expense, such property to a condition at least equal to that existing before such damage or injury was done, by repairing, rebuilding or otherwise restoring, as may be directed, or he shall make good such damage or injury, in an acceptable manner. Mail service shall be maintained at all times.

E. **INDEMNIFICATION OF THE COUNTY**

For County projects the Contractor shall indemnify and save harmless (including, but not limited to, compensation of attorney fees) the County and its officers, agents, and employees from all suits, actions, or claims of any character, name and description brought for or on behalf of persons or property due to any neglect in safeguarding the work, the use of unacceptable or defective material in the construction of the work, or on account of any act or omission, neglect, or misconduct of the Contractor, its agents, employees, or subcontractors.

**14.0 SEVERABILITY**

If any portion of these Standards is held invalid or unconstitutional by a court of competent jurisdiction, such portion shall not affect the validity of the remaining portions of these Standards. It is the intent of the Board of County Commissioners of Cecil County that these Standards shall stand, even if a section, subsection, sentence,

clause, phrase, or portion may be found invalid.

If provisions of these Standards conflict with any other ordinance, code, regulation or rule promulgated by the County or another governmental body having jurisdiction on the subject matter of these Standards, the more restrictive or higher standards shall prevail.

## **15.0 ALTERNATE STANDARDS**

Upon findings by the Director that these Standards are not feasible or practical for a particular project, he may require such alternate or additional Standards and Specifications in accordance with good engineering principles as may be deemed necessary.

## **16.0 DESIGN**

Except where a more restrictive standard is expressed herein, or as excepted below, the following standards are accepted by reference and shall be binding upon design of water mains, sewer mains, pump stations, water works, wastewater works, and appurtenances:

- Great Lakes Upper Mississippi River Board of State Public Health and Environmental Managers, Recommended Standards for Water Works, 1997 or later revision. Also known as, “10-State Standards for Water.”
- ASCE Gravity Sewer Design and Construction, 2<sup>nd</sup> edition or
- Great Lakes Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, Recommended Standards for Wastewater Facilities, 1997

### **A. ADDITIONAL DESIGN REQUIREMENTS AND EXCEPTIONS**

1. Section 8.22 of the 10-State Standards for Water shall be changed to require a minimum diameter water service main of eight inches, except where a dual house connection is proposed outside of the right-of-way.
2. Applicant shall be responsible for confirming adequate capacity of existing water distribution systems, sanitary collections systems, pump stations, water treatment works, and wastewater treatment plants. Where necessary, the applicant shall conduct an engineering study of the system(s) satisfactory to the Department to demonstrate existing capacity.
3. A Residential Equivalent Living Unit (ELU) shall be assumed to produce 80,000 gallons per year or 220 gallons per day of sanitary flow,

with equal consumption of water. All residential units shall be assumed to be one ELU, regardless of housing type (i.e. townhouse, apartment or detached single family).

4. Design of sanitary sewers shall include infiltration assumptions satisfactory to the Department, but shall not be less than 250 gpd per mile per inch diameter of sewer.
5. A peaking factor of four shall be used in the design of sanitary sewers.
6. Sanitary manholes and other structures shall be designed with a 0.1 foot drop between inlet and outlet inverts.
7. All commercial, industrial, and retail connections must be provided with a properly sized grease trap.
8. Minimum of three x and y pair of location points obtained through the use of global positioning systems (GPS) or traditional surveying techniques must be shown on the construction drawings. Coordinate points shall be provided for each water valve, fire hydrant, valves, vaults, manholes and pump stations. The Department reserves the right to require additional coordinate points in extraordinary circumstances as determined by the Department.

END OF SECTION

## SECTION 02012

### TEST PITS

#### **PART 1 - GENERAL**

##### A. Description

1. Test pits shall include, but not necessarily be limited to, excavation to determine the exact horizontal location and/or elevation of underground structures, utilities, and other obstructions; the backfill and compaction of the excavation; and the stabilization of the surface, in accordance with the Approved Plans.
2. Prior to construction it shall be the Contractor's responsibility to establish the location and/or elevation of existing utilities and structures that may affect the proposed work.

The Contractor shall test pit all utilities prior to the excavation of the proposed utility and submit copies of the results to the Director or duly authorized agent within 1 working day. The Contractor shall immediately notify the Engineer if the horizontal or vertical location of the test-pitted utility will conflict with the proposed construction. The proposed construction may not occur until the engineer has revised the construction drawings and the revised construction drawings have been approved by the County.

##### B. Related Work Included Elsewhere

1. Trench Excavation, Backfill, and Compaction: Section 02250
2. Restoration: Section 02800

##### C. Quality Assurance

It is intended that all suitable materials removed from the test pit excavation, exclusive of paving materials, be used for backfill. The County has the right to inspect all material used as backfill to determine the material's suitability for use as backfill.

#### **PART 2 - MATERIALS**

##### A. Materials Furnished by the County

None

B. Contractor's Options

1. Use of Excavated Material

All suitable material excavated from test pits shall be used, as far as practicable, for backfill. The Contractor shall properly store or stockpile and protect all materials that are to be reused in the work. The Contractor shall replace, at his own expense, material that was suitable when excavated, which has subsequently become unsuitable because of careless, neglectful, wasteful, or unprotected storage. The Contractor shall have no property right in any material taken from any excavation and no excavated material shall be wasted or otherwise removed from the project site without permission of the County. All unsuitable material shall be removed from the excavation and disposed of off-site in accordance with local, state and federal regulations by and at the expense of the Contractor.

2. Borrow

Borrow material for test pit backfill shall meet the requirements of Section 02250.

3. Graded Aggregate Subbase

Graded aggregate subbase for test pit backfill shall meet the gradation requirements specified in Section 02240.

**PART 3 - EXECUTION**

A. General

It shall be the Contractor's responsibility to determine the location and/or elevation of underground structures and utilities by the use of test pit excavation prior to initiating excavation operations for the installation of the proposed facility. Test pits shall be of the size, depth and location as approved by the County. Should the location and/or elevation thus determined be different from that shown on the Plans, the Contractor shall promptly furnish the correct information to the County so that the impact on the project may be determined.

B. Test Pits

1. The Contractor shall provide all necessary traffic control in accordance with the applicable regulations.

2. Surface preparation, excavation, backfill, compaction, and maintenance

of the backfilled excavation shall be as specified in Section 02250 for trenches, except that the limits of the work shall be as approved by the County.

3. Restoration shall be as specified in Section 02800 unless otherwise specified or directed by the County.

END OF SECTION

## SECTION 02050

### REMOVAL OR ABANDONMENT OF EXISTING UTILITIES

#### **PART 1 - GENERAL**

##### A. Description

1. Removal or abandonment of existing utilities and underground structures shall include, but not necessarily be limited to, the removal, salvage, demolition in place, abandonment, or other disposition of existing utilities, underground structures, or other facilities shown on the plans, encountered in the course of the work, and/or as directed by the County and in accordance with the Approved Plans.
2. All materials resulting from demolition work, except as indicated or specified otherwise, shall become the Contractors property. Salvaged materials specified to remain the property of the County shall be transported to another location designated by the County.

##### B. Related Work Included Elsewhere

1. Trench Excavation, Backfill, and Compaction: Section 02250
2. Water Mains: Section 02660
3. Gravity Sanitary Sewer and House Connections: Section 02700
4. Sanitary Sewer Manholes: Section 02710
5. Cast-in-Place Concrete: Section 03300
6. Flowable Fly Ash: Section 03500
7. Mortar: Section 04100
8. Brick Masonry: Section 04200

##### C. Quality Assurance

The County will inspect all materials and work to insure compliance with the Approved Plans.

## **PART 2 - MATERIALS**

### **A. General**

Materials shall be furnished in accordance with the Approved Plans and the current edition of the approved list of Suppliers and Materials for Water and Sewer Main Construction.

### **B. Materials Furnished by the County**

Not Applicable.

### **C. Contractor's Options**

None.

### **D. Detailed Material Requirements**

1. Borrow material for backfilling the space left by removal of facilities or backfilling abandoned structures shall meet the requirements specified in Section 02250.
2. Pipe plugs and caps for water or sewer main abandonment shall be as specified in Section 02660.
3. Pipe plugs for sewer main abandonment shall be a heavy-duty, conical-shaped, cast iron body sewer pipe plug with expandable rubber diaphragm with malleable iron wing nut.
4. Portland cement concrete for abandonment of utilities shall be Mix No. 1 as specified in Section 03300.
5. Flowable Fly Ash shall be as specified in Section 03500.
6. Mortar shall be as specified in Section 04100.
7. Brick for pipeline and structure bulkheads shall be sewer brick as specified in Section 04200.

## **PART 3 – EXECUTION**

### **A. General**

1. Utilities to be abandoned or removed shall not be abandoned or removed until all required proposed utility work is installed and tested to the

complete satisfaction of the Director. Furthermore, the Contractor shall notify the Director at least three (3) days prior to beginning the abandonment or removal.

2. The area over the existing facility to be removed shall be excavated and, after removal or abandonment as specified, backfilled and compacted in accordance with Section 02250.
3. Brick construction shall be as specified in Section 04200 and as specified herein.
4. Rubbish and debris shall be removed from the site unless otherwise directed so as to not allow accumulations inside or outside the project site. Materials that cannot be removed daily shall be stored in areas approved by the County.

B. Removal

Where indicated on the Plans, or directed by the County, existing utility pipelines and/or appurtenances shall be removed by the Contractor.

C. Abandonment

1. Sanitary Sewers 15-inch Diameter and Smaller
  - a. All open ends of abandoned sewer pipe shall be sealed by setting the mechanical plug in the pipe followed by concrete fillers shown in the standard detail. Existing manhole channels and benches shall be reconstructed as necessary with brick and mortar to provide a smooth transition within the manhole.
  - b. Abandon sewer services by removing the vertical stack to a minimum depth of 4 feet below finished grade. The stack shall be detached by saw-cutting. A sewer plug shall be installed on the abandoned vertical stack and encased in concrete a minimum of 12 inches around all sides of the stack. Backfill shall be as specified in Section 02250.
2. Sanitary Sewers 18-inch Diameter and Larger
  - a. All open ends of abandoned sewer pipe shall be sealed constructing a minimum 20-inch thick brick and mortar or concrete bulkhead.
  - b. Where a sewer is to be abandoned while the adjacent manhole is to remain active the Contractor shall seal (watertight) the

pipeline opening in the manhole with a minimum 20-inch thick brick and mortar or concrete bulkhead. Existing manhole channels and benches shall be reconstructed as necessary with brick and mortar to provide a smooth transition within the manhole.

3. Sanitary Manholes

- a. Frames and covers of abandoned manholes will remain the property of Cecil County. They shall be removed from the structure and transported to a designated location.
- b. The Contractor shall remove the structure to at least three feet (3' - 0") below finished grade in accordance with standard detail.
- c. Pipe openings within the manhole shall be sealed in accordance with the standard details

4. Water Mains and Appurtenances

Where indicated on the Plans, or directed by the County, the Contractor shall abandon existing water mains and/or appurtenances as follows:

- a. The section of water main remaining in service shall be capped or plugged and strapped and/or buttressed in accordance with the Approved Plans.
- b. When abandoning water mains 20-inches in diameter and larger, construct a 20-inch thick brick and mortar or concrete bulkhead, or plug, or cap each end of the abandoned sections. All open ends of abandoned water pipe shall be sealed.
- c. For water mains smaller than 20-inch diameter, install plugs or caps at each end of the abandoned sections.
- d. Abandon water services by exposing the corporation stop at the main, turning stop off, disconnecting the service line from the corporation stop, inserting a plug or cap on the exposed end of the corporation stop, encasing corporation in 6 inches of concrete, and backfill excavation to finished grade. Water services larger than two inches in diameter shall have the valve at the main removed, the service capped and encased in 12-inches of concrete. For facilities owned by a Private or Public Utility Company abandon water services by exposing and capping the corporation stop after disconnecting the service line large services greater than 2" shall be abandoned by plugging the

water valve with an M.J. Plug.

- e. The Contractor shall remove all structures to a minimum depth of three feet below finished grade, break or drill holes in the bottom of the structure to provide drainage, and backfill the structure as specified in Section 02250.
- f. For water facilities owned, operated and maintained by the County fire hydrants shall be returned to the Division of Water and Sewer Maintenance office at the North East River/ Advanced Wastewater Treatment Plant, 123 Carpenters Point Road, Charlestown, MD 21914.

END OF SECTION

SECTION 02110

CLEARING AND GRUBBING

**PART 1 - GENERAL**

A. Description

1. Clearing and grubbing shall include, but not necessarily be limited to, clearing areas of trees, brush, shrubs, down timber, rotten wood, other vegetation, debris and rubbish, as well as removal of fences and incidental structures; and grubbing or removing from the ground all stumps, roots and stubs, brush, organic materials, and debris, as shown and specified in the Approved Plans and within the limits of disturbance.
2. For developer projects the Contractor shall be responsible for acquiring all required permits associated with tree removal and tree trimming. For capital projects, the Contractor shall obtain a permit for any tree clearing outside of the L.O.D and within the State Highway Administration right-of-way from the Maryland Department of Natural Resources prior to construction.

B. Related Work Included Elsewhere

None.

C. Quality Assurance

The County will inspect the work to insure that it is performed in accordance with the Approved Plans.

**PART 2 - MATERIALS**

Not applicable.

**PART 3 - EXECUTION**

A. Limits

1. General

- a. Unless otherwise indicated in the Approved Plans, all trees and other growth within the drainage and utility easement or rights-of-way shall be removed. In certain situations designated trees may be required to be saved and shall be designated on the

construction drawings.

- b. Within the limits indicated on the Approved Plans to be cleared and grubbed, the County has the right to designate trees and other growth which the County may desire to leave standing.
- c. The clearing and grubbing operation shall be completed in its entirety prior to any water and sewer utility construction.

B. Unsuitable Materials

Note that after the clearing and grubbing operations are completed, unsuitable materials such as unstable formations, root mat, or swamp muck encountered below the surface of the ground must also be removed and properly disposed.

C. Salvaged Materials

When indicated, such materials as leaf mold or other organic materials above the surface of the ground and suitable for use as mulch or topsoil shall be salvaged and stockpiled.

D. Trees, Shrubbery and Plants

On County Capital projects only, the Contractor shall schedule a meeting with the County Project manager and inspector to review which trees, shrubs and vegetation shall not be disturbed. The County will discuss which trees, shrubbery, and plants which are not to be removed, and the Contractor shall protect them from any damage, as outlined in the General Provisions.” Where trees which are left standing are trimmed or become scarred by the Contractor’s operations, the cuts or scars shall be repaired by the Contractor. All trimming and repairs shall be done by skilled workmen and in accordance with good tree surgery practices under the supervision of a tree expert licensed by the State of Maryland.

E. Burning

If allowed, the Contractor shall obtain the appropriate permits to allow the burning of trees, brush, trash, or other perishable materials. If burning is prohibited by the Fire Marshall, the Contractor shall remove these materials and dispose of them off-site in permitted disposal facilities.

F. Disposal Locations

Perishable materials and debris shall be removed from the site easement or right-of-way and disposed of at locations off the project and outside the limits of view from the project by the Contractor. The Contractor shall make all

necessary arrangements with property owners, in writing, for obtaining suitable disposal locations, and furnish the County with a copy of the agreement. The cost involved shall be included in the price bid. The Contractor shall be responsible for obtaining all State and local permits for the disposal locations and furnish the County with evidence indicating the sites are approved for disposal.

G. Fences

All fences within the easement or right-of-way that are identified to remain shall be removed as carefully as practicable and replaced so that it remains in a condition equal to or better than what existed prior to construction.

H. Excavation Areas

Within areas to be excavated, all imbedded stumps, root mats, etc., shall be removed to a depth of not less than 1-foot below the subgrade or slope surfaces. All depressions made below the subgrade or slope surfaces by the removal of stumps or roots shall be refilled with materials suitable for embankment and shall be compacted in accordance with the requirements in Section 02250.

END OF SECTION

## SECTION 02240

### AGGREGATE BACKFILL

#### **PART 1 - GENERAL**

A. Description

Aggregate backfill shall include, but not necessarily be limited to, furnishing and placing granular material for the installation of pipes, fire hydrants, manholes, vaults, and other structures as directed by Cecil County, indicated on the plans, and in accordance with the Approved Plans.

B. Related Work Included Elsewhere

1. Trench Excavation, Backfill, and Compaction: Section 02250
2. Water Mains: Section 02660
3. Water Services and Appurtenances: Section 02664
4. Fire Hydrants: Section 02666
5. Gravity Sanitary Sewer and House Connections: Section 02700
6. Sanitary Sewer Manholes: Section 02710
7. Sanitary Sewer Force Mains: Section 02720

C. Quality Assurance

All aggregate fill material will be subject to test by the County to determine the material's compliance with the Approved Plans.

#### **PART 2 - MATERIALS**

A. Materials Furnished by the County

The County will not furnish aggregate fill material.

B. Detailed Material Requirements

1. Aggregate fill material for the installation of pipes, hydrants, manholes, vaults and miscellaneous structures as noted in the Standard Details shall meet the requirements of AASHTO M43, Size 57.

2. Aggregate fill material for subgrade stabilization shall meet the requirements of AASHTO M 43, Size 3.
3. Aggregate backfill material that meets the Maryland SHA requirements for graded aggregate subbase may be used with the approval of Cecil County.

### **PART 3 - EXECUTION**

- A. If areas of the foundation are soft, composed of mud, or are, in the County's judgement, unfit to receive the pipe, structure, concrete, or masonry, then such unacceptable material shall be removed and replaced with aggregate fill material as directed by Cecil County.
- B. The aggregate backfill material shall be carefully placed to the dimensions indicated on the plans or directed by Cecil County.
- C. Except for Size 57 or 3, all aggregate backfill material shall be compacted.
- D. Aggregate fill shall not be dropped from heights in excess of 5 feet above utility.

END OF SECTION

## SECTION 02250

### TRENCH EXCAVATION, BACKFILL AND COMPACTION

#### **PART 1 - GENERAL**

##### A. Description

1. Trench excavation, backfill and compaction shall include, but not necessarily be limited to, the excavation, backfill, and compaction of trenches for pipelines, fire hydrants, valves, manholes, vaults and other structures shown on the Plans, and in accordance with the Approved Plans.

##### B. Related Work Included Elsewhere

1. Test Pits: Section 02012
2. Removal and Abandonment of Existing Utilities: Section 02050
3. Aggregate Backfill: Section 02240
4. Boring and/or Jacking Pipe: Section 02300
5. Tunneling: Section 02400
6. Water Mains: Section 02660
7. Water Valves and Appurtenances: Section 02662
8. Water Services, Water Meter Settings and Vaults: Section 02664
9. Fire Hydrants: Section 02666
10. Gravity Sanitary Sewer and House Connections: Section 02700
11. Sanitary Sewer Manholes: Section 02710
12. Sanitary Sewer Force Mains: Section 02720

##### C. Quality Assurance

For County owned projects or projects to be owned and operated by a Private or Public Utility Company located in part or in whole within a proposed or existing county right of way or easement all materials removed from trench excavations

and used for backfill will be subject to test by the County to determine the material's suitability for use as backfill.

**PART 2 - MATERIALS**

A. Materials Furnished by the County

For County projects the County will not furnish any materials for trench backfill other than those materials which are available from the trench excavation limits as shown on the Standard Details and the Approved Plans.

B. Contractor's Options

Not applicable.

C. Detailed Material Requirements

1. Material for backfills may be from on-site excavations (if of proper quality) or from borrow sources. The material shall be free from organic material, sludge, grit, trash, muck, roots, logs, stumps or frozen material and other deleterious substances. Except as otherwise specified or approved, the material shall not contain rocks or lumps larger than six inches in greatest dimension. The material shall not contain mica in quantities which, in the judgement of the County are sufficient to affect compaction characteristics. The use of any soil additive that in the judgement of the Director or private/public utility owner may adversely affect the proposed utility is strictly prohibited.

2. Material for Backfill shall be as follows:

- a. Select Material – Within public right-of-way, private roads and parking lots within drainage and utility easement, business, commercial and industrially zoned properties, areas supporting vehicular loads and as specified herein or noted in the Contract Documents.

AASHTO Soil Classification	A-1	A-2	A-3
Sieve Analysis (% passing)			
No. 10 (2.0mm)	50 max.	-	-
No. 40 (0.425mm)	50 max.	-	51 max.
No. 200 (0.075mm)	25 max.	35 max.	10 max.
Typical Material	Stone Fragments, gravel and sand	Silty or clayey gravel and sand	Finesand

Additionally, the following material is allowable under the Unified Soil Classification System: GW and SW, or a well graded aggregate meeting the Maryland State Highway Administration requirements for roadway sub-base.

The maximum dry density shall be 105 lb/ft<sup>3</sup> or greater as measured by AASHTO T-180, Method C. The liquid limit and plasticity index for the portion of material passing the No. 200 size shall not exceed 41 and 10 respectively.

- b. Suitable Material – All other areas not required under paragraph a. above.

The maximum dry density shall be 100 lb/ft<sup>3</sup> or greater as measured by AASHTO T-180, Method C, unless the material has more than 35 percent retained on the No. 4 sieve in which case Method D shall be used. Suitable material shall include all material designated as select material as well as material classified in the Unified Soil Classification System (USCS) as ML, CL, MH and CH.

- c. Structural Fill – Structural fill shall be placed and compacted against cast-in-place concrete structures in accordance with the requirements specified in the Contract Documents.

### 3. Use and Ownership of Excavated Material

- a. Suitable material excavated from utility trenches shall be used, as far as practicable, for backfill in trenches.
- b. The Contractor shall properly store, stockpile and protect all materials that are to be reused in the work. The Contractor shall replace, at his own expense, material that was suitable when excavated, which has subsequently become unsuitable because of careless, neglectful, wasteful, or unprotected storage. The Contractor shall have no property right in any material taken from any excavation and no excavated material shall be wasted or otherwise removed from the project site without permission of the County. All unsuitable and surplus suitable material, as determined by the County, shall be removed from the excavation and disposed of off-site by and at the expense of the Contractor in accordance with all applicable Federal, State, and local regulations.
- c. If insufficient suitable soils are available from excavation on the contract project, the Contractor may obtain suitable soils from

sources designated in the Special Provisions, or from such sources within 300 yards of the site as may be approved by the County. If these sources do not supply sufficient suitable soils, the Contractor shall submit for inspection and test by the County borrow excavation sites from which such soils as may be required to complete the construction of excavation backfill on the contract project. Borrow Excavation shall be supplied and placed at the contract unit price or when not provided for in the contract at a negotiated price for Extra Work”.

4. Aggregate backfill for pipe and structure installation, bedding and trench backfill shall meet the gradation requirements specified in Section 02240.

### **PART 3 - EXECUTION**

#### **A. Surface Preparation**

##### **1. Sediment Control**

The Contractor shall install all required sediment control devices in accordance with permits and all applicable Federal, State and local regulations.

##### **2. Clearing and grubbing**

The Contractor shall clear and grub the surface over the line of the trench in accordance with the requirements of Section 02110.

##### **3. Removing Pavement, Sidewalk, Curb, etc.**

a. Prior to the removal, the Contractor shall saw-cut all existing pavement, sidewalk and curb. Jack hammering edges of pavement sidewalk and curb removal is prohibited.

b. The Contractor shall remove paving only to the width shown on the Standard Details, noted in the Special Provisions, or as directed by the County. When the Contractor removes paving for a greater width than is deemed necessary or disturbs paving, sidewalk, curbs, etc. due to settlement, slides, or cave-ins, or in making excavation outside the limits of the trench without written order of the County, the County will require the Contractor to replace the excess damaged area and may retain from payments due the Contractor such amounts required to permanently replace the excess material removed. The Contractor shall be responsible for repaving or surfacing

roadbeds or replacing sidewalk, curbs, etc. that have failed, settled, or have been damaged at anytime before expiration of the Contract maintenance period due to work or any other activities by the Contractor, his subcontractors, or suppliers.

4. Maintaining Traffic

The Contractor shall furnish all labor, tools, equipment, and materials required for the maintenance of traffic during construction in accordance with the traffic control plan or permits.

B. Trench Excavation

1. General

- a. Excavation for the installation of utilities shall be unclassified and shall consist of the excavation removal and/or disposition of all material encountered to the lines, grades, and sections shown on the Plans and/or the Standard Details, as specified, or as directed by the County.
- b. Unless otherwise indicated, excavation shall be by open cut, except that short sections of a trench may be tunneled, or the pipeline jacked, if, in the opinion of the County, the pipe can be safely and properly installed.
- c. Trenches shall be excavated and backfilled either by hand or by machinery. The Contractor shall have no claims, nor will extra compensation be allowed, for hand excavation or backfill which may be required by these Specifications or by the County for protection of existing utilities or structures.

2. Protection of Property and Structures

- a. The Contractor shall, at his own expense, sustain in place and protect from direct or indirect injury all existing facilities in the vicinity of the excavation, whether above or below the ground, or that may appear in the trench. The Contractor shall be responsible for the implementation of protective measures associated with the presence or proximity of pipes, poles, tracks, walls, buildings, property markers, and other structures and property of every kind and description in or over his trenches or in the vicinity of his work whether above or below the surface of the ground. The Contractor shall repair or replace damaged facilities at his expense.

- b. The Contractor shall be responsible to obtain any applicable local, state and Federal permits associated with dewatering. Dewatering means and methods shall be the responsibility of the Contractor. The Contractor shall be responsible for damage to private property or its water resources as a result of the Contractor's construction activities.

3. Utility Adjustments

- a. All adjustments to utilities other than those owned by the County shall be performed by the utility owner.
- b. Adjustments to water services between the property line and the water main shall be performed by utility contractors licensed and insured in the State of Maryland. Adjustments between the property line and the house shall be performed in accordance with Cecil County Plumbing Code. It shall be the Contractor's responsibility to obtain all permits necessary for the performance of this work.
- c. Adjustments to sanitary sewers within the County easement or right-of-way shall be accomplished by a utility contractor licensed and insured in the State of Maryland. Adjustments to sanitary sewers outside the County easement or right-of-way shall be performed in accordance with the Cecil County Plumbing Code. It shall be the Contractor's responsibility to obtain all permits necessary for the performance of this work.

4. Obstructions Shown on Plans

- a. Certain information regarding the reputed presence, size, character, and location of existing underground utilities and structures has been shown on the Plans based upon available records. There is no certainty of the accuracy of this information, and it shall be considered by the Contractor in this light. If test pit data is not shown on the Plans, the Contractor shall excavate test pits in advance of his work in accordance with Section 02012 to locate existing utilities. The Contractor shall hereby distinctly understand that the County is not responsible for the correctness or sufficiency of the information given. The Contractor shall have no claim for delay or extra compensation on account of incorrectness of information given, or on account of the insufficiency or absence of information regarding obstructions. The Contractor shall have no claim for relief from any obligation or responsibility under the Contract in case the location, size, or character of any underground facility is encountered that is not

shown on the Plans.

- b. It shall be the responsibility of the Contractor to notify MISS UTILITY,” all municipal utilities, all utility line owners, and any other parties affected prior to the beginning of work. It is the Contractors responsibility to reference and maintain the location markings during the construction of the project. In the event that a utility location needs to be re-established by Cecil County, the cost to provide this shall be borne by the Contractor.

5. Removing Obstruction

- a. Should the position of any pipe, conduit, or other structure above or below ground be such as, in the opinion of the County, to require its removal, realignment, or change due to the work to be done under the Contract, the work of removal, realignment, or change will be done as extra work, or will be done by the owner of the obstructions without cost to the Contractor; but the Contractor shall uncover and support the structures in the limits of his trench at his own expense before such removal, and before and after such realignment or change. Whether the obstruction is shown on the Plans or not, the Contractor shall not be entitled to any claim for damage or extra compensation on account of the presence of said structure or on account of any delay in the removal or rearrangement of the same; however, if said structure is not shown on the Plans, time extension will be allowed if deemed to be warranted by the County.
- b. In the event that obstructions would delay the work of pipe installation, the Contractor may, with prior written County approval, be permitted to leave a gap in the work and return to fill the gap after the obstructions have been removed. The installation shall be completed by laying full pipe lengths and appropriate closure pieces.
- c. The Contractor shall not interfere with any persons, firms, or corporations or with the County in protecting, removing, changing or replacing pipes, conduits, poles, or other structures.
- d. In the event that the County has entered into any agreement with an affected utility owner or owners which will have an effect on the operations or financial responsibilities of the Contractor, the requirements of these agreements will be included in the Special Provisions of the Contract.

6. Change of Trench Location

- a. In the event the County 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 shall be authorized upon the Contractor's request, the Contractor shall not be entitled to extra compensation or to a claim for damages; provided that the change is made before the excavation is begun. If, however, such change, made at the direction of the County involves the abandonment of excavation already made, such abandoned excavation together with the necessary backfill, will be considered extra work and the Contractor shall be compensated accordingly. In the event that the trench is abandoned in favor of a new location, at the Contractor's request, the abandoned excavation and backfill shall be at the Contractor's expense.
- b. If an obstruction shall lie within the trench in such manner that the trench has to be excavated to extra width in order that sheeting or bracing may be properly placed, or in order that a structure to be placed in the trench may be properly built, such extra width of trench shall be classed as miscellaneous excavation. No sloping of sides of excavation, however, for the purpose of avoiding the necessity of placing sheeting or bracing, either in the presence or absence of obstructions, will be considered as excavation beyond pay limits.

7. Trench Width and Depth

- a. Trenches shall be excavated to the necessary width and depth as may be shown on the Plans or Standard Details, as specified in the Special Provisions, or as directed. The trench subgrade shall be such as to provide a uniform and continuous bearing and support for the pipe on solid undisturbed earth for the full length of each pipe, except for that portion at the bell hole. Any part of the bottom of the trench excavated below subgrade shall be backfilled with approved material and compacted in accordance with Approved Plans.
- b. Subgrade, in the case of pipelines, shall be six (6) inches below the underside of the pipe barrel, where the pipe is laid on granular bedding. Where the pipe is laid on a natural foundation, subgrade shall be four (4) inches below the underside of the pipe barrel.

- c. The sides of the trenches shall be in accordance with the latest OSHA requirements. It is the contractor's responsibility to install and supply all materials needed to conform to OSHA requirements.
- d. Bell holes shall be excavated in the bottom of the trench to ensure that pipe has continuous bearing.
- e. Where sheeting or trench boxes are used, the maximum width shall be as noted in the Standard Details.

8. Length of Open Trench

- a. The Contractor shall keep the backfill operation to the top of trench for offsite and existing areas and to road subgrade in areas of new construction, within 100 feet of excavation and pipe laying operations. The County reserves the right to require the backfilling of open trenches over completed pipe lines if, in his judgment, such action is necessary; and the Contractor shall thereby have no claim for extra compensation, even though to accomplish said backfilling, he is compelled temporarily to stop excavation or other work at any place.
- b. All trenches shall be closed at the end of each workday.
- c. The excavation of all trenches shall be fully completed at least one full pipe length in advance of pipe installation, unless otherwise authorized.

9. Responsibility for Condition of Excavation

The Contractor shall be responsible for the condition of all excavations made by him.

10. Trench Support

- a. The support of the trench in conformance with OSHA requirements shall be the sole responsibility of the Contractor.
- b. The Contractor shall support the sides and ends of all excavations wherever necessary with braces, sheeting, shoring or stringers, trench boxes, or other acceptable excavation support systems. All trench support systems shall be installed by men skilled in such work and shall be so arranged that it may be withdrawn as backfilling proceeds, without injury to the utility or structure constructed or to any roadbed, adjacent structure or

- c. All timbering in excavations, trench boxes, or excavation support systems shall be withdrawn as the backfilling is being done, except where and to such extent as the County shall order in writing that said timbering or excavation support system be left in place or where the County permits the trench support to be left in place at the Contractor's expense and upon his request. The Contractor shall cut off any sheeting left in place 2 feet below finished grade and shall remove the material cut off without compensation therefore.
- d. Wherever necessary, in running sand, or soft ground, or for the protection of any structure or property, sheeting shall be driven without extra compensation to such a depth below the bottom of the trench as may be required or directed. Where directed by the County to leave sheeting in place, payment will be made under the appropriate contingent item.
- e. All work shall be performed in accordance with the latest applicable Federal, State, and local safety and health regulations.

11. Drainage and Dewatering

- a. The Contractor shall grade the site as necessary to prevent surface water ponding or from flowing into the trench or other utility excavations and shall provide all necessary temporary surface drainage and keep the same operating to the satisfaction of the County until permanent drainage or finished grading and permanent surface stabilization has been completed.
- b. It shall be the Contractor's responsibility to adequately control water that may be present in the excavation. He shall provide for the disposal of water removed from excavations in such a manner not to cause damage to public or private property or to any portion of the work completed or in progress or cause any impediment to the use of any area by the public; nor shall the Contractor discharge any flushing or ground water or any material of any nature into existing sanitary sewer system during the construction of the facilities. All water shall be discharged through an approved sediment control device.

12. Excavation below Subgrade

- a. The Contractor shall, without additional compensation, before any pipe or appurtenance is installed, fill all unauthorized

depressions or irregularities in the bottom of the trench or tunnel with aggregate fill.

- b. Where the bottom of the trench, at subgrade, is in unstable or unsuitable material, excavation shall be carried to such depth as ordered by the County. The trench bottom shall be restored to subgrade with aggregate fill. Excavation and backfill for removal of unsuitable material will be paid for under the appropriate contingent item.

C. Backfill

1. The Contractor shall backfill all trenches as rapidly as practicable after the installation of the utility therein, or after the excavation has served its purpose.
- 2.. Subgrade to 2' – 0" above top of pipe: Unless otherwise noted in the Construction Drawings, Specifications or Permits, backfill material shall be carefully placed around and to a depth of two feet over the pipe. These initial lifts shall be carefully placed and tamped by hand or suitable machine compaction methods (dependent on material) in four to eight inch layers. Care should be exercised in this operation to insure that the alignment of the utility is not disturbed.
3. Subgrade to 2' – 0" above top of pipe to top of trench. The remainder of the trench may be backfilled in layers not exceeding the specified compaction lift depths. However, if lift thickness is followed and the specified compaction is not obtained based on the testing during backfilling, the Contractor shall, at his own expense, remove, replace, and retest as many times as is required to obtain the specified compactions. In backfilling the remainder of the trench, stones of not more than 6 inches in largest dimension which have been taken out in excavating may be mixed with earth in an amount not exceeding 25% of the backfill volume. Stones of larger size or in greater quantities shall not be used, unless directed by the County. The Contractor shall not permit excavations to be used for the disposal of refuse.
4. Use of frozen backfill material is prohibited.
5. In paved areas, the Contractor shall furnish and backfill the trench as per the requirements of the governing regulatory agency, and/or Approved Plans.
6. Should additional material be required for backfilling in excess of that obtained from excavation, the Contractor shall obtain Borrow material from off-site sources, to complete the trench backfill.

7. Pipe Structures, Appurtenances and backfill material shall not be laid upon frozen soil or aggregate.

D. Compaction

1. In unimproved areas (areas not identified in paragraph 2 below) compaction shall be accomplished as follows for the remaining depth of trench: Backfill material shall be placed in maximum 2 foot layers or as approved by the County and compacted in such a manner that a completely dense refill is obtained which is free of voids and not susceptible to undue settlement or depression.
2. Soil compaction certified by a soils testing company will be required under the following conditions, unless otherwise shown on the construction drawings, noted in the Specifications or required in the permit.

- a. Road right-of-ways, roadways, driveways, parking lots, sidewalks and other easement areas with vehicular loads; and all business, commercial or industrial property.

The remaining trench depth less any thickness left for crusher run, paving, or concrete specified hereinafter shall be backfilled with suitable material and mechanically tamped in layers not to exceed twelve inches to not less than 92% 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 which shall be compacted to 95% of the maximum density determined as noted above. All compaction must comply with the aforementioned or the latest edition of the governing applicable road code or permit whichever is most stringent.

- b. In some circumstances, lawn and landscape areas may require the above compaction standards. Residentially zoned property (maintained lawn and landscaped areas)

The remaining trench depth shall be backfilled with suitable material and mechanically tamped in layers not to exceed twelve inches to not less than 85% of the maximum density at optimum moisture content as determined by the Modified Proctor Method, AASHTO Designation T-180.

3. Insofar as the specifications for mechanical tamping equipment or methods are concerned, no specific requirements are included in these

Specifications other than that the use of any particular type of equipment is subject to the approval of the County and that the County has sole right to judge what equipment is suitable for the uses intended. The Contractor shall be cognizant that use of hand-tamping equipment may be required around existing utilities.

4. For developer projects, the developer or contractor shall inspect and test the soil compaction utilizing a Geotechnical Firm licensed in the State of Maryland to ensure the requirements are met in paragraph 2 above. A full-time soils testing technician shall be on-site performing compaction tests during all backfilling operations. The following shall be required of the soils testing company.
  - a. Prior to construction, perform modified Proctor Test T-180 on bag samples of proposed backfill material for the purpose of obtaining moisture-density relationship curves (Proctor curves). The soils technicians inspecting the backfilling operations shall have the proctor curves with them at all times.
  - b. Monitor and document all backfill operations that are subject to compaction certification.
  - c. The soils technicians shall assure each lift, not exceeding 100 linear feet, meets the compaction requirements noted on the construction drawings. The moisture density of the soil shall be tested by either the sand cone method or by nuclear density gauge. The soils technician shall notify the contractor if any lift does not meet the compaction requirements. The contractor shall then re-compact the backfill as necessary until the minimum compaction has been achieved. The soils technician shall note the station and depth of each test and re-test with results. The contractor shall not proceed until the minimum compaction requirements have been met.
  - d. The soils technician shall provide the County Inspector with copies of the reports on a daily basis on the day the testing occurred.
  - e. The soils technician shall take moisture tests of the backfill material a minimum of twice daily. If the tested soil moisture will prevent the required density, the technician shall immediately notify the contractor. The Contractor shall then take the necessary steps to modify the soil moisture to acceptable levels that will achieve the minimum compaction requirements without the use of additives.

- f. The soils technician shall determine if the backfill material meets the requirements of the Standard Specifications.

For capital projects, Cecil County will retain the services of a soils testing at the County's expense.

E. Maintenance of Backfilled Trench

1. All backfilled trenches shall be maintained in an acceptable condition by and at the expense of the Contractor for a period of twelve (12) months following the date of conditional acceptance of the work.
2. If the Contractor fails to fill depressions in the backfilled trench within 24 hours after the receipt of notice from the County, the County may refill said depressions and the Contractor shall reimburse the County for all costs incurred. In case of emergency, the County may refill any dangerous depression or protect with lights wherever necessary without giving previous notice to the Contractor; and the Contractor shall reimburse the County for all costs incurred.
3. The Contractor shall be responsible for any injury or damage that may result from lack of maintenance of any refilled excavation at any time prior to final acceptance of the Project.

END OF SECTION

## SECTION 02300

### BORING AND/OR JACKING PIPE

#### **PART 1 - GENERAL**

##### A. Description

Boring and/or jacking pipe shall include, but not necessarily be limited to, furnishing and installing carrier pipe and/or casing pipe beneath railways, roadways, or other locations indicated on the Plans and in accordance with the Contract Documents. The work consists of the furnishing of a trenchless installation which serves as a casing for utilities. The trenchless excavation shall be installed to the lines and grades shown on the Construction Drawings. The Contractor shall be responsible for selecting a method suitable for the conditions to be encountered and to assure no disturbance to the existing surface.

##### B. Related Work Included Elsewhere

1. Aggregate Backfill: Section 02240
2. Trench Excavation, Backfill, and Compaction: Section 02250
3. Water Mains: Section 02660
4. Water Services and Appurtenances: Section 02664
5. Gravity Sanitary Sewer and House Connections: Section 02700
6. Sanitary Sewer Force Mains: Section 02720

##### C. Quality Assurance

The County will inspect all materials before, during, and after installation to ensure compliance with the Approved Plans.

##### D. Railroad Crossings (For County Projects Only)

No work shall begin without a fully executed Agreement between the County and the Railroad. The Contractor is required to read and adhere to all terms and conditions of the Agreement. The Contractor shall furnish and install all materials specified in the Agreement.

#### **PART 2 - MATERIALS**

##### A. Materials Furnished by the County

The County will not furnish any materials for boring and/or jacking pipe.

B. Detailed Material Requirements

1. Portland Cement Concrete

Portland cement concrete for inverts or cradles shall be Mix No. 1 as specified in Section 03300.

2. Mortar for Grout

- a. Mortar used for grouting voids outside the casing pipe shall conform to the requirements of Section 04100 except that it shall be composed of one part Portland cement and three parts sand.
- b. Mortar used for bulk heading sleeve ends shall conform to the requirements of Section 04100.

3. Brick Masonry

Brick Masonry for bulk heading sleeve ends shall conform to the requirements of Section 04200.

4. Steel Casing Pipe

- a. Steel casing pipe shall be smooth walled and have a minimum yield strength of 36,000 psi (ASTM A-570, Grade 36). Minimum wall thickness shall be as noted herein or as specified in the Approved Plans. Pipe shall conform to AWWA C-200.

Casing Pipe

Nominal Pipe Size (inches)	Wall Thickness (inches)
12	0.375
16	0.375
20	0.375
24	0.375
30	0.500
36	0.500
48	0.500

- b. The pipe shall be fabricated and field connected in accordance with Section 02660. Joints shall be fully welded around the circumference of the pipe.
- c. The exterior of the pipe including field connection shall be bituminous coated before installation. Bituminous coating shall meet the requirements of AWWA C210.

5. Carrier Pipe

Carrier pipe shall be as specified in the Approved Plans and meet the requirements specified in Sections 02660, 02700, or 02720 as appropriate.

6. Casing Spacer/Insulators

- a. Casing spacer/insulators shall be fabricated items capable of providing position, support and separation of carrier pipes inside casing pipes. Spacer/insulators shall be virtually corrosion-proof and resistant to sodium chloride and acids.
- b. Spacer/insulators shall provide the ability to position the carrier pipe within the casing. Unless otherwise approved by the Division of Water and Sewer, the concentric centering method shall be utilized. Spacer/insulators shall be capable of grade adjustment to position a gravity sewer to its required carrier pipe alignment due to irregularities in the casing pipe alignment.
- c. Spacing insulators shall be injection molded high density virgin polyethylene or an ultra high molecular weight polymer. The carrier pipe shall be capable of sliding within the casing pipe with minimal pushing force. The bearing surfaces of runners shall have a high resistance to wear and abrasion, high impact strength, low deflection under compression and low coefficient of friction.

**PART 3 - EXECUTION**

A. Preparation

- 1. Bored and/or jacked pipe greater than 4 inches in diameter shall receive a casing pipe unless directed otherwise by the Director or authorized agent.
- 2. Preliminary work shall consist of excavating and sheeting a suitable shaft on the lower side of the crossing and installation of a backstop and

guide rails. The guide rails shall be long enough to hold at least two lengths of pipe and shall be carefully checked for line and grade before any pipe is placed on them.

3. Design, construction, maintenance and removal of the jacking pit and receiving pits, including damage attributed to the construction of the pits shall be the responsibility of the Contractor. The Contractor shall be responsible for any necessary utility relocations or the support of utilities related to the jacking and receiving pit construction at no additional cost to the County.
4. The Contractor shall provide, operate and maintain for the duration of the construction, a ventilation system, lighting and other health safety measures suitable for meeting local, State and Federal health and safety requirements.

B. Boring and/or Jacking

1. When augers or similar devices are used for pipe emplacement, the front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger and cutting head from leading the pipe so that there will be no unsupported excavation ahead of the pipe. The arrangement shall be removable from within the pipe in the event an obstruction is encountered. The excavation by the cutting head shall not exceed the outside diameter of the pipe by more than 1/2 inch. The face of the cutting head shall be arranged to provide reasonable obstruction to the free flow of soft material.
2. If an obstruction is encountered during installation that stops the forward action of the pipe, and it becomes evident that it is impossible to advance the pipe, operations shall cease and the pipe abandoned in place and filled completely with flowable fly ash.
3. Bored or jacked installations shall have a bored hole essentially the same as the outside diameter of the pipe plus the thickness of the protective coating. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe (plus coating) by more than approximately 1-inch, grouting or other methods approved by the County shall be employed to fill such voids.
4. When groundwater is encountered in the excavation, pumps of sufficient capacity to handle the flow shall be maintained at the site. The pumps shall be in constantly attended operation on a 24-hour basis until their operation can be safely halted. When dewatering, close observation shall be maintained to detect any settlement or displacement of surface facilities. Should settlement or displacement be detected, the Contractor

shall notify the County immediately and take such action as necessary to maintain safe conditions and prevent any further damage. Discharge of groundwater shall meet all local, state and federal regulations and shall be borne by the Contractor at his expense.

5. All operations shall be conducted so as not to interface with, interrupt, or endanger the operation of traffic, or damage, destroy, or endanger the integrity of any surface facilities.
6. Carrier pipe will be tested in accordance with Section 02660 or Section 02700 as applicable.
7. Each end of the sleeve will be bulkheaded in accordance with Section 02050.

C. Installation of Carrier Pipe

1. Carrier pipe shall be installed within the casing pipe as shown in the Approved Plans and as specified in Sections 02660, 02700, and 02720.
2. There shall be no direct contact between carrier pipe and casing pipe. There shall be no less than three pipe spacer/insulators per segment of pipe. The first spacer shall be placed not more than two feet from each end of the casing pipe. Spacer placement intervals shall be set to maintain joint stability during and after installation to maintain separation distance between casing and carrier pipe and to maintain required grade adjustments. Interval between spacers shall be seven to nine feet; however, manufacturer recommendations shall be adhered to for type, size and live load of carrier pipe.

END OF SECTION

## SECTION 02310

### Directional Boring of Pressure Sewer and Water Main

#### **PART 1 – GENERAL**

- A. The pressure sewer shall be located within the easement and within 1 foot horizontally and within 2 inches vertically of the alignment shown on the contract plans and shall be installed by directional boring. Directional boring shall be conducted so as to minimize the number and size of excavation holes.
- B. **Operating Expertise**  
The Contractor or his Subcontractor must demonstrate expertise in trenchless methods by providing the County a list of ten utility references for whom similar work has been performed within the last three years prior to the pre-construction meeting. The references should include a name and telephone number where contact can be made to verify contractor capability. The Contractor must provide documentation showing successful completion of the projects used for reference. The pre-construction meeting may not be scheduled until after the County approves of the above expertise. Conventional trenching experience will not be considered applicable. For Private or Public Utility projects, the contractor shall comply with the contractual certifications.
- C. **Submittals**
1. The Contractor shall submit technical data equipment, method of installation and proposed sequence of construction for approval by the County. The submittal shall include information pertaining to working and receiving shaft, dewatering, method of spoils removal, size and capacity of equipment capabilities for installing pipes on a curve, type of cutter head, drilling fluid type, method of monitoring line and grade and detection of surface movement.
  2. Prior to the pre-construction meeting and County approval to perform the directional boring, the Contractor must submit the names of supervisory field personnel and historical information of directional boring experience. In addition, the Contractor must submit for approval the name plate data for the drilling equipment and mobile spoils removal unit and MSDS information for the drilling slurry compounds.
- D. **Related Work Specified Elsewhere**
1. Clearing and grubbing: Section 02110
  2. Trench excavation, backfill and compaction: Section 02250
  3. Low pressure sewer: Section 02731

4. Sewage Grinder Pumping Units: Section 11307

E. Quality Assurance

The County will inspect all materials before, during and after installation to ensure compliance with the Contract Documents.

**PART 2 - MATERIALS**

A. Materials shall be in accordance with Section 02731.

**PART 3 - EXECUTION**

A. Installation

1. Prior to installation, the entire drainage and utility easement and/or right-of-way shall be cleared and grubbed in accordance with Section 02110 unless otherwise shown on the drawings or specified.
2. Installation shall be in trenchless manner producing a continuous bore. The number of access pits shall be kept to a minimum.
3. The drilling system shall be remotely steerable and permit electronic monitoring of tunnel depth and location. Accurate placement of pipe at up to eight feet deep, within a  $\pm 2$  inch window is required. The drilling device shall be capable of drilling a 90 degree, 35 foot radius curve.
4. The equipment must be capable of boring the following lengths in single bored, and successive boring pits will not be allowed to be any closer than the following distances:

<u>Pipe Size</u>	<u>Boring Distance</u>
1 in. to 1 ½ in.	400 Feet
2in. to 2 ½ in.	350 Feet
3in to 6in.	300 Feet
6in to 8 in	250 Feet

5. Drilling must be performed by a fluid cutting process (high pressure/low volume), utilizing a liquid/clay slurry, i.e. bentonite. The clay slurry must be totally inert. A vacuum spoils recovery vehicle must be on site to remove the drilling spoils from the access pits. The spoils must then be transported from the job site and be properly disposed of at an approved location. Under no circumstance will the drilling spoils be permitted to be disposed of into sanitary, storm or other public or private drainage systems.

6. Mechanical, pneumatic or water jetting methods will be considered unacceptable due to the possibility of surface subsidence.
7. Upon owner request, the Contractor shall prove the accuracy of the electronic monitor every fifty (50) feet of directional bore in the presence of the Owner or duly authorized agent during directional drilling operations via test pit every 50' of bore. If the above accuracy is not met, the Contractor shall adjust or provide the necessary equipment which will meet the accuracy requirements. All such calibration costs shall be at no cost to the Owner.
8. After an initial bore has been completed, a reamer head shall be installed at the termination pit, and the pipe and reamer head shall be pulled back to the starting pit. The reamer must also be capable of discharging liquid clay to facilitate the installation of the pipe into a stabilized and lubricated tunnel. Reaming diameter shall not exceed 1.5 times the outside diameter of the pipe being installed.
9. The pipe being pulled into the tunnel will be protected and supported so that it moves freely and is not damaged by stones and debris on the ground during installation.
10. Pull back forces shall not exceed the manufacturers recommended allowable pulling force for the product pipe.
11. The Contractor shall allow sufficient lengths of pipe to extend past the termination point to allow connections to adjacent pipe sections. Pulled pipe shall be allowed a minimum of twenty-four (24) hours of stabilization prior to making tie-ins. The extra length of pipe shall be sufficient to make all necessary connections and tests.
12. Upon completion of boring and pipe installation, the Contractor will remove all spoils from the starting and termination pits. All pits will be compacted as per County and contract documents and be restored to their original condition.

B. Safety

1. Because the directional boring may encounter existing buried electrical lines, the following safety requirements must be met:
  - a. All drilling equipment must have a permanent inherent alarm system capable of detecting electrical current. The ground system shall be equipped with an audible alarm to warn the operator

when the drill head nears electrified cable.

- b. All crews shall be provided with grounded safety mats, heavy gauge ground cables with connectors and hot boots and gloves.
- c. All supervisory personnel must be adequately trained and have direct supervisory experience in directional boring.

C. Obstruction/Alignment

- 1. The bore shall not deviate from the horizontal alignment shown on the drawings by more than one (1) foot. If obstructions are encountered during the drilling operation, the Owner shall be notified immediately. With approval of the Owner, the Contractor shall attempt to go around the obstruction. If a deviation of more than three (3) feet from the horizontal alignment is required to bypass the obstruction, the Owner shall be immediately consulted to determine if adjustments in the alignment are required. At no time shall the alignment be allowed to exit the sewer easement or right-of-way. To prevent dips and high points in the pipeline profile, a vertical deviation in the pipeline profile may not exceed two (2) inches.
- 2. The Contractor shall employ all means necessary to complete the pipe installation as specified at no additional cost to the Owner. Any deviation from the previously approved means and methods shall be approved by the Owner prior to the implementation.
- 3. The Contractor shall mark the location and depth of the alignment with spray paint on paved surfaces and wooden stakes on non-paved surfaces at twenty-five (25) foot intervals. The Contractor shall record depth of the sewer at the twenty-five (25) foot intervals and provide a copy of the record to the Owner upon completion of the installation of each bore. The Contractor shall measure or survey locations where the horizontal alignment deviates from the proposed alignment and incorporate the changes in the as-built drawings.
- 4. If the bore pipe installation has deviated beyond the specified tolerances, it shall be the Owners option to require the Contractor to abandon the bore, or remove the installed pipe, and rebore or reinstall the pipe on the correct alignment at no additional cost to the Owner.

D. Detection

- 1. Tracer Wire: All non-metallic pipe shall have tracer wire secured with duct tape to the top of the pipe. The wire shall be continuous for the full length of the pipeline. Underground splice connections shall be made

with solderless split bolt connectors and taped to pipe.

2. Detector wire shall be terminated from each pipe run in each structure along the system, i.e., flushing connection vaults, air release vaults, service valve assembly vaults, etc. Allow adequate length of each wire in the structure, so it may be pulled one (1) foot out of the top of the structure for connection of detection equipment.
3. The detection wire shall be tested for continuity for each bored installation before acceptance by the Owner.
4. Detection tape is not required for pipe installed by directional boring.

END OF SECTION

## SECTION 02400

### TUNNELING

#### **PART 1 - GENERAL**

A. Description

Tunneling shall include, but not necessarily be limited to, furnishing and installing tunnel liners beneath railways, roadways, or other locations indicated on the Plans and in accordance with the Contract Documents. The work consists of the furnishing of a trenchless installation which serves as a liner for utilities. The trenchless excavation shall be installed to the lines and grades shown on the construction drawings. The Contractor shall be responsible for selecting a method suitable for the conditions to be encountered and to assure no disturbance to the existing surface.

B. Related Work Include Elsewhere

1. Aggregate Backfill: Section 02240
2. Trench Excavation, Backfill, and Compaction: Section 02250
3. Water Mains: Section 02660
4. Gravity Sanitary Sewer and House Connections: Section 02700
5. Sanitary Sewer Force Mains: Section 02720

C. Quality Assurance

The County will inspect all materials before, during, and after installation to ensure compliance with the Contract Documents.

D. Railroad Crossings (For County Projects Only)

No work shall begin without a fully executed Agreement between the County and the Railroad. The Contractor is required to read and adhere to all terms and conditions of the Agreement. The Contractor shall furnish and install all materials specified in the Agreement.

- E. The trenchless excavation method shall be designed for the earth, construction and other loads present plus AASHTO HS25 Highway Live Load increased 30 percent for impact. If the tunnel crosses a railway, it shall meet the design standards of the Railway Company. The Contractor's engineer or appropriate

design professional, who must be registered in the State of Maryland, shall prepare the design for review by the Engineer. Steel Tunnel Liner Plates, if used, shall be designed in accordance with the latest edition of the Standard Specifications for Highway Bridges adopted by the American Association of State Highway and Transportation Officials. All design shall be in accordance with OSHA, MOSH and all federal, state and local regulations.

F. Working Drawings

The Contractor shall submit working drawings for review by the Engineer on the trenchless excavation method itself and on any required launching/jacking and receiving pits. The Working Drawings shall be signed and sealed by the Contractor's engineer or appropriate design professional. 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 launching/jacking and receiving pits have been designed in accordance with these Specifications. County review of the Working Drawings shall not relieve the Contractor of the responsibility and liability for the adequacy and accuracy of the Working Drawings when implemented in the field.

G. Preconstruction Survey

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

H. Submittals

The Contractor shall submit the following to the Engineer for review:

1. Working Drawings, Trenchless Excavation Plan and Preconstruction Survey, describing in detail the proposed methods, procedures and the entire operation to be used, shall include but not be limited to the following:

## General

- a. Size, capacity and arrangement of equipment.
- b. Method of dewatering and drainage.
- c. Method of ground stabilization and materials, if proposed, and evidence of experience and competency.
- d. Method of detection of ground movement.
- e. Method of monitoring and controlling line and grade.

## Tunneling

- a. Launching and receiving pits.
  - b. Method of excavation and removing soils materials.
  - c. Method of support of tunnel face and initial supports.
  - d. Method of erecting, placing and operating the tunnel shield.
  - e. Grout and concrete design mix specifications.
  - f. Method and procedure for the placement of gravel pack or grout between the tunnel liner plates and the excavation.
  - g. Method and procedure for installing the carrier pipe and casing spacer/insulators, or supports and anchors, to prevent floatation and surge pressure buckling.
  - h. Method of bulkheading the tunnel ends.
2. Certified test reports for liner plates and connectors, shop drawings and specifications showing sizes, shapes, methods of attachment, connection details and grout hole details, shall be submitted for conformance with the specifications and approved by the Engineer before delivery of materials. Certifications for liner plates shall be in accordance with AASHTO M167, Paragraph 18.
  3. Certified test reports for casing pipe, shop drawings and specifications showing sizes, joint welds and coatings shall be submitted for conformance with the specifications and approved by the Engineer

before delivery of materials.

## **PART 2 - MATERIALS**

A. Materials Furnished by the County

The County will not furnish any materials for tunneling.

B. Contractor's Options None.

None

C. Detailed Material Requirements

1. Portland Cement Concrete

Portland cement concrete for invert cradles shall be Mix No. 1 as specified in Section 03300.

2. Mortar for Grout

For filling voids outside the liner plate, the grout shall conform to the requirements of Section 04100 and the following. The mortar shall be composed on one (1) part Portland Cement (Type 1) and three (3) parts sand with only enough water to permit the material to flow properly. The grout shall remain fluid long enough to be injected through the lining and to fill the voids and shall set promptly enough to avoid grout flowing into the new annular space after the next advance.

4. Liner Plate

- a. All materials shall be new and unused. Steel liner plates shall conform to the requirements of ASTM A569 and AASHTO M167. Steel liner plates shall have the minimum mechanical properties of flat plate before cold forming as follows:

Tensile Strength	=	42,000 psi
Yield Strength	=	28,000 psi
Elongation, 2 inches	=	30%

The liner plate thickness provided shall be no less than that shown in the Contract Documents. If the proposed tunneling method includes jacking operations, liner plate thickness shall be increased to withstand the jacking pressure to be imposed.

Tunnel liner plate segments shall be fabricated with such

accuracy and uniformity in dimensions that segments shall be entirely interchangeable, not only with individual rings but with similar segments of other rings. All plates shall be punched for bolts on both longitudinal and circumferential seams and shall be so fabricated as to permit complete erection from the inside of the tunnel. In 2-flange plates, the longitudinal lapped seams shall have four bolts per foot. To provide four bolts per foot, holes along the edge of the plates that will form the longitudinal seams in the finished structure shall be staggered in rows two inches apart with holes in one row in the valleys and holes in the other row in crests of the corrugations. The tolerance of hole diameter shall be plus or minus 0.02 inches. Liner plate grouting rings shall be located longitudinally at 48-inch or 54-inch intervals, depending on plate size. Liner plate grouting rings shall have a minimum of four grout holes in each grouting ring with one hole each at 2:00, 4:00, 8:00 and 10:00 positions. Grout holes shall be 1 ½ or 2-inch diameter pipe half couplings welded to the liner plate.

- b. The liner plates shall be coated on both sides as follows:
  - 1. Liner plates shall be hot-dipped galvanized using prime westerns spelter or equal in accordance with AASHTO M167. In no case shall the coating application be less than 2oz/sq.ft. Spelter coating shall be of first class commercial-quality, free from defects such as blisters, flux and uncoated spots.
  - 2. Liner plates shall be bituminous coated on all sides in accordance with AASHTO M190, Type A pipe.
- c. Bolts and nuts used with 4-flange plates shall not be less than ½ inch in diameter for plate thicknesses less than or equal to 0.179 inch (7 gauge) and not less than 5/8 inch in diameter for plate thicknesses greater than 0.179 inch. Bolts shall have quick-acting course threads meeting the requirements of ASTM A307. Nuts shall have quick-acting course threads meeting the requirements of ASTM A 307, grade A. Bolts and nuts shall be hot-dip galvanized in accordance with ASTM A153.

#### 4. Carrier Pipe

Carrier pipe shall be as specified in the Approved Plans and meet the requirements specified in Sections 02660, 02700, or 02720 as appropriate.

5. Surface Settlement Markers
  - a. Surface settlement markers within pavement areas shall be P.K. nails.
  - b. Surface settlement markers within non-paved areas shall be wooden hubs.
6. Casing Spacer/Insulators
  - a. Casing spacer/insulators shall be fabricated items capable of providing position, support and separation of carrier pipes inside casing pipes. . Spacer/insulators shall be virtually corrosion-proof and resistant to sodium. chloride and acids.
  - b. Spacer/insulators shall provide the ability to position the carrier pipe within the casing. Unless otherwise approved by the Division of Water and Sewer, the concentric centering method shall be utilized. Spacer/insulators shall be capable of grade adjustment to position a gravity sewer to its required grade alignment within a casing pipe and to maintain the required carrier pipe alignment due to irregularities in the casing pipe alignment.
  - c. Spacing/insulators shall be injection molded high density virgin polyethylene or an ultra high molecular weight polymer. The carrier pipe shall be capable of sliding within the casing pipe with minimal pushing force. The bearing surfaces of runners shall have a high resistance to wear and abrasion, high impact strength, low deflection under compression and low coefficient of friction.

### **PART 3 - EXECUTION**

#### **A. Line and grade**

The Contractor shall be responsible for extending the line, grade and elevation in the tunnel/casing from the launching/jacking pit. The Contractor shall submit to the Engineer for approval the method it proposes to use for extending controls within the tunnel/casing. No work in these areas will be allowed to be performed prior to such approval. The Engineer may make periodic checks on the lines, grade elevation, etc., established by the Contractor. The Contractor shall maintain line and grade to within plus or minus 2 inches of that indicated on the Contract Documents.

#### **B. Job Conditions**

Blasting is prohibited without the explicit written approval of the County.

Tunneling or jack and bore construction shall be performed so as not to interfere with, interrupt or endanger surface activity thereon, and minimize subsidence of the surface, structures and utilities above and in the vicinity of the casing pipe. Support the ground continuously in a manner that will prevent loss of ground and keep the perimeters and face of the casing pipe, passages and shafts stable. The Contractor shall be responsible for all settlement resulting from trenchless operations and shall repair and restore damaged property to its condition prior to being disturbed at no cost to the County or Owner of property or additional cost to the Contract.

The Contractor shall comply with applicable ordinances codes, statues, rules and regulations of the State of Maryland, MDSHA, applicable County building codes and applicable regulations of the Federal Government, OSHA 29CFR 1926 and applicable criteria of ANSI A10 16-81, “ Safety Requirements for Construction of Tunnel Shafts and Caissons”.

C. Excavation Support Systems and Dewatering Systems

Excavation Support Systems and Dewatering Systems shall meet the requirements of Section 2250 of these Specifications and the following:

1. Dewatering – when water is encountered, provide and maintain a dewatering system of sufficient capacity to remove water on a 24-hour basis keeping excavations free of water until the backfill operation is in progress. Dewatering shall be performed in such a manner that removal of soil particles is held to a minimum. Discharge from dewatering operations shall be directed into approved receiving basins in accordance with all applicable regulatory requirements. When dewatering, the Contractor shall maintain close observation of the highway or railroad to detect any settlement or displacement of the embankment, tracks or other facilities.

Methods of dewatering shall be at the option and responsibility of the Contractor with prior County approval. The Contractor shall maintain close observation to detect settlement or displacement of surface facilities due to dewatering. Should settlement be detected, the Contractor shall notify the Engineer immediately and take such action as necessary to maintain safe conditions and prevent damage.

2. Protection of Drainage Facilities – If it becomes necessary during construction to block a ditch, pipe or other drainage facility, the Contractor shall install temporary ditches, pipes or other drainage facilities to maintain adequate drainage as approved by the Engineer or the property owner. The temporary facilities shall be removed and the permanent facilities restored upon completion of the work.

The Contractor shall use soil erosion attenuation methods and materials to protect ditches and other drainage facilities during construction.

3. Construction of Launching and Receiving Pits – Design, construction, maintenance and removal, including any damage attributed to the construction of launching and receiving pits, is the responsibility of the Contractor.

Launching and receiving pits shall be constructed in accordance with approved working drawings sealed by a professional engineer registered in the State of Maryland.

Excavation, backfill and grading shall be performed in accordance with Section 2250 of these Specifications and to the requirements specified herein.

The Contractor is responsible for any necessary utility relocations or the supporting of utilities for launching/jacking and receiving pits construction. Utility support and relocations shall be at no additional cost to the Contract.

#### D. Ground Movement Monitoring

The Contractor shall carry out operations to minimize horizontal displacement, settlement and/or heave of the ground and shall be responsible for all damage due to displacement, settlement consolidation or heave from any construction related activities.

No horizontal displacement, settlement or heave will be permitted at property structures.

The Contractor shall install and maintain a system of instrumentation to monitor the underground excavation operation and to detect movement in the soil, adjacent structures and utilities.

Installation of the instrumentation by the Contractor shall not preclude the Engineer, through an independent Contractor or Consultant, from installing instrumentation to monitor ground movement in or adjacent to the construction work.

Survey benchmarks used for ground movement monitoring shall be a sufficient distance away from the construction to avoid errors in readings due to ground movement.

The Contractor shall cooperate fully with the agency which has rights to the

right-of-way. Settlement detected shall be corrected by the Contractor at no additional cost to the Contract.

The Contractor shall report any settlement and horizontal movement immediately to the Engineer and take immediate remedial action, at no additional cost to the Contract.

In the event of movement of the ground surface, structure or utility being detected or damage recorded, the Engineer may order that the work be stopped and secured. Before proceeding, the Contractor shall correct any problems causing or resulting from such movement at no additional cost to the Contract. If ground settlement or heave occurs which might affect the accuracy of temporary or permanent benchmarks, it is the Contractor's responsibility to monitor and report such movements to the Engineer.

E. Power Supply

Provide temporary electric lights to properly and safely illuminate all parts of the tunnel construction area including special illumination at the working face. Lighting circuits shall be thoroughly insulated and separated from power circuits and lights shall be enclosed in wire cages. The Contractor shall secure all necessary electrical permits to prosecute the work.

Power machinery and tools within the tunnel shall be operated by either electricity, compressed air, diesel with approved scrubber or other approved power. Electrical tools and equipment shall be ground in accordance with the latest requirements of the National Electrical Code.

F. Ventilation and Air Quality

The Contractor shall provide, operate and maintain for the duration of the trenchless project a ventilation system suitable for meeting applicable local, state and federal safety requirements for the health of the workers.

G. Tunneling Operations

Tunneling equipment shall be of U.S. Bureau of Mines approved types.

The tunnel face shall be controlled using such support procedures as breasting, poling, plates, face jacks, sliding tables, either singly or in combination, spaced as required.

Excavate in such a manner that voids behind liner plates are held to a minimum. Immediately after each increment of excavation, install one ring of liner plates. Completely fill voids with grout or gravel pack followed by grout, placed under pressure as specified in this Section.

The use of water or other liquids to facilitate liner plate installation and/or spoil removal is prohibited.

Whenever the tunneling operation is suspended, the face or heading shall be completely bulkheaded or supported by positive means and all completed liner plate rings shall be grouted. The dewatering system shall remain operating. Qualified personnel shall periodically check conditions that might threaten the stability of the work.

Spoil from the work shall be disposed of off-site at a permitted facility or location.

1. Tunnel Shield – The shield shall be of steel construction, designed to support railroad loading in addition to the other loadings that it must sustain. The advancing face shall be provided with a hood extending no less than twenty (20) inches beyond the face and extending around no less than the upper 240° of the total circumference. It shall be sufficient length to permit the installation of at least one complete ring of liner plates within the shield before it is advanced for the installation of the next ring of liner plates. The shield shall conform to and not exceed the outside diameter of the liner plate tunnel being installed by more than one (1) inch at any point on its periphery unless otherwise approved by the Engineer.

The shield shall be adequately braced and provided with the necessary appurtenances for completely bulkheading the face with horizontal breast boards and arranged so that the excavation can be benched as necessary. Excavation shall not be advanced beyond the edge of the hood, except in rock.

2. Installation of Tunnel Lining – The Contractor shall construct tunnel to the line and grade shown on the Contract Documents.

The inside dimensions of the tunnel liner plate ring, measured along the diameter at any location, shall not vary more than three percent of the liner plate diameter.

Liner plates shall be installed in a manner that will not damage the liner plates or coating. Damaged liner plates shall be replaced at no additional cost to the Contract. Coating damage shall be repaired to the satisfaction of the Engineer.

Flanges which will be in contact with each other shall be cleaned of foreign matter, taking care not to damage the coating in the cleaning process. Such surfaces shall be free from material that could interfere

with proper bearing and water tightness.

Bolt liner plates in accordance with liner plate manufacturer's recommendations. Retighten or replace bolts as required.

3. Grouting – Cement grout shall be placed under pressure through the grout holes to fill any voids that exist between the liner plates and the undisturbed earth.

Grouting shall be kept as close to the heading as possible, using grout stops behind the liner plates, if necessary. In no case shall more than six (6) lineal feet of tunnel be progressed beyond the grouting. Grouting shall be done:

- a. At more frequent intervals than six (6) feet if conditions warrant;
- b. At the end of the work shift or when work is interrupted for any reason;
- c. Progressively with each adjacent set of grout holes.

In general, grouting shall proceed progressively upward from the lowest grout holes of each ring. When going from lower to higher grout holes, do not make connection to the higher holes until grout has completely filled the space below. Continue grouting until grout appears in the next set of grout holes, which shall be kept open during grouting to permit escape of air and water.

A threaded plug shall be installed in each grout hole as the grouting is completed at that hole.

The grout pump and injection system shall be of a type that will deliver the grout in a smooth, even flow without surge. The grouting circuit shall contain a return line to allow return grout from the nozzle to the supply tanks. The grouting equipment shall be capable of development a uniform pressure at the grout hole connection sufficient to fill voids without disturbing the liner plates, adjacent utilities, structures or roadways. The equipment shall be equipped with hoses having a minimum inside diameter of 1 ½ inches and have a minimum capacity of ½ cubic yard per minute.

4. Placement of Invert Concrete – Place concrete fill in invert of tunnels even with edges of liner plate flanges and to the limits shown on the Contract Documents to facilitate skidding carrier pipe into tunnel. Concrete fill shall not be poured as a level floor.

END OF SECTION

SECTION 02660

WATER MAINS

**PART 1 - GENERAL**

A. Description

Water main installation shall include, but not necessarily be limited to, furnishing and installing water pipe, fittings, and appurtenances of the size and type shown on the Plans, installed on a firm foundation true to line and grade in accordance with the Contract Documents.

B. Related Work Specified Elsewhere

1. Aggregate Backfill: Section 02240.
2. Trench Excavation, Backfill, and Compaction: Section 02250.
3. Water Valves and Appurtenances: Section 02662.
4. Water Services and Appurtenances: Section 02664.
5. Fire Hydrants: Section 02666.
6. Cast-In-Place Concrete: Section 03300.
7. Miscellaneous Metals: Section 05500.

C. Quality Assurance

The County will inspect all materials before, during and after installation to ensure compliance with the Approved Plans.

**PART 2 - MATERIALS**

A. General

1. Materials shall be furnished in accordance with the Approved Plans and the current edition of the Approved List of suppliers and materials for Water and Sewer Main construction.
2. To minimize the number of joints, only standard manufacturer length of pipe shall be furnished and installed for all water mains unless otherwise indicated on the Plans, or as approved by the County.

B. Pipe Symbols

For convenience and standardization, the various types of pipe are designated on the plans by the following symbols:

DIP - Ductile Iron Pipe  
PVC – Polyvinyl Chloride Pipe  
HDPE – High Density Polyethylene Pipe

C. Materials Furnished by the County

1. The County will not furnish any materials for water main construction.
2. Unless otherwise noted in the “Special Provisions,” the County or Private Public Utility will make water available from its potable water system for pipeline testing at no charge to the Contractor for one attempt at a test cycle. Test cycle shall include initial flushing, filling, chlorination, hydrostatic testing and flushing with dechlorination. If any portion of the cycle fails, the Contractor will be responsible for water. The Contractor shall contact the Division of Water and Sewer or the Private/Public Utility to coordinate its use. If subsequent testing is required, the Contractor will purchase additional water from the County’s or Private/Public Utility’s system.

D. Contractor’s Options

1. The Contractor shall furnish ductile iron pipe (DIP) and compatible specified fittings for water mains 3-inches in diameter and greater unless specified otherwise by the approved plans.
2. The Contractor may furnish Polyvinyl Chloride Plastic water pipe (PVC) and compatible specified fittings for water mains equal to or smaller than 12 inches in diameter unless specified otherwise by the approved plans.
3. The Contractor may furnish High Density Polyethylene water pipe (HDPE) and compatible specified fittings for water mains equal to or smaller than 12 inches in diameter unless specified otherwise by the approved plans.

E. Detailed Material Requirements

1. Portland cement concrete for pipe fitting buttresses and anchorages shall be as specified in Section 03300.
2. Polyvinyl Chloride Plastic Water Pipe, 4 inch through 12 inch shall be 200 (DR14) and shall meet the requirements of AWWA C900 or C909. PVC Water Pipe 3 inch and smaller shall be PVC 1120 (SDR21) and shall meet the requirements of ASTM C2241. The outside diameters of DR14 shall be equivalent to cast iron pipe. PVC Water Pipe shall have an integral bell with a rubber-gasketed joint as listed in the AWWA C900 or C909 standard. Pipe

and couplings shall be marked and factory tested in accordance with AWWA C900 or C909.

3. High Density Polyethylene Pipe DR-11 & DR-17.

4. Ductile Iron Pipe and Fittings

a. Pipe

- 1) Pipe shall be designed and manufactured in accordance with ANSI/AWWA C151/A21.51 unless directed in writing by the County.
- 2) All pipe and fittings shall be designed and constructed to withstand all external pressure caused by overburden as indicated on the profile and traffic loads to which the pipe may be subjected.
- 3) Pipe shall be double thickness cement mortar lined in accordance with AWWA C104 with an interior seal coat of bituminous material. The outside surface shall also be bituminous coated.
- 4) The minimum special standard thickness class shall be as noted herein or as shown on the plans or specified in the "Special Provisions".

Size (In.)	Class	Max. Cover (Ft.)
3	52	100+
4	52	100+
6	52	86
8	52	49
10	52	38
12	52	33
14	52	24
16	52	21
20	52	18
24	52	17
30	52	14
36	52	13
42	52	13
48	52	12
54	52	12

\* The use of class 50 ductile iron pipe will be permitted so long as the contractor

at a minimum beds pipe in 4 inch minimum loose soil and backfills in accordance with Part 3 (A)(5)

b. Joints

Joints may be mechanical or rubber gasketed push-on type. Unless otherwise noted, all joints shall be in accordance with ANSI/AWWA C111/A21.11 Standard.

c. Fittings

- 1) All fittings shall have mechanical joints.
- 2) All fittings 3-inches through 24-inches shall be manufactured in accordance with the ANSI/AWWA C153/A21.53 Standard. All fittings 30-inches through 48-inches shall be manufactured in accordance with the ANSI/AWWA C110/A21.10 standard for a working pressure of 250 psi unless specified or directed otherwise by the County.

5. Joint Restraint

- a. Restrained joint pipe and fittings shall be of the pipe manufacturer's standard design for ductile iron, and fittings.
- b. Mechanical joint restraining systems for ductile iron pipe may be used at fittings, valves, fire hydrant leads, vault bypasses and when connecting to existing utilities unless noted otherwise by the Water and Sewer Engineering office. The mechanical joint restraint shall be incorporated in the design of the follower gland and shall include a restraining mechanism which when actuated imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron conforming to ASTM A 536-80. Restraining devices shall be of ductile iron heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to ANSI/AWWA A21.11 and ANSI/AWWA C153/A21.53 of the latest revision. Twist-off nuts shall be used to insure proper actuating of the restraining devices. The 3 inch through 16 inch mechanical joint restraining device shall have a working pressure of at least 350 psi with a minimum safety factor of 2:1. The 18 inch through 48 inch mechanical joint restraining device shall have a working pressure of at least 250

psi with a minimum safety factor of 2:1. Restrained joints on straight lengths of pipe shall be as manufactured by the pipe manufacturer and the restraining mechanisms shall be an integral part of the bell and spigot.

- c. Rod for tie rod assemblies shall meet the material requirements of ASTM A 193, Grade B7, and shall be threaded for at least 4 inches on both ends. Rod shall be 3/4 inch diameter unless otherwise noted. Nuts shall meet the requirements of ASTM A 194. Manufactured tie rod and accessories shall result in the completed restrained joint assembly having a minimum working pressure rating of 200 psi.

6. Detector Tape

Visual Detection Tape shall be 3 inches wide (minimum) nonmetallic blue plastic tape lettered "water" in black graphics as manufactured by Lineguard, Allen Systems, Linetic or Empire Level.

7. Approved Manufacturers

All Water Main Pipe, Fittings and Appurtenances shall be manufactured by one of the following:

a. Ductile Iron Pipe and Fittings:

- 1) U.S. Pipe and Foundry
- 2) Griffin Pipe
- 3) American Pipe
- 4) Atlantic States Pipe
- 5) Clow
- 6) Tyler Foundry

b. Restrained DIP joints:

- 1) U.S. Pipe and Foundry, T.R. Flex
- 2) Griffin Snap Lock
- 3) American Flex Ring
- 4) Claw Super Lock
- 5) Tyler Foundry

c. Couplings for DIP C-900-AC:

- 1) Dresser – Style 153 4"-12"
- 2) Ford – Style FC 2"-24"
- 3) Smith-Blair – Style 441 2"-16"

- 4) Viking-Johnson MaxiFit 1½”-24”
- 5) Viking-Johnson MaxiStep 1½”-24”
- 6) Ramac – Style 501

All couplings must be epoxy or nylon coated.

d. Retainer Glands (DIP):

- 1) EBAA Iron Mega-A-Lug
- 2) Ford Wedge Action Series 1400

8. High Density Polyethylene and Polyvinyl Chloride Plastic Pipe

A) Tracer Wire for Non Metallic Pipelines

Tracer wire shall be 8 gauge, 7 strand continuous copper wire with a 45 mil polyethylene insulation. The wire shall be blue, have “UL” markings and suitable for direct bury applications. All underground splicing shall be with butt splice connectors and shrink tubing or split bolt connections with a water proof binder and underground electrical tape.

B) Continuity Test Station

1. The continuity test station aside a fire hydrant shall be a 2 ½” shaft cathodic test box constructed of ABS plastic with cast iron rim and lid. The minimum box length shall be 24” and the body shall be flared or squared at the base to prevent pull out or settling. Lid shall be locking, blue in color and have raised custom lettering noting “test”. Test station shall be complete with an inset removable terminal board with three (3) terminals.
2. The continuity test station that is located over the water main shall be a 4 ¼” valve box with blue locking lid. Test station shall be complete with an inset removable terminal board with three (3) terminals.

## PART 3 - EXECUTION

### A. Preparation

1. Trench excavation, backfill, and compaction, and pipe bedding and haunching shall be as specified in Section 02250.
2. Prior to start of utility installation, all rights-of-way shall be graded to within  $\pm 0.2$  feet of the proposed subgrade in paved areas and finished grade in unpaved areas.
3. Trench Water: The pipeline trench excavation shall be dewatered sufficiently to allow pipe joints to be made under dry conditions. No joint shall be made under water.
4. Laying Pipe in Freezing Weather: No pipe shall be laid upon a foundation into which frost has penetrated, nor at any time when there is danger of ice formation or frost penetration at the bottom of the excavation. In freezing weather, open trench length shall be kept to a minimum and the excavation promptly backfilled after the pipe has been installed.
5. Pipe Bedding: Each pipe shall be bedded on a solid foundation acceptable to the County and in accordance with the Standard Details. Bedding shall be installed to insure that joints are properly made and the pipe is firmly supported the full length of the barrel. Aggregate bedding shall be installed to grade prior to laying pvc pipe. Ductile Iron pipe shall be bedded in loose soil (4" min) and have approved compacted backfill material consolidated to top of pipe.

### B. Pipe Installation

1. All pipe shall be installed in accordance with the approved manufacturers written instructions and as specified herein. These recommendations, if more restrictive than that shown in the Standard Details shall include: maximum trench width, bedding requirements, backfill material, and compaction, where applicable. In addition, the following shall apply unless otherwise noted:
  - a. Ductile iron pipe (DIP) shall be installed in accordance with the Standard Details and the recommendations of the Ductile Iron Pipe Research Association.
  - b. Polyvinyl Chloride water pipe (PVC) shall be installed in accordance with the standard details and the recommendations of

Uni-Bell.

- c. High Density Polyethylene water pipe (HDE) shall be installed in accordance with the standard details and the recommendation of the Manufacturer.
2. Equipment for Handling Pipe: Proper and suitable tools and appliances as approved for safe and convenient handling and joining of pipes shall be used.
3. Pipe Installation: Pipe shall be installed on aggregate backfill per Section 02240 as shown on Cecil County Standard Details. Pipe shall be carefully handled and lowered into the trench. Pipe shall be installed with special care to insure that each joint is watertight, has met the required manufacturers insertion depth, and has no shoulder or unevenness of any kind along the inside of the pipeline. No wedging or blocking will be permitted in installing any pipe unless directed by written order or permission in writing is obtained from the County.
4. Pipe Setting and Protection: No pipe shall be brought into position until the preceding length has been thoroughly bedded and secured in place. Care shall be used to assure water tightness and prevent damage to, or disturbing of, the joints during the refilling process. After pipes have been installed and joints have been made, there shall be no walking on or working over the pipe, except as may be necessary in tamping the backfill material, until the backfill is at least 2 feet over the top of the pipe.
5. Cleaning Pipe: The pipes shall be thoroughly cleaned before being installed and shall be kept clean until acceptance of the completed work. Open ends of all pipelines shall be provided with a stopper carefully fitted to keep dirt and other substances from entering. This stopper shall remain in place at all times when installation is not in progress.
6. Cutting Pipe: Whenever a pipe requires cutting, to fit into the line or bring it to the required location, the work shall be performed by an approved method that leaves a smooth, square end. Field spigots shall be stop-marked with a felt tip marker or wax crayon for the proper length of assembly insertion.
7. Jointing Pipe
  - a. General

Before any joints are made in the trench, the Contractor shall demonstrate to the County by making a sample joint that the methods he will employ conform with the Specifications, will

secure a water-tight joint, and that the workmen whom he intends to use for this work are familiar with the requirements for making proper joints.

b. Push-On Gasketed Joints

Prior to making gasketed joints, both mating pipe ends and the gasket shall be cleaned of all foreign material. The gasket shall then be inserted in or stretched over the cleaned gasket seat and lubricant applied as recommended by the manufacturer and approved by the County. The pipe ends shall be carefully aligned and pushed together to meet the required manufacturers insertion depth. There shall be no shoulder or unevenness of any kind along the inside of the pipeline. In all cases, the spigot shall be inserted into the previously laid and seated bell, in order to minimize the potential of gasket roll, to prevent the bell dragging and pushing soil into the joint and to prevent the need to undercut the pipe to lay the bell.

c. Mechanical joints shall be joined in accordance with the manufacturer's recommendations as approved by the County. All nuts shall be tightened uniformly with a torque of not less than 75 or more than 90 foot-pounds.

d. Other methods of jointing pipe will be given consideration by the County, provided the Contractor furnishes evidence that the proposed method is equal to or better than the specified methods, and further, provided that the proposed method has been successfully used and that the joint has previously been manufactured by the company from whom the Contractor proposes to purchase pipe.

e. All jointing material and workmanship shall be in accordance with the manufacturer's recommendations as approved by the County.

8. Detector Tape: Install visual detection tape 18 inches above all mains.

9. Tracer Wire: All non-metallic water mains shall have tracer wire secured with duct tape to the top of the pipe at ten (10) foot centers. The Tracer Wire shall be continuous for the full length of the pipeline. Continuous conductivity shall be maintained and tested. Underground splice connections shall be made with solderless split bolt connectors and taped to pipe.

10. Restrained joints and joint restraint systems shall be assembled in

accordance with the manufacturer's recommendations. Tie rod nuts shall be uniformly tightened and double nutted to prevent movement. Joint restraint systems shall be field protective coated with two coats of a bituminous coating after assembly.

11. Connections to existing work shall be made by the Contractor in the presence of the County at such a time and in such manner as directed and approved by the County. Seventy-two hours prior to the shut off the Contractor shall notify the County, the local fire company and consumers in the affected areas. The notification shall be in writing and shall provide the anticipated time of day of the shut off as well as the anticipated duration. It should also include the name and telephone number where the Contractor can be contacted for additional information. All valves necessary for making connections will be operated by the County. The Contractor shall complete the connections with the greatest possible speed and all work shall proceed without interruption until the existing system is returned to operation, so that the public will be inconvenienced as little as possible.
12. Buttresses and anchors shall be installed at all caps, horizontal bends, tees, branches and vertical bends as required in the Approved Plans, Standard Details, and as directed by the County.

#### C. Field Tests

1. General
  - a. All portions of water mains and appurtenances shall be tested prior to connection to the existing water system. The methods used shall comply with the approved plans and contractual specifications.
  - b. During installation water mains will be visually inspected for compliance with these specifications and the Approved Plans by the County with the assistance of the Contractor. Further inspections and tests will be conducted by both parties after the section of pipeline being inspected and tested has been backfilled and has had ample time for the curing of buttresses.
  - c. The Contractor shall schedule all tests with the County or the Private/Public Utility Company at least two working days in advance of the test, and shall conduct all tests in the presence of the County or owner. On County Capital Projects, the County will witness one test at no cost to the Contractor. Should the pipeline fail the first County witnessed test, the Contractor shall reimburse the County for all costs resulting from such additional

tests so required until the pipeline passes the test(s). The Contractor shall also reimburse the County for the cost of inspection if the Contractor is not prepared for any test, or for additional tests required.

- d. Prior to performing any test and filling operations, the pipeline shall be flushed free of all debris, silt, earth, gravel, rock or other foreign material. It shall be done in a manner to prevent debris of flushing water from entering the existing water mains.
- e. Any defective work which shows up while conducting tests shall be replaced or repaired as approved by the County by the Contractor at his expense.
- f. Water mains shall be tested in sections dictated by the operational breaks noted on the Approved Plans and specifications.
- g.- No water mains shall be connected to existing mains, except through 3/4" loading line, at any point until they have been tested and chlorinated.
- h. All stub valves shall be open and testing will be through caps or blow-offs at buttress.
- i.. After these tests have passed, the Contractor will drain the line and connect to existing mains.
- j. After tying into existing mains the Contractor will refill and flush the lines and a representative of the County will check to see that the chlorine residual is back to acceptable levels before any water services are installed.
- k. Once the line is permanently tied into the existing system the line shall remain charged unless directed otherwise by the Owner.
- l. Chlorination, testing and de-chlorination is required to be performed by a professional chlorination and testing company which has received prior written approval by the Division of Water and Sewer Maintenance Department or Owner.
- m. All water used for testing procedures must be accounted for and documented by the Contractor. Certification reports prepared by the testing company shall be provided to the owner and along with pipe size, length and number of times pipe was filled to the maintenance department prior to the permanent tie-in.

## 2. Disinfection and Hydrostatic Testing

### a. General

- 1) When mains are completed, they shall be chlorinated, flushed tested, and de-chlorinated . Chlorination and hydrostatic testing is performed simultaneously. The Contractor shall furnish all labor, tools, materials, and equipment necessary to perform the tests specified and to chlorinate the water mains.
- 2) Testing and tying in will be coordinated through the County on the job. Under no circumstances will any existing valves or fire hydrants be operated by the Contractor without prior approval of the County.
- 3) The section of water main being tested shall be filled from an existing fire hydrant or main as designated by the County. The Contractor shall furnish an approved backflow preventer at the point of supply. When charging and testing water mains which are not sufficiently close to existing water mains, the Contractor may use an approved and sanitized potable water truck to haul water from an existing county owned water main as pre-approved by the Water and Sewer Division. Portable water obtained from a private or municipal water main, appropriate pre-approval must be obtained from said owners.

### b. Hydrostatic Testing

These results must be submitted to the Water and Sewer Division Department within twenty four (24) hours of receipt.

### c. Initial Flushing

- (1) Prior to the simultaneous chlorination and hydrostatic testing the Contractor shall flush the water main from all debris and particulate matter adhering to the pipe interior with a minimum scouring velocity of 2.5 feet per second in accordance with AWWA C651. The purpose of this initial flush is to eliminate foreign matter which may significantly reduce the effectiveness of the disinfectant. The following table presents the flow rates necessary to properly flush the main.

<u>Pipe Diameter (inches)</u>	<u>Minimum Flow Rate (gallons per minute)</u>	<u>Flushing duration per Every 100 ft of pipe seconds</u>
4	100	40
6	200	40
8	400	40
12	900	40
16	1,600	40
20	2,200	40
24	3,200	40
30	4,800	40
36	7,200	40

The contractor shall, measure and the County shall witness the flow rate provided using his meter to ensure the minimum rate has been achieved.

- (2) The contractor shall provide the County Inspector a minimum of 1 working day advanced written notice of flushing. The Contractor shall provide the County Inspector with size and linear feet, proposed discharge point diameter of drain (if applicable), chlorine concentration, time and date flushing will commence, and anticipated time duration of flushing. The County Inspector will in-turn notify the Division of Water and Sewer Maintenance Superintendent.

#### C. Disinfection and Hydrostatic Testing

- (1) Following the initial flush, the testing company shall simultaneously disinfect and hydrostatically test the main.
- (2) Disinfection – Continuous Feed Method
  - (a) The continuous feed method, in accordance with AWWA C651, may be utilized for disinfection and as specified herein.
  - (b) Approved forms of chlorine include liquid or gaseous chlorine, sodium hypochlorite solution, and calcium hypochlorite.
  - (c) At a cap and fill pipe in the new main, the water and chlorine solution shall be introduced at a constant rate to provide a uniform minimum concentration of 25 ppm available free chlorine. Air within the line shall be fully evacuated in the filling process.

- (d) The following table from AWWA C651 provides a reference for the amount of chlorine required to achieve the minimum chlorine dosage.

**Chlorine required to produce minimum 25 ppm concentration in 100 feet of pipe.**

<u>Pipe Diameter (Inches)</u>	<u>100% Chlorine (pounds)</u>	<u>1% Chlorine Solution (gallons)</u>
4	0.13	0.16
6	0.30	0.36
8	0.54	0.65
12	1.20	1.44
16	2.17	2.6
20	3.42	4.21
24	4.80	5.91

Note: Solutions of 1 percent chlorine shall be prepared with sodium hypochlorite or calcium hypochlorite. Sodium hypochlorite requires 1 lb. of chlorine with 8 gallons of water.

- (e) The chlorine residual shall be tested by the testing company and verified by Cecil County no less than 24 hours after the main was completely full of chlorinated water. Valves and fire hydrants shall be operated to ensure full contact with the chlorinated solution, during the filling operations.
- (3) Disinfection – Slug Method (Superchlorination Method)
- (a) The slug method, in accordance with AWWA C651, may be utilized for disinfection.
- (b) Approved forms of chlorine include liquid or gaseous chlorine, sodium hypochlorite solution, and calcium hypochlorite.
- (c) At a cap and fill pipe in the new main, the water and chlorine solution shall be introduced at constant rate such that the water will not have less than 100 ppm free chlorine. Air within the line shall be fully evacuated in the filling process.
- (d) The chlorine residual shall be tested by the testing company and verified by Cecil County no less than 3 hours after the

main was completely full of chlorinated water. Valves and fire hydrants shall be operated to ensure full contact with the chlorinated solution, during the filling operations.

(4) Hydrostatic Testing

- (a) Hydrostatic testing shall be performed in accordance with AWWA C600.
- (b) After filling the main during the disinfection process, the main shall be hydrostatic tested by piping potable water into the main up to 200 psi measured at the highest elevation of the main in accordance with the pipeline profile shown on the contract documents. If pressure readings cannot be taken at the highest elevation, the pressure shall be increased to accommodate the difference between the highest elevation and test elevation. An additional 0.43 psi shall be added to every additional foot in elevation change.
- (c) The test pressure shall be maintained and shall not drop for a minimum fifteen (15) minutes.
- (d) If test did not pass, the Contractor shall remedy such defects and repeat the disinfection and hydrostatic test until approved by the County at the Contractor's expense for additional water.
- (e) Hydrostatic testing against closed valves is prohibited.

d. Final Flushing

Upon completion of the disinfection and hydrostatic testing, the main shall be flushed to remove the chlorinated water. Flushing procedures shall be as follows:

- (1) The Contractor shall provide the County Inspector a minimum of 1 working day advanced written notice of flushing. The Contractor shall provide the County Inspector with size and linear feet of pipe, proposed discharge point, diameter of drain (if applicable), chlorine concentration, time and date flushing will commence, and anticipated time duration of flushing. The County Inspector will in-turn notify the Division of Water and Sewer Maintenance Superintendent.
- (2) The discharge of chlorinated or dechlorinated water into the wastewater collection system is strictly prohibited.
- (3) In accordance with the Maryland Code of Regulations, the discharge of

chlorinated water onto the ground surface or into storm drains is prohibited. In such cases, the water shall first be dechlorinated to achieve no more than 0.1 ppm free chlorine residual before disposal.

- (4) The main shall be considered flushed once the free chlorine residual has matched the chlorine residual in the water main from which the flushed water originated.

e. Bacteriological Testing

- (1) After final flushing, but before the main is tied into the existing system bacteriological tests shall be performed. The Contractor shall obtain the services of a Maryland-Certified water testing company to perform bacteriological testing. All test samples shall be collected in the presence of the Division of Water and Sewer Maintenance personnel. A minimum 2-working day, advanced notification shall be made to the Maintenance office. Bacteriological tests shall be performed in accordance with AWWA C651 and as specified herein. Prior to testing the free chlorine residual shall be between 0.5 mg/l and 1.5 mg/l.
- (2) Two consecutive sets of acceptable samples, taken at least 24 hours apart shall be collected. If acceptable, the main may be put into service.
- (3) A technician employed by the certified testing company shall collect all samples no less than 24 hours after the final flush. Samples shall be taken from a corporation stop with a copper-tube gooseneck assembly located at or near the end of the main. A blow-off drain, if provided as part of the testing apparatus may also be utilized.
- (4) Sample locations shall be a minimum one set at the beginning, one set every 1200 feet, one set every branch and one set at the end of the main.
- (5) Samples shall be tested by the certified testing company for bacteriological quality in accordance with "The Standard Methods for the Examination of Water and Wastewater".
- (6) The sample results must be submitted to the Water and Sewer Maintenance Department within 24-hours of receipt. These results shall indicate free chlorine residual, concentration, the presence or absence of coli form organisms and a standard plate count. The samples shall pass if there are no presence of coliform organisms and the plate count is 500 cfu per ml or less.

- (7) If the results are not acceptable, the main shall be flushed and re-sampled. If the results of the second sampling are not acceptable, the Contractor shall repeat the disinfection and final flushing procedures and re-test for bacteriological quality until a successful test.

f. Hydrostatic Testing

These results must be submitted to the Water and Sewer Maintenance Department within 24 hours of receipt.

g. Continuity Testing for Non-Metallic Pipe

- 1) After backfilling, the County shall test at the Contractor's/Developer's expense, the tracer wire to demonstrate electrical continuity between valve boxes and through the length of the non-metallic pipeline installed. The Contractor shall schedule all tests with the County at least 48 hours in advance. Any discontinuity shall be located, repaired, and retested at the Contractor's expense until continuity is demonstrated.
- 2) On Capital Projects, the County will perform one continuity test at no cost to the Contractor. Should the continuity test fail, the Contractor shall reimburse the County for all costs resulting from such additional test so required until the continuity test passes.

END OF SECTION

## SECTION 02662

### WATER VALVES AND APPURTENANCES

#### **PART 1 - GENERAL**

A. Description

Water valve and appurtenance installation shall include, but not necessarily be limited to, furnishing and installing gate, butterfly, air release, vacuum, combination air valves or assemblies with appurtenant valve vaults, roadway valve boxes and accessories in accordance with the Approved Plans.

B. Related Work Included Elsewhere

1. Trench Excavation, Backfill, and Compaction: Section 02250
2. Water Mains: Section 02660
3. Cast-In-Place Concrete: Section 03300
4. Precast Concrete: Section 03400
5. Brickwork, Unit Masonry: Section 04200
6. Miscellaneous Metals: Section 05500

C. Quality Assurance

The County will inspect all materials before, during and after installation to insure compliance with the Approved Plans.

#### **PART 2 - MATERIALS**

A. General

Materials shall be furnished in accordance with the Approved Plans.

B. Materials Furnished by the County

The County will not furnish any water valves or appurtenances.

C. Contractor's Options

None

D. Detailed Material Requirements

1. Aggregate for bedding, leveling, and drainage shall meet the gradation requirements of AASHTO M 43, Size Number 57.
2. Water mains and appurtenances shall be as specified in Section 02660.
3. Tapping saddles and corporation stops shall be as specified in Section 02664.
4. Portland cement concrete for miscellaneous valve appurtenances and cast-in-place vaults shall be the mix number indicated on the Standard Details and as specified in Section 03300.
5. Precast concrete vault and manhole sections and grade rings shall be as indicated on the Standard Details and as specified in Section 03400.
6. Brick for valve support and miscellaneous valve appurtenances shall be sewer brick as specified in Section 04200.
7. Mortar for brickwork shall be as specified in Section 04100.
8. Frames, covers, and steps shall be as indicated on the Standard Details and as specified in Section 05500.
9. Gate Valves

a. General

Gate valves shall be iron body, resilient-seated, non-rising stem, 2-inch square operating nut which shall turn left (counter-clockwise) to open, with ample strength to withstand and operate under a working pressure of 150 psi, unless otherwise noted. The thrust collar shall be effective for both opening and closing. Valves shall be manufactured in accordance with AWWA C509 and shall be furnished with mechanical joint ends unless flanged or other type ends are indicated on the Plans.

- b. Gate valves through 20-inch diameter shall be vertical type with O-ring stem seals. Gate valves 20-inches through 30-inches shall have gearing as approved by the County.
- c. Gate valves shall be coated in accordance with AWWA C550. Both the inside and outside surfaces of the body and bonnet shall be epoxy coated.

- d. Buried valves shall be furnished with an extension in accordance with the Standard Details.
- e. Wedge rubber shall be molded in place and bonded to the ductile iron portion, and shall not be mechanically attached with screws, rivets, or similar fasteners.
- f. Waterway shall be smooth and shall have no depressions or cavities in seat area where foreign material can lodge and prevent closure or sealing.
- g. Wedge shall be constructed of gray or ductile iron, fully encapsulated in synthetic rubber except for guide and wedge nut areas.

10. Tapping Valves and Sleeves

Valves for tapping service shall meet all the requirements for gate valves. In addition, the body seat rings shall have a clear opening equal to the nominal size of the tapping valve. Tapping sleeves shall be iron body mechanical joint type, or as approved by the County. Tapping valves for ductile iron pipe shall have flange by mechanical type ends unless otherwise shown on the Plans. All tapping sleeves shall be furnished with an outlet for testing. Tapping sleeves for prestressed concrete pipe shall be furnished and installed in accordance with the pipe manufacturer's recommendations.

11. Air and/or Vacuum Release Valve

- a. Air-release, air/vacuum, and combination air valves shall be manufactured in accordance with AWWA C512 as modified herein. Valves shall be furnished with threaded ends unless otherwise noted in the Approved Plans.
- b. The air/vacuum valve shall have a cast iron body and cast iron cover. The internal compound level mechanism shall be stainless steel and all other internals including float shall be stainless steel to avoid galvanic action. The stainless steel float shall withstand a minimum pressure of 1,000 psi.
- c. All materials of construction shall be certified in writing to conform to ASTM specifications as follows:

<u>Part</u>	<u>Material</u>	<u>Specification</u>
Body and Cover	Cast Iron	ASTM A48, Class 35
Internal Linkage	Stainless Steel	Series 300
Float and Internals	Stainless Steel	Series 302
Seat	Buna-N	
Exterior Paint	Phenolic-Primer Red Oxide	FDA approved for potable water

- d. All internals shall be easily removed through the top cover without removing the main valve from the lines.
- e. An isolating valve shall be installed between main and air/vacuum release valve for maintenance.
- f. Air/vacuum release valve shall be installed in an easily accessible vault. Vault shall be adequately vented to meet air/vacuum release valve requirement.
- g. The valve manufacturer shall furnish installation and maintenance instruction manuals with each valve.

## 12. Valve Boxes

Screw type roadway valve boxes and covers shall be made of cast iron conforming to the requirements of ASTM A 48, Class 30 B and shall meet the dimensional and marking requirements indicated on the Standard Details and Section 05500.

## 13. Approved Manufacturers

All water valves and appurtenances shall be supplied by one of the following manufacturers:

- a. Resilient Seat/Wedge Valves

Sizes thru 12"

- Mueller Resilient Seal Seat Series A-2360-20.

Sizes thru 24"

- U.S. Pipe Metroseal
- Kennedy Kenseal Resilient Seal Gate
- M&H Style 3076-01 Resilient Seal Gate Valve
- American 500 Series
- Clow Resilient Seat – F-6100 Series

Valves great than 16" must have gearing

b. Resilient Wedge Gate Valves (AWWA C509)

- Mueller
- U.S. Pipe
- A.P. Smith
- M&H Metropolitan

c. Tapping Sleeve

- U.S. Pipe and Foundry
- M&H Valve
- Clow 4"-16" F-5205
- Mueller 4"-24" H-615

d. Air and/or Vacuum Release Valves

On Mains 1" Through 12"

- Apco (Valve and Primer) 143 – C142
- Valmatic 201-C 101
- G.A. Industries 945, 930

Air and/or Vacuum Release Valves (cont'd)

On Mains 14" Through 20"

- Apco 145-C 144

- Valmatic 202C 102
  - G.A. Industries 945, 930
- e. Valve Boxes
- Bingham & Taylor
  - Capital Foundry of VA

### **PART 3 – EXECUTION**

#### **A. General**

1. Excavation, foundation preparation, backfill, and compaction shall be as specified in the Standard Details and Section 02250.
2. Valves shall be restrained, supported, and strapped and/or anchored in accordance with the Standard Details.

#### **B. Gate Valves**

1. Gate valves shall be installed in accordance with the Standard Details and at the locations shown on the Plans or as directed by the County.
2. Roadway valve boxes shall be centered and plumb over the valve operating nut. Backfill shall be compacted under and around valve boxes to insure that no vertical loads are transmitted to the valve operators.

#### **C. Valves in Vaults or Manholes**

Dewatering and air release, vacuum, and combination air valves shall be installed in manholes in accordance with the Standard Details.

#### **D. Field Tests**

1. Water valves and appurtenances installed at the same time as a new water main shall be tested, after installation, by the Contractor along with the water main in accordance with Section 02660.
2. Water valves and appurtenances installed in an existing water main will be visually inspected for leakage by the County at the existing water main line pressure before the excavation is backfilled. The valve and joints shall be leak free under line pressure.
3. Tapping sleeves and valves shall be tested after assembly on the existing water

main but prior to making the tap. The Contractor shall pressurize the complete assembly to 150 psi for 15 minutes with zero leakage, unless otherwise noted, and the County will visually inspect the tapping sleeve and valve for leakage. No leakage will be permitted.

END OF SECTION

## SECTION 02664

### WATER SERVICES AND APPURTENANCES

#### **PART 1 - GENERAL**

##### A. Description

Water services and appurtenances shall include, but not necessarily be limited to, furnishing and placing water services with appurtenant meter housings and connection to the water main in accordance with the Contract Drawings.

##### B. Related Work Included Elsewhere

1. Trench Excavation, Backfill, and Compaction: Section 02250
2. Water Mains: Section 02660
3. Water Valves and Appurtenances: Section 02662
4. Cast-In-Place Concrete: Section 03300
5. Precast Concrete: Section 03400

##### C. Quality Assurance

The County will inspect all materials before and after installation to insure compliance with the Contract Documents.

#### **PART 2 - MATERIALS**

##### A. General

1. Materials shall be furnished in accordance with the Contract Documents and the current edition of the Approved List of Suppliers and Materials for Water and Sewer Main Construction.
2. To minimize the number of joints, only standard manufacturers length of pipe shall be furnished and installed for all water services unless otherwise indicated on the Plans, or as approved by the County.

##### B. Materials Furnished by the County (For County Capital Projects Only)

The County will furnish 5/8-inch and 3/4-inch water meters and remote readouts for water service connections for installation by the Contractor.

C. Contractor's Options

Refer to Standard Details and current edition of the Approved List of Suppliers and Materials for Water and Sewer Main Construction.

D. Detailed Material Requirements

1. Water Meters

- a. Water meters shall be as shown on the Standard Details and the Construction Documents.
- b. Water meters shall meet the requirements of AWWA C700, C701, C702 and C703 (proportional type only). The mainline case shall be bronze or epoxy coated cast iron. Registers shall be permanently sealed, straight reading and read in U.S. gallons.

2. Water Service

- a. Water services less than 3-inches in diameter shall be Type K, annealed, or SDR21 gasketed PVC water pipe that meets the requirements of ASTM D2241 and ASTM D1784: PVC 1120. The pipe is to have an integral bell that utilizes a gasket for sealing that meets the requirements of ASTM F477.
- b. Water services 3-inches in diameter and larger shall be as specified in Section 02660.

3. Meter fittings, yokes, lids, covers, and appurtenances shall be as noted in the Approved list of Suppliers and Materials for Water Main Construction.

4. Tubing Couplings - Copper tube couplings shall be as noted in the Approved list of Suppliers and Materials for Water Main Construction.

5. Corporation stops with compression type fittings shall be as noted in the Approved list of Suppliers and Materials for Water Main Construction.

6. Gate valves, roadway valve boxes, curb boxes and tapping sleeves for water services shall be as specified in the Standard Details and Section 02662.

7. All service line valves and fittings shall be manufactured in accordance with AWWA C800. Connection to service lines shall be compression type.

8. Meter vaults for 1-1/2-inch or larger service lines shall have aluminum access hatches designed to withstand an H-20 wheel load. Door leaf shall be 1/4-inch

aluminum diamond or safety tread pattern plate. Channel frame shall be ¼-inch aluminum with concrete anchor flange around the perimeter, bituminous coated where in contact with concrete, and a 1-1/2-inch drainage coupling. Doors shall be equipped with stainless steel hinges and an automatic hold-open arm with release handle. The door shall have a locking mechanism and snap lock with a removable handle. The door shall be operable by a force not to exceed 30 pounds. Fixed ladders shall be equipped with an aluminum LadderUp safety post or approved equal.

9. Tapping saddles shall be manufactured of high strength ductile iron, ASTM A536, protected with a fusion applied epoxy or nylon fused (10-12 mil) coating. Saddles shall be furnished with Type 304 stainless steel straps with a minimum 2 inch wide bearing area and a rubber gasket suitable for potable water.
10. Pipe wall penetrations shall be as specified in the Standard Details.
11. Meter vaults shall be precast concrete vaults of the size indicated on the Standard Details furnished and installed as specified in Section 03400.
12. All water services and/or fire service lines shall be equipped with approved backflow prevention devices.

13. Detector Tape

Visual Detection Tape shall be 3 inches wide (minimum) nonmetallic blue plastic tape lettered “water” in black graphics as mentioned by Lineguard, Allen Systems, Linetic or Empire Level.

14. Location Lumber

Lumber for marking house connection locations shall be minimum 2-inch x 6-inch boards of sufficient length to extend from the plug at the end of the house connection to a height of 4 feet, more or less, above finished grade, painted blue above finished grade.

15. Tracer Wire for Nonmetallic Pipelines

Tracer wire shall be 8 gauge, 7 strand continuous copper wire with polyethylene insulation. The wire shall be blue, have “UL” markings and suitable for direct bury applications. All underground splicing shall be with butt splice connectors and shrink tubing or split bolt connectors with a water proof binder and underground electrical tape.

16. Continuity Test Station

- a. The continuity test station beside a fire hydrant shall be a 2 ½” shaft

catodic test box constructed of ABS plastic with cast iron rim and lid. The minimum box length shall be 24" and the body shall be flared or squared at the base to prevent pull out or settlement. Lid shall be locking, blue in color and have raised custom lettering noting "test". Test station shall be complete with an inset removable terminal board with three (3) terminals.

- b. The continuity test station that is located over the water main shall be a 4 1/4 " valve box with blue locking lid. Test station shall be complete with an inset removable board with three (3) terminals.

17. Approved Manufacturers

All water services and appurtenances shall be supplied by the following manufacturers:

- a. Water Service Pipe (3/4" – 2") K Type Copper Tubing  
(2" HDPE pipe can be substituted for copper)
  - Halstead
  - Reading
  - Cerro
  - Muller Tubing Company
  - Howell Metals
- b. Curb-Box 92D Screw-Type (2-1/2")
  - Bingham & Taylor
  - Ametek (County use only)
- c. Curb-Box Locking Screw-Type (4-1/4")
  - Bingham & Taylor
  - Capital Foundry of Virginia Inch. - #NH-138-H-UP
- d. Frame and Cover for Valve Vaults Air-Release Manhole
  - East Jordan/B&C
  - Campbell Foundry

- E.A. Quirin Foundry
- e. Meter Vault (18"-24")
  - Precast Concrete, (18" or 24")
    - Mayer Brothers, Inc.
    - Davis Concrete
  - Polyethylene/PVC, (18" only)
    - Mid State Plastic, Inc.
    - Southeastern Distributors
- f. 18" Meter Frame and Cover
  - Vestal
  - Ford Meter Box Company A-32-C
  - Bingham & Taylor 180-18-A
  - MBC-Meters Box Covers, Inc.
  - Capital Foundry of Virginia, Inc. #MD-890
- g. Valve/Meter Vault, Precast Concrete, Large
  - Mayer Brothers, Inc.
  - Terre-Hill
  - Atlantic Precast
  - A.C. Miller
  - Wyoming
  - Davis Concrete
  - Gillespie
- h. Aluminum Meter Vault Doors (H-20 Loading)

- BilCo
- Syracuse Castings
- Just-Set
- i. Service Saddle
  - Ford Style FC-202
  - Romac 202N
  - Smith-Blair 317 Nylon-Coated
  - Mueller DN2S or DE2S
    - Specify type of pipe
    - All saddles to be epoxy or nylon-coated
- j. Corporation Stop, Compression Joint
  - Ford FB-1000
  - Mueller B-25008
  - McDonald 4701-B-22 Mac-Pak
- k. Corporation Stop for 2” PVC Pipe
  - Dresser “Quicktap” Service Connection Style 294
- l. Curbstop, Threaded
  - Ford B-11 Series
  - Mueller B-20283
  - McDonald 6101
- m. Curbstop, Compression Joint
  - Ford B-44 Series
  - Mueller B-25209

- McDonald 6100-22 Mac-Pak

n. Coupling, Copper Compression Joint

- Ford C-44 Series

- Mueller H-15403

- McDonald 4758-22

o. Y-Branch Coupling, Compression

- Ford: 1" – 1" x 3/4" x 3/4" Y-44-243G

1½" – 1½" x 1" x 1" Y-44-264G

- Mueller: H-15343

- A.Y. McDonald 08YS22

p. Inlet Yoke Valve

	5/8"	3/4"	1"	1-1/2"
Ford	AV94-313WG	AV94-323WG	AV94-444WG	--
Mueller	*H-14273	*H-14273	--	--
A.Y. Mc Donald	*4642-BY22	*4242-BY22	--	--

\*Specify size of service

q. Meter Yoke Assembly

	5/8"	3/4"	1"	1-1/2"
Ford	Y501	Y503	Y504	--
Mueller	H-5010	H-5030	J5040	--
A.Y. Mc Donald	14-1	14-3	14-4	--

r. Outlet Yoke Check Valve

	5/8"	3/4"	1"	1-1/2"
Ford	HA94-313G	HA94-323G	HA91-444 w/ C84-44G (for 1" service)	--
Mueller	*H-14245	*H-14245	--	--
A.Y. Mc Donald	12-3Y223	12-37233	12-37244	--

\*Specify size of service

s. Expansion Connector

	5/8"	3/4"	1"	1-1/2"
Ford	EC-1	EC-23	EC-4	--
Mueller	--	--	--	--
A.Y. Mc Donald	14-1E	14-2E	14-4E	--

t. Yoke Gaskets

	5/8"	3/4"	1"	1-1/2"
Ford	GT112	GT118	GT23	--
Mueller	500844	500845	311335	--
A.Y. Mc Donald	14-1G	14-2G	14-4G	--

u. Yoke Nuts

	5/8"	3/4"	1"	1-1/2"
Ford	YLN-1	YLN-23	YLN-4	--
Mueller	509326	509316	526268	--
A.Y. Mc Donald	14-1N	14-2N	14-4N	--

v. Threaded Brass Fittings

- ~~Niagara~~ All manufacturers

w. Meter Ball Valve Brass

	5/8"	3/4"	1"	1-1/2"
Ford	B43-231W	B43-342W	GT23	--
Mueller	No	B24350-3/4 x 1	311335	--
A.Y. Mc Donald	6100MW-22 3/4" x 5/8" x 5/8"	6100MW-22 1" x 3/4" x 3/4"	6100MW -22 1"	--

x. Dust Cap

- Niagara

y. 18" x 24" Adaptor Ring

- Ford Ext.-1  
- MBC – Meter Box Covers, Inc.

- Vestal ER-1824
- z. Water Meters
  - 5/8" to 1" Sensus SRII
  - 1-1/2" to 2" Sensus SR
  - 3" and up Sensus Series "W" Turbo Meters
  - All water meters to be equipped with Touch Read Pit Lid (TR/PL) type registers
- aa. Backflow Preventors
  - 3/4"
    - Hersey Products, Inc.
      - ⇒ Double Check Valve (F.D.C.)
      - ⇒ Reduced Pressure Valve Assembly (F.R.P. II)
  - 1"
    - Hersey Products, Inc.
      - ⇒ Double Check Valve (F.D.C.)
      - ⇒ Reduced Pressure Valve Assembly (F.R.P. II)
  - 1-1/4"
    - Hersey Products, Inc.
      - ⇒ Reduced Pressure Valve Assembly (F.R.P. II)
  - 1-1/2" - 2"
    - Hersey Products, Inc.
      - ⇒ Double Check Valve (F.D.C.)
      - ⇒ Reduced Pressure Valve Assembly (F.R.P. II)
  - 2-1/2"
    - Hersey Products, Inc.
      - ⇒ Reduced Pressure Valve Assembly (Model 6CM)
  - 3"
    - Hersey Products, Inc.
      - ⇒ Double Check Valve Assembly (Model No. 2)
      - ⇒ Detector Double Check Valve Assembly (D.D.C. II)
      - ⇒ Reduced Pressure Valve Assembly (Model 6CM)
  - 4" - 10"
    - Hersey Products, Inc.
      - ⇒ Double Check Valve Assembly (Model No. 2)
      - ⇒ Detector Double Check Valve Assembly (D.D.C. II)

- ⇒ Reduced Pressure Valve Assembly (Model 6CM)
- ⇒ Detector Reduced Pressure Valve Assembly (Model 6CM-R.P.D.A.)

### **PART 3 - EXECUTION**

#### **A. Preparation**

1. Trench excavation, backfill, and compaction, bedding and haunching shall be as specified in Section 02250.
2. Prior to start of utility installation, all rights-of-way shall be graded to within  $\pm 0.2$  feet of the proposed subgrade in paved areas and finished grade in unpaved areas.
3. Trench Water: The service trench excavation shall be dewatered sufficiently to allow pipe joints to be made under dry conditions. No joint shall be made under water.
4. Laying Service in Freezing Weather: No service shall be laid upon a foundation into which frost has penetrated, nor at any time when there is danger of ice formation or frost penetration at the bottom of the excavation. In freezing weather, open trench length shall be kept to a minimum and the excavation promptly backfilled after the service has been installed.
5. Pipe Bedding: Each service shall be bedded on a solid foundation acceptable to the County and in accordance with the Standard Details. When aggregate bedding is required, bedding shall be installed to grade prior to laying pipe.

#### **B. Water Services and Appurtenances**

1. Water services and appurtenances shall be installed in accordance with the approved manufacturer's written instructions, County Standards, Approved Plans, and as specified herein:
2. Equipment for Handling Pipe: Proper and suitable tools and appliances as approved for safe and convenient handling and joining of pipes shall be used.
3. Water services shall be jacked or driven under paving unless otherwise directed by the County. In case jacking or driving house services under any type of paving cannot be made, the County with approval of the pertinent agency may permit the Contractor to open cut. In the case of an open cut in paving, trench widths shall not exceed 18-inches or the

requirements noted in the utility permit, whichever is most stringent.

4. House services installed in areas other than paving areas shall be open cut or driven at the Contractor's option.
5. All services shall be laid to the grade and lines in accordance with the Approved Plans or as directed by the County. Special care shall be taken to insure that the services are well-bedded. Any defects resulting from settlement shall be repaired by the Contractor at his expense.
6. Copper service pipe shall be cut square to the run of the pipe and free from burrs.  $\frac{3}{4}$ -inch to 1-inch pipe can be cut with a disc-type pipe cutter or hacksaw. An abrasive wheel will not be allowed. Care must be taken not to deform pipe end.
7. All services shall be thoroughly flushed with potable water at the time the main is tapped. All PVC services and services larger than 3-inch diameter shall be installed, chlorinated and tested as specified in Section 02660.
8. The pipe and fittings shall be thoroughly cleaned before being installed, and shall be kept clean until the acceptance of the completed work.
9. All meter vaults 24-inch in diameter and smaller shall be set at a minimum depth of two feet, eight inches (2'-8"). They shall be set on brick or precast concrete rings and bedded on firm undisturbed earth.
10. Tracer Wire: All nonmetallic water mains shall have tracer wire secured with duct tape to the top of the pipe at ten (10) foot centers. The tracer wire shall be continuous for the full length of the pipeline. Continuous conductivity shall be maintained and tested. Underground splice connections shall be made with solderless split bolt connectors and taped.
11. Detector Tape: Install visual detection tape 18-inches above all water service pipe.

C. Connections to Water Mains

1. The following table provides types of allowable taps for different pipe sizes and materials:

Pipe Material	Services Size (inches)	Main Size (inches)	Direct	Allowable Taps		
				Service Saddle	Trapped Tee w/ Boss	Tapping Sleeve and Valve
PVC	>1	thru 12	NO	YES	NO	NO
P & PVC	All	≤ 4	NO	YES	NO	NO
P & PVC	≤ 1	> 4	YES	-	-	-
P & PVC	> 1	thru 10	NO	YES	YES	YES
DIP	≤ 2	> 12	YES	-	-	-
DIP	> 2	> 12	NO	YES	YES	YES
PVC	≤ 1	12	YES	-	-	-
PVC	> 1	12	NO	YES	YES	YES

2. Corporation taps or tapping sleeves shall be installed on new water mains under operating pressure after the water mains have been chlorinated and tested in accordance with the Contract Documents.
3. Service connections to existing water mains shall be made as noted in this section only where authorized by the County.
4. The County reserves the right to require a saddle on any water main service connection where the integrity of the connection or appurtenances is in question.

END OF SECTION

SECTION 02666

FIRE HYDRANTS

**PART 1 - GENERAL**

A. Description

Fire hydrant installation shall include, but not necessarily be limited to furnishing and installing fire hydrants or relocating fire hydrants in accordance with the Approved Plans.

B. Related Work Included Elsewhere

1. Trench Excavation, Backfill, and Compaction: Section 02250
2. Water Main Installation and Chlorination: Section 02660
3. Water Valves and Appurtenances: Section 02662
4. Cast-In-Place Concrete: Section 03300
5. Unit Masonry: Section 04200

C. Quality Assurance

The County will inspect all materials before, during and after installation to insure compliance with the Approved Plans.

**PART 2 - MATERIALS**

A. General

Materials shall be furnished in accordance with the Approved Plans.

B. Materials Furnished by the County

The County will not furnish any materials for fire hydrant installation or relocation.

C. Contractor's Options

None.

D. Detailed Material Requirements

1. Washed gravel for hydrant foundation shall meet the gradation requirements of

AASHTO M 43, Size Number 57.

2. Fire Hydrants

- a. Hydrant valve opening shall be at least 5-1/4-inch diameter net. Inlet connection shall be 6-inch mechanical joint.
- b. Hose connections shall consist of two 2-1/2-inch diameter hose connections and one 4-1/2-inch diameter steamer or pumper connection. Hose and pumper nozzle threads shall conform to ANSI Specifications B26 for “National (American) Standard Fire-Hose Coupling Screw Thread.”
- c. Operating nut shall be 5-sided, 1-1/2-inches from point to flat, and shall turn left (counterclockwise) to open.
- d. The inlet connection to hydrants shall be six (6) inch mechanical joint.
- e. Hydrant design shall be such that when the barrel is broken, it may be replaced without excavating or breaking adjacent pavement; that the entire barrel, including all working parts along with the main and drain valve seats, may be removed for inspection or repair without excavating or disturbing the ground.
- f. The groundline lugs and valve rod shall be frangible so that in the event of accident, damage or breaking of the hydrant above or near the grade level, the main valve will remain closed and reasonably tight against leakage. Breakaway lugs are required, breakaway bolts will not be accepted.
- g. The main valve seal shall be compression type sealing against a bronze seat and the valve shall open against pressure. The main valve shall be removed by use of a short-stemmed wrench.
- h. Minimum bury depth shall be 3-1/2-feet measured from the top of the connecting pipe to the ground level at the hydrant.
- I. Bonnet shall have cast on the top an arrow and the word “open” indicating the direction for opening.
- j. Fire hydrants shall meet the requirements of the “AWWA” Standard for fire hydrants for ordinary water works service C502. All lug bolts shall conform to ASTM A307, Grade B.
- k. Interior of shoe shall be epoxy coated.

3. Approved Manufacturers

All hydrants shall be manufactured by one of the following:

a. Fire Hydrants, 5-1/4" Valve Openings – M.J.

U.S. Pipe Metropolitan, 250 Model 94

b. Fire Hydrant Paint (Color per Fire Code)

Derusto  
X-O Rust XO-4  
Bruning Silathane 11  
Mueller

### **PART 3 - EXECUTION**

A. General

1. Excavation, foundation preparation, backfill, and compaction shall be as specified in Section 02250.
2. Construction methods shall be in accordance with Section 02660.

B. Fire Hydrant Installation

1. Fire hydrants shall be installed and restrained in accordance with the Standard Details, at the locations shown, and to elevations directed by the County. Hydrants shall be set within an aggregate drainage well extending the full width of the trench, from the center of the hydrant to a length equal to the width in a direction towards the main line, and from the bottom of the trench to a point 6-inches above the drip opening.
2. Hydrant leads shall be laid level on a firm foundation to insure that the hydrant is set plumb. Backfill around the hydrant shall be compacted so as to obtain a density of at least 92% of maximum when measured in accordance with AASHTO T-180, Method D.
3. Where hydrants are to be relocated, the Contractor shall ascertain whether or not the hydrant valve has been restrained before removing the hydrant to be relocated.
4. Where the existing lead is to be abandoned the lead shall be capped and blocked at the main by removing the hydrant valve and installing the cap or plug. All caps and plugs shall be buttressed and strapped to the main or restrained in

accordance with County Standards.

5. The outside of all fire hydrants above the breakaway flange shall be painted with two coats of paint.
6. Main port of fire hydrant shall be directed towards pavement.

C. Field Test

1. Fire hydrants installed at the same time as a new water main shall be tested after installation by the Contractor, along with the water main, in accordance with Section 02660.
2. Fire hydrants installed on an existing water main will be visually inspected for leakage by the County at the existing water main line pressure before the excavation is backfilled. The hydrant, valve, and connecting pipe shall be leak-free under line pressure.

END OF SECTION

## SECTION 02700

### GRAVITY SANITARY SEWER AND HOUSE CONNECTIONS

#### **PART 1 - GENERAL**

##### A. Description

Sanitary sewer installation shall include, but not necessarily be limited to furnishing all labor, materials, and services necessary to install pipe, fittings, miscellaneous structures of concrete or brick masonry, and appurtenances for gravity sewer and house connections, of the size and type shown, in accordance with the Approved Plans.

##### B. Related Work Specified Elsewhere

1. Aggregate Backfill: Section 02240
2. Trench Excavation, Backfill and Compaction: Section 02250
3. Sanitary Sewer Manholes: Section 02710
4. Precast Concrete Structures: Section 03400
5. Mortar and Masonry Grout: Section 04100
6. Unit Masonry: Section 04200
7. Miscellaneous Metals: Section 05500

##### C. Quality Assurance

The County will inspect all materials before, during and after installation to ensure compliance with the Approved Plans.

#### **PART 2 - MATERIALS**

##### A. General

1. Materials shall be furnished in accordance with the Contract Documents and the current edition of the approved list of suppliers and materials for water and sewer main construction.
2. To minimize the number of joints, only standard manufacturer length of pipe shall be furnished and installed for all sanitary sewer mains and house connections unless otherwise indicated on the Plans, or as approved by the County.

## B. Pipe Symbols

For convenience and standardization, the various types of pipe are designated on the plans by the following symbols:

CISP - Cast iron soil pipe  
DIP - Ductile iron pipe  
PVC - Polyvinyl chloride pipe

## C. Materials Furnished by the County

1. The County will not furnish any materials for gravity sanitary sewer and house connections.
2. Unless otherwise noted in the "Special Provisions," the County or Private/Public Utility Company will make water available from its potable water system for pipeline testing at no charge to the contractor for one test only. The Contractor shall contact the Department of Public Works Water and Wastewater Division or Private/Public Utility Company to coordinate its use. If subsequent testing is required, the Contractor will purchase additional water from the County's or Private/Public Utility Company's system.

## D. Contractor's Options

1. The Contractor may furnish Polyvinyl chloride (PVC), or ductile iron pipe (DIP) for sewers equal to or smaller than 24-inch diameter unless specified otherwise in writing by the County.
2. The Contractor may furnish ~~reinforced concrete pipe (RCSP)~~, or ductile iron pipe (DIP) for sewers greater than 24-inch diameter unless specified otherwise in writing by the County.
3. The Contractor may furnish precast, cast-in-place, or masonry construction for miscellaneous sanitary sewer structures unless specified otherwise in writing by the County.
4. Lateral connections to sewers shall be the same material as the sewer. Where drop lateral connections are necessary, the sewer and the lateral must be DIP.

## E. Detailed Material Requirements

1. Polyvinyl Chloride Sewer Pipe (PVC) and Fittings
  - a. Polyvinyl chloride (PVC) pipe and fittings 4-inch through 15-inch in diameter must comply with ASTM D 3034 and F1336 and have a minimum wall thickness of SDR 35 or SDR26. Pipe and fittings 18-inch

through 24-inch diameter shall meet the material requirements of ASTM F679 and F1336 and have a minimum wall thickness of T-1. All PVC compounds for all sizes shall comply with ASTM D 1784 and have a minimum cell classification of 12454B and comply with ASTM D 1784.

- b. The storage and handling of PVC pipe and fittings shall be in strict accordance with manufacturer's recommendations.
- c. All pipe and fittings must be manufactured with a locked-in gasket.
- d. House service riser pipe shall be heavy wall sewer pipe having a minimum wall thickness of SDR 26 and shall meet the requirements of ASTM D 3034.
- e. The PVC wye and fitting supporting the house service riser shall be integrally cast in concrete as per the Standard Details.

2. Ductile Iron Pipe (DIP) and Fittings and Cast Iron Fittings

a. Pipe

- 1. Ductile iron pipe (DIP) shall conform to ANSI/AWWA C150/A21.50 in matters of design and ANSI/AWWA C151/A21.51 for materials. Pipe thickness shall conform to the Special Thickness Class 52 minimum.  
\* Class 50 Pipe may be substituted in all areas outside the County Road right of way. Pipe class shall be as shown on the Plans. The outside surface shall be bituminous coated.
- 2. The Contractor shall be cognizant of available ductile iron fittings which adapt to PVC SDR 35 or SDR26.
- 3. At a depth of 18 feet or greater, the pipe shall be ductile iron pipe (DIP) and shall conform to ANSI/AWWA C151/A21.50 in matters of design and ANSI/AWWA C151/A21.51 for materials. Pipe thickness shall conform to the Special Thickness Class 52 minimum. Class 50 pipe may be substituted in all areas outside the County Road right of way. Pipe class shall be shown on the plans. The outside surface shall be bituminous coated.
- 4. For 18" through 30 inch the ductile iron pipe (DIP) shall conform to ANSI/AWWA 1501/A21.50 in matters of design and ANSI/AWWA C151/A21.51 for materials.

b. Interior Linings

All ductile iron sewer pipe shall have a factory-applied protective coating or lining. The coating or lining shall consist of the following:

1. Ceramic Epoxy Coating

a. Material

The material shall be an amine cured novalac epoxy containing a minimum 20% by volume of ceramic quartz pigment. It shall have a permeability rating of 0.00 in accordance with ASTM E-96-66, Method A, Procedure A. In accordance with ASTM G-95, there shall be no more than 0.5mm undercutting after two years. In accordance with ASTM B-117, there shall be no undercutting after two years. In accordance with ASTM D-714-87, there shall be no effect to 20% sulfuric acid after two years and no effect to 25% Sodium Hydroxide after 30 days. In accordance with European Standard EN 598, there shall be no more than 3 mils loss after one million cycles.

b. The lining shall be applied by a certified coating application company approval by Cecil County. All interior surfaces shall be cleaned to remove grease, oil or other deleterious substances by use of solvents. The pipe interior shall then be abrasive blasted to remove all rust, scale and loose oxides. Within eight hours of the final blasting, the interior of the pipe shall receive of minimum 40 mil nominal dry thickness coating, Application of the coating shall occur when the ambient air temperature is 40 degrees or above. The application instructions and cure times from the coating manufacturer shall be strictly adhered. A joint compound supplied by the same coating manufacturer shall be brushed on the spigot end and gasket area, up to six inches back from the end of the spigot end. The joint compound dry film thickness shall be a minimum six mil and maximum ten mil.

c. All coatings shall be checked for thickness using a magnetic thickness film gauge in accordance with SSPC-PA-2. The interior lining shall undergo holiday testing with a non-destructive 2,500 volt test. All pinholes shall be repaired. The pipe manufacturer shall supply the contractor with a certificate attesting to the conformance

with the above specifications. This information shall be submitted to the County.

2. Alternative Coating

Coating that conforms to AWWA C151; pressure class 250psi; double cement mortar lined per AWWA C104 with an interior seal coat of bituminous material coated per AWWA C151 outside surface bituminous coat per AWWA C151.

3. Cast Iron Soil Pipe and Fittings

Cast iron soil pipe and fittings for sanitary house connections outside the public right-of-way or on risers shall meet material requirements of ASTM A74, service weight or heavier with mechanical, or gasketed joints.

4. Pipeline Plugs for Testing

Pipeline plugs shall be rubber gasketed or ribbed, watertight, airtight to the extent required by air testing requirements of this Section, cannot be dislodged by testing pressure (internal or external), and of an approved design.

5. Detector Tape

Detector Tape shall be 3 inches wide (minimum) nonmetallic green plastic tape lettered "sewer" in black graphics as manufactured by Lineguard, Allen Systems, Linetec or Empire Level.

For County owned facilities tracer wire will not be required for non-metallic gravity mains and services. However the contractor must adhere to the requirements of any Public or Private Utility Company.

6. Approved Manufacturers

All gravity sanitary sewer and connections shall be supplied by one of the following manufacturers:

a. Polyvinyl Chloride Pipe

- J.M. Pipe Company
- E.T.I.
- National Pipe & Plastic
- Diamond

b. Polyvinyl Chloride Fittings

Moulded 2"-8"

- Har-Co
- J.M. Pipe Company
- Multi-Fitting
- Plastic Trend

Fabricated

- Multi-Fittings, 10"-27"
- Freedom, 10"-15"
- Nyoplast, 10"-15"
- B&H, 10"-15"
- GPK Products, Inc., 10"-27"

c. Polyvinyl Chloride Riser Pipe – Cleanout

- J.M. Pipe Company
- ETI
- National Pipe & Plastic
- Diamond

d. Ductile Iron Pipe

Slip Joint

- U.S. Pipe & Foundry
- Griffin
- American
- McWane
- Atlantic States
- Clow

Restrained Joint

- T.R. Flex
- Snap Lock
- Flex Ring
- N/A
- N/A
- Super Lock

- e. Adaptor (From 6” House Connection to Cast Iron Soil Pipe)
  - Fernco
  - Calder
  - IND Seal
  
- f. Reinforced Concrete Pipe
  - Hydro Conduit
  - Price Brothers
  
- g. Saddles
  - Pioneer Branch
  - Geneco Scatate
  - Ford “CB”
  - Romac “CB”
  
- h. Repair Clamps
  - 4” – 16”
    - Smith Blair, Style 262
    - Ford, Style FS2
    - Romac, Style SS2
    - Powerseal, Style 3122AS

16” Through Section

- Ford, Style FS3
- Smith Blair, Style 263
- Romac, Style SS3
- Powerseal, Style 3123 AS
  
- i. Soil Pipe
  - Tyler
  - Charlotte
  
- j. Plugs, Sewer (Wing-NUT)
  - Cherne Industries, “Gripper”
  - R.C. Graham, “Hand Tite”
  - Circle Gass Manufacturing
  
- k. Cleanout – Hub & Cap

- Panella Industries, PVC with Magnet
- Jumbo Manufacturing Company, Cast Iron with Gasket
- Circle Gas Manufacturing Company, Cast Iron with Gasket

1. Detector Tape (3" Non-metallic)

- Lineguard
- Allen Systems
- Linetec
- Empire Level

**PART 3 - EXECUTION**

A. Preparation

1. Trench excavation, backfill, and compaction, and pipe bedding and haunching shall be as specified in Sections 02240 and 02250.
2. Prior to start of utility installation, all rights-of-way shall be graded to within  $\pm 0.2$  feet of the proposed subgrade in paved areas and finished grade in unpaved areas.
3. Trench Water: The pipeline trench excavation shall be dewatered sufficiently to allow pipe joints to be made under dry conditions. No joint shall be made under water. In the event significant groundwater is encountered during construction, the Director may require the County and/or Contractor to prepare a corrective plan of action for review and approval by the County.
4. Laying Pipe in Freezing Weather: No pipe shall be laid upon a foundation into which frost has penetrated, nor at any time when there is danger of ice formation or frost penetration at the bottom of the excavation. In freezing weather, open trench length shall be kept to a minimum and the excavation promptly backfilled after the pipe had been installed.
5. Pipe Bedding: Each pipe shall be bedded on a solid foundation acceptable to the County and in accordance with the Standard Details. Bedding shall be installed to insure that joints are properly made and the pipe is firmly supported the full length of the barrel. All sewer mains and services shall be installed with a minimum of 6" of aggregate under the pipe, 6" of aggregate around the pipe and 6" of aggregate above the top of the pipe. Aggregate shall be AASHTO M43 size number 57. Aggregate bedding shall be installed to grade prior to laying of **pvc** pipe sections.

## B. Pipe Installation

1. All pipe shall be installed in accordance with the approved manufacturers written instructions and as specified herein. These recommendations, if more restrictive than that shown in the Standard Details shall include maximum trench width, bedding requirements, backfill material, and compaction, where applicable. In addition, the following shall apply unless otherwise noted:
  - a. Polyvinyl chloride sewer pipe (PVC) shall be installed in accordance with the Standard Details and the recommendations of Uni-Bell.
  - b. Ductile iron pipe (DIP) and cast iron sewer pipe shall be installed in accordance with the Standard Details and the recommendations of the Ductile Iron Pipe Research Associations.
2. Equipment for Handling Pipe: Proper and suitable tools and appliances as approved for safe and convenient handling and joining of pipes shall be used.
3. Pipe Installation: Pipe shall be carefully handled and lowered into the trench. Pipe shall be installed with special care to insure that each joint is watertight, has met the required manufacturer's insertion depth, and has no shoulder or unevenness of any kind along the inside of the pipeline. No wedging or blocking will be permitted in installing any pipe unless directed by written order or permission in writing is obtained from the County. Each section of pipe shall be checked for proper grade before installation of the next section. No pipe shall be laid under water. Trenches must be dewatered prior to pipe installation.
4. Pipe Setting and Protection: No pipe shall be brought into position until the preceding length has been thoroughly bedded and secured in place. Care shall be used to assure water tightness and prevent damage to, or disturbing of, the joints during the refilling process. After pipes have been installed and joints have been made, there shall be no walking on or working over the pipe, except as may be necessary in tamping the backfill material, until the backfill is at least 2 feet over the top of the pipe.
5. Cleaning Pipe: The pipes shall be thoroughly cleaned before being installed and shall be kept clean until acceptance of the completed work. Open ends of all pipelines shall be provided with a stopper carefully fitted to keep dirt and other substances from entering. This stopper shall remain in place at all times when installation is not in progress.
6. Cutting Pipe: Whenever a pipe requires cutting, to fit into the line or bring it to the required location, the work shall be performed by an approved method that leaves a smooth, square end. Cut PVC pipe ends shall have burrs removed and the end beveled to match factory bevel. Field spigots shall be stop-marked with

a felt tip marker or wax crayon for the proper length of assembly insertion.

7. Alignment of Pipe: A calibrated, precise sewer pipe laser shall be used to align the pipe to the proper grade. The Contractor is responsible to continuously monitor the line and grade in each pipe run between structures at pipe station 0+50, and at each 100-foot interval thereafter as a minimum quality control, or as directed by the County. It is the Contractor's responsibility to maintain proper calibration of the equipment throughout the duration of the project.
8. Plugging New Sewers: All new sewers shall be plugged with compatible pipe caps or plugs at the end of each run or working day to prevent foreign matter from entering pipe. Plugs in completed portions of the sewer system shall not be removed until approval is received from the County.
9. Jointing Pipe

- a. General

Before any joints are made in the trench, the Contractor shall demonstrate to the County by making a sample joint that methods he will employ conform with the Specifications, will secure a watertight joint, and that the workmen whom he intends to use for this work are familiar with the requirements for making proper joints.

- b. Push-On Gasketed Joints

Prior to making gasketed joints, both mating pipe ends and the gasket shall be cleaned of all foreign material. The gasket shall then be inserted in or stretched over the cleaned gasket seat and lubricant applied as recommended by the manufacturer and approved by the County. The pipe ends shall be carefully aligned and pushed together to meet the required manufacturer's insertion depth. There shall be no shoulder or unevenness of any kind along the inside of the pipeline. In all cases, the spigot shall be inserted into the previously laid and seated bell, in order to minimize the potential of gasket roll, to prevent the bell dragging and pushing soil into the joint and to prevent the need to undercut the pipe to lay the bell. All bells shall be laid uphill.

- c. Other methods of jointing pipe will be given consideration by the County, provided the Contractor furnishes evidence that the proposed method is equal to or better than the specified methods, and further, provided that the proposed method has been successfully used and that the joint has previously been manufactured by the company from whom the Contractor proposes to purchase pipe.

- d. All jointing and workmanship shall be in accordance with the manufacturer's recommendations as approved by the County.
- 10. Detector Tape: Install visual detection tape 18 inches above all mains.
- 11. Connections to existing work shall be made by the Contractor in the presence of the County at such a time and in such manner as directed and approved by the County. Shut-off operations will not be allowed. The Contractor shall complete the connections with the greatest possible speed and all work will proceed without interruption until the connection operation is complete. When specified in the "Special Provisions," the Contractor shall make connections at night.

C. Sanitary House Connections

- 1. Sanitary house connection branch fittings shall be located where designated by the Approved Plans and/or the County. Short pieces of sewer pipe shall be field-cut to meet this condition as approved. The Contractor shall have available at the construction site factory approved equipment to machine and adapt the field-cut end to standard couplings and jointing materials.
- 2. Sanitary Sewer Taps: All taps made into sanitary sewer lines shall be made by an approved hole-cutting method in accordance with the manufacturer's recommendations. Every effort shall be made to prevent entrance of foreign matter into the pipe during the tapping procedure.
- 3. Backfill for the support of Y-branches and bends shall be placed as shown in the Standard Details, or as directed.

D. Field Tests

- 1. General
  - a. All portions of the sewers and appurtenances shall be tested. The County shall have the final decision as to the method or methods used, i.e. water infiltration, water exfiltration, air, mirror, or combination of these.
  - b. After installation, sanitary sewers and sanitary house connections will be inspected by the County with the assistance of the Contractor for compliance with these specifications. Inspections and tests will not be conducted until the section of pipeline being inspected and tested has been backfilled, dewatering pumps have been removed from the area, and the ground water has stabilized.
  - c. The Contractor shall schedule all tests with the County at least two working days in advance of the test, and shall conduct all tests in the presence of the County. On County Capital Projects, the County will

witness one test at not cost the Contractor. Should the pipeline fail the first County witnessed test, the Contractor shall reimburse the County for all costs resulting from such additional tests so required until the pipeline passes the test(s). The Contractor shall also reimburse the County for the cost of inspection if the Contractor is not prepared for any test, or for additional tests required.

All sewer mains may not contain any debris, silt, earth, gravel, rock or other foreign material at the time of final inspection. Each manhole run shall be flushed by the Contractor with sufficient quantities of water to flush all material within the sewer main prior to performing any tests. The downstream manhole shall be plugged and the flushing water and debris shall be collected within this manhole. The Contractor shall completely remove the water and all stones, silt, sediment, debris and foreign material from the manhole. The flush water and debris may not extend beyond one or more manhole runs which collectively add up to 400 feet. Flush water may not be re-used for subsequent manhole runs. Water from the County or private water company system shall be quantified in gallons by the Contractor and provided to the Division of Water and Sewer Maintenance Personnel at the time of testing. At no time may flush water or debris be introduced into the existing County sewage collection system. The Contractor shall be responsible for all labor, materials, equipment and other associated costs of cleaning the sewer mains to the satisfaction of the County.

- d. Control and/or treatment of the discharge of chlorinated water used for flushing, cleaning, or testing operations shall comply with all current applicable local, state, and federal regulations. Costs associated with the control or treatment procedures shall be the Contractor's responsibility.

Cecil County Water and Sewer or a Public Utility Company will allow repairs to sewer mains on a very limited basis, if the main does not pass the pressure test. Repairs to sewer mains will be allowed with gasketed PVC couplings only. There shall be no more than one repair for every 125 feet within any given manhole run. If the number of identified air leaks exceed above the requirement, then the new pipe shall be laid instead of additional PVC couplings. Upon completion of construction and successful testing, there shall be no more than one repair every 125 feet within any given manhole run.

- e. All sewer lines shall be televised by the Contractor prior to acceptance by the County. Station numbers and beginning and ending manhole numbers shall be shown and/or voiced.

## 2. Materials

- a. When specific test of materials are called for in the referenced standards and

specifications, the County has the option of requiring that any or all of these tests be performed.

- b. Polyvinyl chloride (PVC) pipe and couplings shall be homogeneous throughout and free from visible cracks, bubbles, blisters, holes, foreign inclusions, cuts or scrapes on inside or outside surfaces or other imperfections which may impair the performance or life of the pipe. Each pipe shall be straight-to-within 1 1/4 inch per 20-foot length of pipe when uniformly supported along its entire length, and shall have a true circular cross-section to within  $\pm 1/64$  inch.
- c. Cast iron soil pipe, ductile iron pipe (DIP), and ductile iron and cast iron fittings shall be sound and without defects that might impair its service.

### 3. Visual Inspection

- a. All equipment necessary for the inspection will be furnished by the Contractor, however; the Contractor shall provide assistance as may be required to enable the County to perform the inspection.
- b. The County will inspect all sanitary sewers for alignment, grade, leakage, and condition. The inspection may be conducted by crawling or walking through the pipeline, using mirrors to reflect light through the pipeline, or closed circuit television equipment.
  - 1) If a mirror test is used, the pipe alignment will be acceptable if it is sufficiently true and straight to allow passage of the reflected light with an image of a "full moon".
  - 2) The pipeline shall be installed on a continuous grade so it does not pond or trap water anywhere along the line.
  - 3) No visible infiltration will be allowed. Any water leakage into the system sufficient to constitute any noticeable trickle or dribble shall be corrected.

### 4. Acceptance Testing

#### a. General

- 1) The Contractor shall furnish all labor, tools, materials, and equipment necessary to perform the specified tests. Testing shall be conducted only after the section of sewer has passed the visual inspection.
- 2) Generally sewers will be tested from manhole to manhole or from manhole to terminus of the pipeline if there is no manhole at the other extremity. Testing shall be by low pressure air and/or infiltration/exfiltration as specified herein

and/or as determined by the County.

- 3) If the sanitary sewer or sanitary house connection fails any test specified herein, the Contractor shall, at his own expense, repair or replace any defective component and retest the failed section or component until all requirements are met. Defective material shall be replaced.
- 4) All equipment used for testing shall be approved by the County.

b. Low Pressure Air Test

Sanitary sewers 24-inch diameter and smaller and attached sanitary house connections shall be tested with low pressure air in accordance with the following procedures: Testing may only occur after the channel and bench have been completed.

- 1) Test plugs shall be supplied and installed by the Contractor within the pipeline at each manhole. Each plug shall be securely braced.
- 2) If the pipeline to be tested is expected to be below the ground water table, the County may visually inspect the trench prior to backfilling to determine the elevation of the groundwater table. All gauge pressures for the test shall be increased by an amount to provide 4 psig above the back pressure due to ground water submergence over the end of the probe to a maximum of 6 psi in the pipe system to be tested.
- 3) If the air pressure required for the test is greater than 6 psig, the pipeline shall not be air tested, but shall be tested for infiltration in accordance with method indicated in Paragraph c, which follows.
- 4) The Contractor shall add air slowly to the portion of the pipeline under test until the internal pressure is raised to 4.0 psig greater than the average backpressure of any groundwater above the pipe's invert.
- 5) The Contractor shall not allow personnel in manholes after the air pressure is increased in the sewer. If the test plug is suspected of leaking, the Contractor shall first relieve the pressure before any adjustments are made to eliminate air leakage at the plug. The Contractor may precoat the plug with a soap solution to check for leakage.
- 6) The Contractor shall allow the air temperature to stabilize for at least 2 minutes by adding only the amount of air required to maintain 4.0 psig above groundwater back pressure. After this 2 minute period, the Contractor shall completely disconnect the hose and compressor from the section being tested to assure no additional air is added to the pipeline.

- 7) The time required for the pressure to drop 1 psig will be observed and recorded. Pipelines which fail to maintain the stipulated pressure for a period equal to or greater than the holding time shown in the table at the end of this Section shall be deemed to have failed the low pressure air test and will not be accepted by the County.
- 8) The portion of the line being tested will be acceptable if the time required in minutes for the pressure to decrease from 4.0 to 3.0 psig shall not be less than the time shown for the given diameters in the following table:

<u>Pipe Diameter</u> <u>in Inches</u>	<u>Minutes</u>
6	3.0
8	4.0
10	5.0
12	5.5
15	7.5
18	8.5
21	10.0
24	11.5

- 9) Air testing may be required for pipe diameters greater than 24 inch when specified by the Engineer and approved by Cecil County.

c. Infiltration/Exfiltration Tests

- 1) Sanitary sewers 24-inch in diameter and larger and sewers in which air testing is not specified or required shall be subjected to either infiltration or exfiltration tests as determined by the County. Testing may be conducted from manhole to manhole, or between more than two manholes, however, the length to be tested shall not exceed 700 feet. Minimum test duration shall be 24 hours unless otherwise directed by the County. Testing shall be conducted in accordance with ASTM C 969 as modified herein.
  - a) Infiltration test shall be made by measuring the amount of water infiltrating into the pipeline section at the lower end of the section being tested by means of a weir installed in the pipe or by other measurement method approved by the County.
  - b) Exfiltration test shall be made by plugging the lower manhole, filling the pipeline section with water to a level of at least 2 feet above the crown of the pipe at the

upstream end of the section being tested or 2 feet above groundwater level whichever is greater and measuring the water level drop in the manhole at the end of the specified test period. Pipelines shall be filled with water for at least 24 hours immediately before the test.

c) Test Criteria

The maximum leakage allowance in the completed sewer lines shall not be greater than 25 gallons per inch diameter per mile per twenty-four hours. Note that this is a rate and does not in any way prescribe or infer the length of the line to be included in each test section.

d) Deflection Testing

In addition to other tests detailed in this Section, PVC sanitary sewers may be tested for deflection (reduction in vertical inside diameter). Testing shall be performed by passing a 5% undersized GO/NO-GO mandrel or sewer ball through the pipeline or measuring deflection continuously by using a deflectometer. Maximum allowable deflection shall be 5%.

e) Closed Circuit Television Inspection

The County retains the right to inspect sewer mains by means of robotically controlled closed circuit television cameras.

END OF SECTION

## SECTION 02710

### SANITARY SEWER MANHOLES

#### **PART 1 - GENERAL**

##### A. Description

Sanitary sewer manhole installation shall include, but not necessarily be limited to, furnishing and installing Pre-cast sanitary sewer manholes and miscellaneous structures of concrete or brick masonry built to the shapes and dimensions shown and in accordance with the Standard Details unless shown on the Approved Plans.

##### B. Related Work Included Elsewhere

1. Trench Excavation, Backfill, and Compaction: Section 02250
2. Sanitary Sewers: Section 02700
3. Cast-in-Place Concrete: Section 03300
4. Precast Concrete Structures: Section 03400
5. Mortar and Masonry Grout: Section 03600
6. Brick Masonry: Section 04200

##### C. Quality Assurance

The County will inspect all materials before, during and after installation to insure compliance with the Approved Plans.

#### **PART 2 - MATERIALS**

##### A. General

1. Materials shall be furnished in accordance with the Contract Documents and the current addition of the Approved List of Suppliers and Materials for Water and Sewer Construction.

##### B. Materials Furnished by the County

The County will not furnish any materials for sanitary manholes.

C. Contractor's Options

1. The Contractor may furnish galvanized steel, polypropylene, or plastic-coated steel for manhole steps.
2. Standard sanitary manholes shall be precast construction; however, the Contractor may furnish cast-in-place, or masonry construction for miscellaneous sanitary sewer structures with the approval of the County.

D. Detailed Material Requirements

1. Granular bedding beneath manhole bases shall meet the gradation requirements of AASHTO M43, Size Number 57, as specified in Section 02240.
2. Portland cement concrete for cast-in-place structures shall be as specified in Section 03300, mix number as indicated on the Standard Details or the Plans.
3. Precast manhole bases, risers, cone sections, grade rings, and precast utility structures shall be as specified in Section 03400.
4. Joints shall be "0" ring compression type meeting the requirements of ASTM C-443.
5. Non-shrink grout shall be as specified in Section 04100.
6. Mortar for brickwork and grade rings shall be as specified in Section 04100.
7. Brick for manhole inverts and miscellaneous structures shall be sewer brick as specified in Section 04200.
8. Frames and covers shall be as shown in the Standard Details and as specified in Section 05500.
9. Manhole steps shall be as per the Standard Details. The plastic coated type shall be manufactured using a minimum 3/8-inch diameter steel reinforcing rod meeting the requirements of ASTM A 615, as a core. The plastic coating shall meet the requirements of ASTM 2146, Type II, Grade 4375B.
10. Force main discharge manholes and above grade manholes shall be seal-coated to the limits noted on the Standard Details with 16 mils of a coal tar polyamide epoxy.
11. Manhole-to-Pipeline Connectors

- a. Cast-in-place type connectors shall be compression type.
    - 1. A banded-boot type for sewer grades greater than 18% and less than 46.5%.
    - 2. A compression type for sewer grades less than 18%.
  - b. Mechanically wedge-in-place type connectors shall be used for cored openings.
  - c. For doghouse type manhole applications a banded-boot type connector shall be used.
12. Manholes shall have sealant between the manhole and the manhole frame. The sealant shall be mastic rope, type B, 3/4 inch minimum diameter, butyl based, meeting requirements of AASHTO M 198.
13. The stainless steel insert dish for manholes shall be manufactured of materials resistant to corrosion from atmospheres containing hydrogen sulfide and dilute sulfuric acid. The insert body shall be 18 GA, 304 stainless steel. The manufacturer must furnish a load test verification showing a load test failure in excess of 3,000 lbs. The insert shall contain gas relief valves designed to release a pressure of .5 to 2.0 psi and have water leakdown rate no greater than 5 gallons per 24 hours. The handle shall be able to withstand a pull of 500 lbs. without breakage.

14. Approved Manufacturers

All sanitary sewer manholes and appurtenances shall be supplied by the following manufacturers:

- a. Precast Concrete Manholes
  - Atlantic Precast
  - Concrete Pipe & Products
  - Terre Hill
  - Monarch Products Company, Inc.
- b. Manhole to Pipe Line Connectors
  - Z-Lok – A-Lok Products (Grades 18% and 45%)
  - A-Lok – Atlantic Precast (18%)
  - Dual Seal 11 – Terre-Hill Concrete Products
- c. Built In-Place Manhole Connectors

- A-Lok Field Kit – A-Lok Products
  - Z-Lok Field Kit – A-Lok Products
  - RX 101 Water Stop
- d. Cored Manhole Gaskets
- A-Lok - A-Lok Products
  - Link Seal – Thunderline Corporation
  - Z-Lok XP – A-Lok Products
  - Kor-N-Seal – National Pollution Control Systems, Inc.
- e. Plastic Manhole Steps
- M.A. Industries, Inc.
- f. Retainer Gland
- Ebba Iron Meg-A-Lug
  - Ford 1400
- g. Mastic Rope Seal (3/4”)
- KC Snyder – “Rubber-Nek”
  - Pres Seal Gasket Corporation

### **PART 3 - EXECUTION**

#### **A. General**

1. Excavation, foundation preparation, backfill, and compaction shall be as specified in Section 02250.
2. Manholes and drop connections shall be installed in accordance with the Standard Details and as specified herein.
3. Miscellaneous structures shall be constructed where shown and as indicated on the Plans or as directed by the County.
  - a. Cast-in-place concrete construction shall be as specified in Section 03300.
  - b. Brick construction shall be as specified in Section 04200.
4. Pipelines connected to manholes and other structures shall have a pipe joint between 3 and 7 feet from the exterior wall of the structure.

5. All new openings in existing manholes shall be core drilled in a manner acceptable to the manhole manufacturer and the County.
6. Manholes shall be installed at the end of each line; at all changes in grade, size, or alignment; at all intersections; and at distances not greater than 400 feet for sewers 15 inches or less, and 500 feet for sewers 18 inches to 30 inches, except that distances up to 600 feet may be approved in cases where adequate cleaning equipment for such spacing is owned by the County. Greater spacing may be permitted in larger sewers. Cleanouts may be used only for special conditions and shall not be substituted for manholes nor installed at the end of laterals greater than 150 feet in length.
7. A stainless steel insert dish or gasketed manhole frame and cover in accordance with Standard Detail S-14 shall be installed within all manholes where the edge of the cover is five (5) feet or less to the face of the curb. They shall also be installed in manholes the lie within the vertical sumps of roadways, swales, or ditches and as directed by the County.

B. Manhole Installation

1. Manholes, frames and covers shall be installed as pipeline installation progresses. The manhole vertical axis shall be plumb and directly over the centerline of the pipeline unless otherwise shown or directed.
2. Manhole joints shall be watertight. Exteriors shall be coated with waterproofing in accordance with the Standard Details.
3. Channels for receiving and passing water shall be formed in the bottom of manholes as shown or directed. All such channels shall be lined with sewer brick. Channels shall slope smoothly and evenly and a channel bench constructed to the height of the crown of the highest pipe. Channels and a watertight plug shall be installed in the manhole for future extensions where shown on the Plans or directed by the County.
4. Pipes shall be cut flush with the inside wall of the manhole.
5. The frame and cover shall be installed in accordance with the Standard Details.
6. Parging of the interior brick surfaces will not be permitted.

C. Curing

1. Manhole channels and benches shall receive a minimum twenty-four (24) hour cure time prior to being subjected to sewage flow. The County reserves the right to adjust this curing period if deemed necessary.

D. Tests

The construction of new manholes shall provide for a watertight interior, free of infiltration of groundwater and inflow of surface storm water runoff. After construction and during the one year maintenance period there shall be no leakage or seepage of water into the manhole from defects related to materials and workmanship. All new manholes shall be vacuum tested as follows:

1. Vacuum Testing of New Manholes

Vacuum testing procedures shall be performed in accordance with ASTM C1244 with the following clarifications and modifications.

- a. Vacuum testing shall be performed by a utility testing company approved by Cecil County Water and Sewer Maintenance Department. The Vacuum tests shall be performed after subgrade is within plus or minus 0.2 feet. Cecil County retains the right to require additional vacuum tests if it believes other construction activities have damaged the integrity of the manhole.
- b. The brick bench and channel does not have to be installed at the time of vacuum testing.
- c. The manhole shall be fully backfilled prior to performing the vacuum test.
- d. Prior to testing, all lift holes shall be plugged with mortar. All pipes and pipe stubs entering the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.
- e. The test head shall be placed at the top of the manhole in accordance with the recommendation of the testing apparatus manufacturer. A vacuum of 10 inches of mercury shall be drawn on the manhole. Then the valve on the vacuum line of the test head shall be closed and the time measured to drop the vacuum to 9 inches of mercury. The manhole is acceptable if the time for the vacuum to drop from 10 to 9 inches of mercury is equal to or greater than that shown in the following table:

Manhole Depth	Manhole Diameter (ft.)				
	4	5	6	7	8
	<b>Time (Seconds)</b>				
<4	10	13	16	19	23
6	15	20	25	29	34
8	20	26	33	38	45
10	25	33	41	48	56
12	30	39	49	57	67
14	35	46	57	67	78
16	40	52	67	76	89
18	45	59	73	86	100
20	50	65	81	95	111
22	55	72	89	105	122
23	59	78	97	114	133

- f. If the vacuum test does not pass, the manhole shall be excavated and the joints examined for source(s) of the failure. The joints shall be properly cleared of foreign matter and gaskets checked. The manhole sections shall be re-set as necessary until the passing of the vacuum tests.

END OF SECTION

## SECTION 02720

### SANITARY SEWER FORCE MAINS

#### **PART 1 - GENERAL**

##### A. Description

Sanitary sewer force main installation shall include, but not necessarily be limited to, furnishing and installing pressure rated pipe, fittings, and appurtenances of size and type shown on the Plans, installed on firm foundation true to line and grade and in accordance with the Contract Documents.

##### B. Related Work Specified Elsewhere

1. Aggregate Backfill: Section 02240.
2. Trench Excavation, Backfill, and Compaction; Section 02250.
3. Precast Concrete Utility Structures; Section 03400.

##### C. Quality Assurance

1. The County will inspect all materials before, during and after installation to ensure compliance with the Contract Documents.

#### **PART 2 - MATERIALS**

##### A. General

1. Materials shall be furnished in accordance with the Contract Documents and the current edition of the Approved List of Suppliers and Materials for Water and Sewer Main Construction.
2. To minimize the number of joints, only standard manufacturers length of pipe shall be furnished and installed for all sanitary sewer mains and house connections unless otherwise indicated on the plans, or as approved by the County.

##### B. Pipe Symbols

For convenience and standardization, the various types of pipe are designated on the plans by the following symbols:

PVC – Polyvinyl Chloride Pipe  
DIP – Ductile Iron Pipe

## HDPE – High Density Polyethylene Pipe

### C. Materials Furnished by the County

1. The County will not furnish any materials for sanitary sewer force main construction.
2. Unless otherwise noted in the “Special Provisions,” the County will make water available from its potable water system for pipeline testing at no charge to the Contractor for one test only. The Contractor shall contact the Department of Public Works to coordinate its use. If subsequent testing is required, the Contractor will purchase additional water from the County’s system.

### D. Contractor’s Options

The Contractor shall only furnish ductile iron pipe and fittings, polyvinyl chloride pipe and fittings or high density polyethylene pipe, and fittings for sanitary sewer force mains unless otherwise noted.

### E. Detailed Material Requirements

1. Portland cement concrete for pipe buttresses and anchorages shall be Mix No. 1, as specified in Section 03300.
2. Polyvinyl Chloride Pipe (PVC)
  - a. Polyvinyl Chloride Plastic Pipe 4 inch through 12 inch shall be Class 150 (DR18) and shall meet the requirements of AWWA C900 or C909. PVC Pipe 3 inch and smaller shall be PVC 1120 (SDR21) and shall meet the requirements of ASTM D2241. The outside diameters of DR18 shall be equivalent to cast-iron pipe. PVC Pipe shall have an integral bell with a rubber gasketed joint as listed in the AWWA C900 or C909 standard. Pipe and couplings shall be marked and factory tested in accordance with AWWA C900 or C909.
3. Ductile iron pipe and fittings, polyvinyl chloride pipe and fittings, concrete pressure pipe and fittings shall be as specified in Section 02660. Pressure ratings or class shall be as noted in the Contract Documents. Cement lining and coatings shall be as required on ductile iron pipe (DIP) and fittings.

Pipe shall be ductile iron pipe meeting the minimum material requirements for water main in Section 02660. Pipe shall be special

thickness class 52; however, the specified thickness shall be noted on the construction drawings or project manual and shall account for expected operating pressures, surge pressures and a factor of safety.

4. Ductile Iron Pipe and Fittings

a. Pipe

- 1) Pipe shall be designed and manufactured in accordance with ANSI/AWWA C151/A21.51 unless directed in writing by the County.
- 2) All pipe and fittings shall be designed and constructed to withstand all external pressure caused by overburden as indicated on the profile and traffic loads to which the pipe may be subjected.
- 3) Pipe shall be double thickness cement mortar lined in accordance with AWWA C104 with an interior seal coat of bituminous material. The outside surface shall also be bituminous coated.
- 4) The minimum special standard thickness class shall be as noted herein or as shown on the plans or specified in the “Special Provisions”.

Size (In.)	Class	Max. Cover (Ft.)
3	52	100+
4	52	100 +
6	52	86
8	52	49
10	52	38
12	52	33
14	52	24
16	52*	21
20	52*	18
24	52*	17
30	52*	14
36	52*	13
42	52*	13
48	52*	12
54	52*	12

\* The use of class 50 ductile iron pipe shall be permitted so long as the contractor bed pipe in accordance with Part 3(A)(5).

b. Joints

Joints may be mechanical or rubber gasketed push-on type. Unless otherwise noted, all joints shall be in accordance with ANSI/AWWA C111/A21.11 Standard.

c. Fittings

- 1) All fittings shall have mechanical joints.
- 2) All fittings 3-inches through 24-inches shall be manufactured in accordance with the ANSI/AWWA C153/A21.53 Standard. All fittings 30-inches through 48-inches shall be manufactured in accordance with the ANSI/AWWA C110/A21 .10 Standard for a working pressure of 250 psi unless specified or directed otherwise by the County.

5. High Density Polyethylene (HDPE) Pipe

a. Polyethylene Plastic Pipe

High density polyethylene (HDPE) pipe shall be in accordance with AWWA C906. The Designer is responsible for selecting a pipe class to meet the design requirements. A thicker pipe wall may be required for directional drilling to stay within allowable tensile stress limits as specified by the pipe manufacturer. The Designer's considerations shall include the soil conditions to be encountered, drilling length and equipment pull strength.

6. Joint Restraint

- a. Restrained joint pipe and fittings shall be of the pipe manufacturer's standard design.
- b. Ductile iron retainer glands for use with mechanical type joints shall be as approved.
- c. Rod for tie rod assemblies shall meet the material requirements of ASTM A193, Grade 67, and shall be threaded for at least 8 inches on both ends. Rod shall be 3/4 inch diameter unless otherwise noted.
- d. Nuts shall meet the requirements of ASTM A194. Manufactured tie rod and accessories shall result in the completed restrained joint assembly having a minimum working pressure rating of 200 psi.

7. Resilient Seat Gate Valves

Resilient seat gate valves shall be as specified in Section 2662 for water valves.

8. Valve Boxes

Valve boxes shall be as specified in Section 02660, except the covers shall be labeled "SEWER."

9. Sewage Air Release and Combination Air/Vacuum Valves

- a. Sewage air and vacuum valves shall be of the type that automatically releases air, gas or vapor under pressure, automatically exhausts large quantities of air during the filling of a system, and allows air to reenter during draining or when a vacuum occurs.
- b. Sewage air and vacuum valves shall have an elongated cast iron body and cast iron cover. The internal compound lever mechanism shall be stainless steel and all other internals, including float, stainless steel to positively prevent a galvanic action. The stainless steel float shall withstand a minimum pressure of 1,000 psi.
- c. All materials of construction shall be certified in writing to conform to ASTM specifications as follows:

<b>Part</b>	<b>Material</b>	<b>Specifications</b>
Body and Cover	Cast Iron	Cast Iron
Internals	Stainless Steel	Stainless Steel
Float	Stainless Steel	Stainless Steel
Seat	Buna-N	Buna-N
Exterior Paint	Phenolic Primer Red Oxide	Phenolic Primer Red Oxide

- d. The valve manufacturer shall furnish installation and maintenance instruction manuals with each valve.
- e. Isolating valve shall be installed between force main and air and vacuum valve.
- f. Sewage air and vacuum valves shall be installed in an easily accessible vault. Vault shall be adequately vented to meet air and

vacuum valve requirements.

- g. All internals shall be easily removed through the top cover without removing the main valve from the lines.

10. Detector Tape

Visual detection tape shall be 3 inches wide (minimum) nonmetallic green plastic tape, lettered "SEWER" in black graphics.

11. Tracer Wire for Non-Metallic Pipelines

Tracer wire shall be 8 gauge, 7 strand continuous copper wire with 45 mil polyethylene insulation. The wire shall be blue, have "UL" markings and suitable for direct bury applications. All underground splicing shall be with butt splice connectors and shrink tubing or split bolt connectors with a water proof binder and underground electrical tape.

12. Continuity Test Station

The continuity test station for force mains shall be a 4 ¼" valve box with green locking lid. Test station shall be complete with inset removable terminal board with three (3) terminals.

13. Approved Manufacturers

All sanitary sewer force mains and appurtenances shall be supplied by the following manufacturers:

a. PVC Pipe and Fittings

- 1) J.M. Pipe Company
- 2) National Pipe and Plastic
- 3) ETI
- 4) Diamond

b. Ductile Iron Pipe and Fittings

- 1) U.S. Pipe and Foundry
- 2) Griffin Pipe
- 3) American Pipe
- 4) Atlantic States Pipe
- 5) Clow
- 6) Tyler Foundry

c. HDPE Pipe

- 1) KWH Pipe, Ltd.
- 2) Phillips Driscopipe

d. Restrained DIP Joints

- 1) U.S. Pipe and Foundry, T.R. Flex
- 2) Griffin Snap Lock
- 3) American Flex Ring
- 4) Claw Super Lock

e. Couplings for DIP C-900-AC

- 1) Dresser – Style 153 4”-12”
- 2) Ford – Style FC 2”-24”
- 3) Smith-Blair – Style 441 2”-16”
- 4) Viking-Johnson MaxiFit 1½”-24”
- 5) Viking-Johnson MaxiStep 1½”-24”
- 6) Ramac – Style 501

All couplings must be epoxy or nylon coated.

f. Retainer Glands (DIP)

- 1) EBAA Iron Mega-A-Lug
- 2) Ford Wedge Action Series 1400

g. PVC, HDPE, DIP, PCCP Pipe and Fittings

- As specified in Section 02660.

h. Air & Vacuum Valves

- G.A. Industries
- Apco
- Val-Matic
- ASCO

i. Detector Tape

- Lineguard
- Allen Systems
- Linetic
- Empire Level

## **PART 3 - EXECUTION**

### **A. General**

1. Trench excavation, foundation preparation, backfill, compaction and aggregate backfill shall be as specified in Sections 02240 and 02250.
2. Force main installation shall be as specified in Section 02660, "Water Mains," except chlorination is not required.
3. Pipe bedding, thrust and anchor blocks, and force main appurtenances shall be installed in accordance with the Standard Details for Water.
4. Resilient Seat gate valve installation shall be as specified in Section 02662 for water valves.
5. Sewage air release and combination air release/vacuum valves shall be installed in accordance with the Standard Details.

### **B. Pipe Installation**

1. All pipe shall be installed in accordance with the approved manufacturer's written instructions and as specified herein. These recommendations, if more restrictive than that shown in the Standard Details shall include: maximum trench width, bedding requirements, backfill material, and compaction, where applicable. In addition, the following shall apply unless otherwise noted:
  - a. Polyvinyl chloride water pipe (PVC) and High Density Polyethylene (HDPE) shall be installed in accordance with the Standard Details and the manufacturer's recommendation.
  - b. Ductile iron pipe (DIP) shall be installed in accordance with the Standard Details and the recommendations of the Ductile Iron Pipe Research Association.
2. Equipment for Handling Pipe: Proper and suitable tools and appliances as approved for safe and convenient handling and joining of pipes shall be used.
3. Pipe Installation: Pipe shall be carefully handled and lowered into the trench. Pipe shall be installed with special care to insure that each joint is watertight, has met the required manufacturers insertion depth, and has no shoulder or unevenness of any kind along the inside of the pipeline. No wedging or blocking will be permitted in installing any pipe unless directed by written order or permission in writing is obtained

from the County.

3. Pipe Setting and Protection: No pipe shall be brought into position until the preceding length has been thoroughly bedded and secured in place. Care shall be used to assure water tightness and prevent damage to, or disturbing of, the joints during the refilling process. After pipes have been installed and joints have been made, there shall be no walking on or working over the pipe, except as may be necessary in tamping the backfill material, until the backfill is at least 2 feet over the top of the pipe.
5. Cleaning Pipe: The pipes shall be thoroughly cleaned before being installed and shall be kept clean until acceptance of the completed work. Open ends of all pipelines shall be provided with a stopper carefully fitted to keep dirt and other substances from entering. This stopper shall remain in place at all times when installation is not in progress.
6. Cutting Pipe: Whenever a pipe requires cutting, to fit into the line or bring it to the required location, the work shall be performed by an approved method that leaves a smooth, square end. Cut PVC pipe ends shall have burrs removed and the end beveled to match factory bevel. Field spigots shall be stop-marked with a felt tip marker or wax crayon for the proper length of assembly insertion.
7. Jointing Pipe
  - a. General

Before any joints are made in the trench, the Contractor shall demonstrate to the County by making a sample joint that methods he will employ conform with the Specifications, will secure a water-tight joint, and that the workmen whom he intends to use for this work are familiar with the requirements for making proper joints.
  - b. Push-On Gasketed Joints

Prior to making gasketed joints, both mating pipe ends and the gasket shall be cleaned of all foreign material. The gasket shall then be inserted in or stretched over the cleaned gasket seat and lubricant applied as recommended by the manufacturer and approved by the County. The pipe ends shall be carefully aligned and pushed together to meet the required manufacturer's insertion depth. There shall be no shoulder or unevenness of any kind along the inside of the pipeline. The method of inserting the spigot into the bell shall be as recommended by the manufacturer

and approved by the County.

c. Mechanical Joints

Mechanical joints shall be joined in accordance with the manufacturer's recommendations as approved by the County. All nuts shall be tightened uniformly with a torque of not less than 75 or more than 90 foot-pounds.

d. HDPE Pipe Jointing Methods

- 1) All joints at the ends of HDPE runs shall be coupled to the adjacent pipe section. Mechanical coupled joints shall provide leak free service at the specified test pressure.
- 2) Wherever possible, the polyethylene pipe should be joined by the method of thermal butt-fusion, as outlined in ASTM D-2657, Heat Joining Polyolefin Pipe and Fittings. Butt-fusion joining of pipe and fittings shall be performed in accordance with the procedures recommended by the manufacturer. The temperature of the heater plate should not exceed 210°C +/- 5°C (410°F +/- 10°F) and the joining pressure should not exceed 25 pounds per square inch of projected end area, excluding an allowance for friction.
- 3) The polyethylene pipe may be adapted to fittings or other systems by means of an assembly consisting of a polyethylene stub-end, butt-fused to the pipe, a back-up flange of ductile iron, made to Class 150, ANSI B16.5 dimensional standards with exceptions, bolts of compatible material and a gasket of suitable red rubber or asbestos-rubber compound cut to fit the joint. In all cases, the bolts shall be drawn up evenly and in line.
- 4) The pipe supplier shall be consulted to obtain machinery and expertise for the joining by butt-fusion of polyethylene pipe and fittings. No pipe or fittings shall be joined by fusion by any contractor unless he is adequately trained and qualified in the techniques involved.

- e. Other methods of jointing pipe will be given consideration by the County, provided the Contractor furnishes evidence that the proposed method is equal to or better than the specified methods, and further, provided that the proposed method has been successfully used and that the joint has previously been manufactured by the company from whom the Contractor

proposes to purchase pipe.

- f. All jointing material and workmanship shall be in accordance with the manufacturer's recommendations as approved by the County.
8. Tracer Wire: All non-metallic force mains shall have tracer wire secured with duct tape to the top of the pipe at ten (10) foot centers and attached to the valve boxes as noted in the Standard Details. The tracer wire shall be continuous for the full length of the pipeline. Continuous conductivity shall be maintained and tested. Underground splice connections shall be made with soldieries split bolt connectors and taped to pipe.
9. Detector Tape: Install visual detection tape 18 inches above all mains.
10. Restrained joints and joint restraint systems shall be assembled in accordance with the manufacturer's recommendations. Tie rod nuts shall be uniformly tightened and double nutted to prevent movement. Joint restraint systems shall be field protective coated with two coats of a bituminous coating after assembly.
11. Connections to existing work shall be made by the Contractor in the presence of the County at such a time and in such manner as directed and approved by the County. The Contractor shall complete the work with the greatest possible speed and all work will proceed without interruption until the existing system is returned to operation, so that the public will be inconvenienced as little as possible. If a sewage pump around is required as part of the connection to existing facilities, the pump around will be done at the Contractor's expense.
12. Buttresses and anchors shall be installed at all caps, horizontal bends, tees, branches and vertical bends as required in the Contract Documents, Standard Details, and as directed by the County.

C. Field Test

1. DIP force main and appurtenances shall be tested in accordance with Section 02660, except as modified herein.
2. HDPE Field Tests
  - a. All pressure pipe shall be tested in accordance with PPI Technical Report TR 31/9-79.
  - b. The pipe shall be installed and backfilled prior to testing.

Flanged connections shall be left exposed for visual leak inspection.

- c. The test shall be performed such that the pipe temperature remains constant during the duration of the test.
- d. Test pressure shall be 1.5 times the rated operating pressure of the pipe or the lowest rated component of the system.
- e. The pipe shall be filled with water and an initial test pressure of 1.5 times the rated operating pressure of the pipe shall be applied and allowed to stand without makeup pressure for 3 hours to allow for diametric expansion or pipe stretching to stabilize.
- f. After the initial equilibrium period, the test section of pipe shall be brought back to a final test pressure of 1.5 times the rated operating pressure of the pipe. The pump shall be turned off and the pipe shall remain standing for 2 hours.
- g. No visual leaks or pressure drops greater than 5 psi shall be permitted during the final test period.
- h. Once the final test period is complete, water shall be added to the pipe to determine the allowance for pipe expansion. The amount of water necessary to return the pipe to the final test pressure shall be measured.
- i. The amount of water required to return the pipe to the final test pressure shall be less than the amount indicated in the following table:

**Allowance for Expansion (U.S. Gallons/100 Feet of Pipe)**

<u>Nominal Pipe Diameter (in.)</u>	<u>Gallons for 2 Hour Test Period</u>
3	0.15
4	0.25
6	0.60
8	1.0
10	1.3
12	2.3
14	2.8
16	3.3
18	4.3
20	5.5

22	7.0
24	8.9
28	11.1
32	14.3
36	18.0
40	22.0
48	27.0
54	35.0

If the pipeline contains sections of various diameters, the allowable leakage will be the sum of computed leakage for each size.

j. Continuity Testing for Non-Metallic Pipe

- 1) After backfilling, the County shall test at the Contractor/Developer's expense, the tracer wire to demonstrate electrical continuity between valve boxes and through the length of the non-metallic pipe line installed. The Contractor shall schedule all tests with the County at least 48 hours in advance. Any discontinuity shall be located, repaired and retested at the Contractor/Developer's expense until continuity is demonstrated.
- 2) On Capital projects, the County will perform one continuity test at no cost to the Contractor. Should the continuity test fail, the Contractor shall reimburse the County for all costs resulting from such additional tests required until continuity test passes.
- 3) Chlorination will not be required

End of Section

SECTION 02731  
Low Pressure Sewer

**1.0 General**

- A. Low pressure system installation shall include, but not necessarily limited to, furnishing and installing pressure sewer pipe, valves, fittings and appurtenances of the size and type shown on the Contract Plans and in accordance with the Contract Documents and approved installation details.
  
- B. Related Work Specified Elsewhere
  - 1. Clearing and Grubbing: Section 02110
  - 2. Trench Excavation, Backfill and Compaction: Section 02250
  - 3. Water Valves and Appurtenances: Section 02662
  - 4. Water Services and Appurtenances: Section 02554
  - 5. Cast-in-Place Concrete: Section 03300
  - 6. Miscellaneous Metals: Section 05500
  - 7. Sewage Grinder Pumping Units: Section 11307
  
- C. Quality Assurance

The County will inspect all materials before, during and after installation to ensure compliance with the Contract Documents.

**2.0 Materials**

- A. General
  - 1. Materials shall be furnished in accordance with the Contract Documents and the current edition of the Approved List of Suppliers and Materials for Water and Sewer Construction.
  - 2. To minimize the number of joints, only standard manufacturer's length of pipe shall be furnished and installed for low pressure sewer unless otherwise indicated on the plans or approved by the County.
  
- B. Materials
  - 1. Pressure Sewer Piping, Fittings and Valves
    - a. All low pressure sewer pipe, valves and fittings 4-inches and larger shall be in accordance with Section 02720.
    - b. HDPE Pipe

- i. High density polyethylene pipe and fittings (HDPE) shall have a standard thermoplastic material designation code of PE 3408, comply with all requirements for a Grade PE34 according to ASTM D 3350 and have a PPI recommended designation of PE 3408.
  - ii. Pipe and fittings shall be manufactured from identical material. The manufacturer shall provide certification that samples of the manufacturer's production pipe have been tested in-house, in accordance with ASTM D 2837 and validated in accordance with the latest revision of PPI TR-3. Under these procedures, the minimum hydrostatic design basis shall be certified by the manufacturer to be 1600 psi at 73.4cF and 800 psi at 140cF.
  - iii. Pipe shall be DR 11, pressure rated for 160 psi.
  - iv. iv. Pipe and fittings shall be butt fusible at 440c F or 500c F and shall be socket or sidewall fusible at 500c F.
  - v. Pipe shall be manufactured in accordance with ASTM F 714.
  - vi. Fittings and transition pieces shall be butt fusion type, meeting the requirements of ASTM D 3261 and this specification. All fittings shall be pressure rated to match the system piping to which they are fused. At the point of fusion, the outside diameter and minimum wall thickness shall meet the outside diameter and minimum wall thickness of ASTM F 714 for the same size of pipe.
- c. PVC Pipe
- i. Pipe shall be push-on type, SDR-26, rated for 160 psi and meet requirements of ASTM D-2241.
  - ii. The pipe shall be plainly marked with manufacturer's name, size, material, type and grade, NSF seal and pressure rating.
  - iii. The material shall consist of Grade 1 PVC compound material in accordance with ASTM D 1784.
  - iv. Rubber gaskets shall meet the requirements of ASTM D-1869.
  - v. Impact strength shall meet the requirements of ASTM D-2444.

- d. All valves 2” and smaller shall be Ball Valve Curb Stop with Female Iron Pipe Thread –(NPT) end connections. The valve size shall be same as the pipeline size. Connection to force main shall be packed joint with stainless steel insert, push-on joint or approved equal. Valves shall open left, counter clockwise and be suitable for the conveyance of wastewater.

The ball valves shall turn one-quarter (1/4) turn, ninety degrees to open and shall have a minimum working pressure rating of 200psi. The ball valve shall be suitable for buried service and shall be manufactured in accordance with AWWA C-500.

Valve extension stems shall be manufactured with cold rolled steel and have a centering ring when depth of ball valve is greater than 6’-0”. Top of stem shall be compatible with a standard tee-head wrench and extend to a maximum of 3-feet below finished grade. Bottom of stem shall be compatible with the ball valve tee-head and pinned to top of valve.

All valves 3” and larger shall be resilient seal gate valves, as specified in accordance with Sections 02660 and 02664.

- e. Roadway valve boxes shall be as specified in Section 02660 except the covers shall be labeled “SEWER”.
- f. Detector Tape

Visual detection tape shall be 3 inches wide (minimum) non-metallic green plastic tape lettered “sewer” in black graphics.

- g. Tracer Wire for Non-Metallic Pipelines

Tracer wire shall be 8 gauge, 7 strand continuous copper wire with a 45 mil polyethylene insulation. The wire shall be green, have “UL” markings and suitable for direct bury applications. All underground splicing shall be with butt splice connectors and shrink tubing or split bolt connections with a water proof binder and underground electrical tape.

- h. Tapping Saddle

Tapping saddle shall be specifically designed to tap a live HDPE low pressure sewer main and shall be capable of being clamped to the main with stainless steel bolts. The tapping tee shall contain a full wrap-around saddle. The tapping tee shall contain an integral brass cutter and sleeve with lower and upper “cutter stops” which shall also function as a cut-off valve. Tapping tee shall be rated for a minimum 160 psi.

i. Small diameter Ductile Iron Pipe Iron Pipe Size (IPS)

Small diameter ductile iron pipe and fittings shall meet the requirements of ASTM A-536, Grade 64-65-12 with a minimum wall thickness of 0.25 inches. Threads shall be NPT per ANSI B. 120-1. All pipe and fittings shall receive an interior epoxy coating in accordance with AWWA C210.

j. 24-inch Frame and Cover Adjustment Riser

Adjustment riser shall be a multi-purpose rubber composite which enables the cast iron frame to be easily adjusted to the finished pavement surface. The adjustment riser shall be specifically manufactured for standard sanitary manholes and frames and shall withstand vehicular traffic conditions.

k. Continuity Test Station

- a. The continuity test station beside a fire hydrant shall be a 2 1/2" shaft cathodic test box constructed of ABS plastic with cast iron rim and lid. The minimum box length shall be 24" and the body shall be flared or squared at the base to prevent pull out or settling. Lid shall be locking, green in color and have raised custom lettering noting Atest@. Test station shall be complete with an inset removable terminal board with three (3) terminals.
- b. The continuity test station that is located over the low pressure sewer shall be a 4 1/4" valve box with blue locking lid. Test station shall be complete with an inset removable terminal board with three (3) terminals.

### **3.0 EXECUTION**

A. Pressure Sewer, Fittings and Valves

1. The pressure sewer main shall be installed by either directional boring or open cut methods. In either case, unless otherwise prohibited by specific wetland permit requirements or otherwise shown on the construction drawings or specified, the entire drainage and utility easement and/or right-of-way shall be cleared and grubbed prior to the pipeline construction in accordance with Section 02110.
2. For open cut methods, the installation of pressure sewer pipe shall be in accordance with Section 02660 of the Standard Specifications. For directional drilling methods, the installation of pressure sewer pipe shall

be in accordance with Section 02310 of the Standard Specifications.

3. Service valve assemblies (SVA) subjected to test pressure or system operating pressure prior to completion of service pipe installation and backfill shall be provided with adequate temporary bracing or anchorage to prevent valve separation from pipe.
4. HDPE pipe and fittings shall be installed in strict accordance with the manufacturer=s recommendations.

B. Pressure Sewer House Service Connections and Appurtenances

1. Service connections from sewage grinder pump connections or pressure sewer mains shall be installed using service saddles as the pressure sewer main is being installed or with installation of the service valve assemblies as approved by the Owner.
2. Intersection, Flushing Connections, Terminal Flushing Connections and In-Line Cleanouts and Valves: Flushing connections and in-line cleanouts and valves shall be provided where indicated on the Drawings and in accordance with the Construction Details.

C. Concrete Thrust Blocks

1. The Contractor shall provide concrete thrust blocks on all pressure sewer bends, tees, plugs and caps in accordance with the drawings and Standard Details. The entire face of earth against which the thrust block will bear shall be undisturbed earth or soil that meets all required compaction requirements, flat, and at the proper angle to counteract the thrust. Concrete thrust blocks shall be cured for a minimum of 48 hours before testing. Wood for temporary blocking and valve box installation shall be pressure treated southern yellow suitable for a buried application. Wood for blocking shall be solid, a minimum of one inch thick. No wood buttressing shall be used except as a temporary restraining measure until remaining work is completed.

D. Tracer Wire

1. All non-metallic mains shall have a tracer wire secured with duct tape to the top of the pipe. The tracer wire shall be continuous for the full length of the pipeline. Continuous conductivity shall be maintained and tested. Underground splice connections shall be made with solderless split bolt connectors and taped to pipe.

E. Detector Tape

1. Install visual detection tape 18 inches above all mains.

F. Inspection and Field Tests

1. The Owner will inspect all materials before and after installation to ensure compliance with these Contract Documents. When specific material tests are called for in the referenced standards and specifications, the County shall have the option of requiring that any or all these tests be performed for materials furnished for a specified project.
2. After installation, pressure piping and appurtenances, and shall be tested by the Contractor for compliance with the Contract Documents. The Contractor shall furnish all labor, tools, materials, and equipment necessary to perform the specified tests.
3. All tests shall be witnessed by the County Owner. The Contractor shall schedule all tests with the Owner at least 2 working days in advance.
4. If any section of the pressure sewer system fails the inspection and/or tests, the Contractor shall, at his own expense, replace, repair, adjust, seal, or reseal the personnel, to witness tests once only for each section tested. If additional tests are required, all costs of County personnel and equipment will be deducted from amounts to be paid the Contractor.
5. Inspection and testing of the various components of the low pressure sewer system shall be tested in accordance with Section 02660 of the Standard Specifications. Specified test pressure shall be 80 psi as measured at the high point of the low pressure sewer system.
6. At the Contractor's expense and risk, he may elect to test against closed curb stops. If test pressures do not hold, the Contractor shall follow the procedure in item 8 below.
7. Testing shall include the entire low pressure system as one whole and complete system. With the exception of the ball valve curb stops on the service valve assemblies, and on the flushing connection risers, all valves shall be in the open position during testing.
8. Normal test procedures include the installation of a temporary capped and buttressed pipes tub extending from the ball valve curb stop at each service valve assembly as shown on the Standard Details. However, at the Contractor's risk and expense, he may elect to test against closed ball valve curb stops at the service valve assemblies. If the ball valve curb stops are unable to hold the test pressure, the Contractor shall, at his

expense, install the temporary capped and buttressed pipe stub as described above. In all cases, there must be a physical break between the ball valve curb stop and grinder pump basin during testing. This physical break must remain until the entire low pressure system has been tested and approved. The pipe and fittings between the ball valve curb stop and grinder pump basin will not be tested.

G. Continuity Testing for Non-Metallic Pipe

1. After backfilling, the County shall test the tracer wire to demonstrate electrical continuity between valve boxes and through the length of the non-metallic pipeline installed. The Contractor shall schedule all tests with the County at least 2 working days in advance. Any discontinuity shall be located, repaired, and retested at the Contractor's expense until continuity is demonstrated.
2. On Capital Projects, the County will perform one continuity test at no cost to the Contractor. Should the continuity test fail, the Contractor shall reimburse the County for all costs resulting from such additional test so required until the continuity test passes.

H. Service Taps on Low Pressure Sewer

Service connections on live low pressure sewers shall be made with tapping saddles specifically designed for HDPE pipe. Tapping saddle shall be secured to the low pressure sewer by tightening the supplied bolts in strict accordance with the pipe and fitting manufacturers recommendations. Plastic stiffener shall be inserted into the service connection end of tap. HDPE service line shall connect to HDPE adaptor.

END OF SECTION

SECTION 02800

RESTORATION

**PART 1 - GENERAL**

A. Description

Restoration shall include, but not necessarily be limited to all clean up and disposal of waste materials and the restabilization of disturbed areas including paved areas, non-paved areas, concrete improvements, street signs, mail boxes, fences, trees, shrubs and other improvements whether shown in the Approved Plans or not.

B. Related Work Included Elsewhere

1. Test Pits: Section 02012
2. Removal or Abandonment of Existing Utilities: Section 02050
3. Clearing and Grubbing: Section 02110
4. Aggregate Backfill: Section 02240
5. Trench Excavation, Backfill and Compaction: Section 02250
6. Boring and/or Jacking Pipe: Section 02300
7. Tunneling: Section 02400
8. Lawn Restoration Section 02820
9. Sodding: Section 02830
10. Soil Stabilization Matting: Section 02850
11. Cast-In-Place Concrete: Section 03300

C. Quality Assurance

The County will inspect all materials before, during and after installation to ensure compliance with the Contract Documents.

**PART 2 - MATERIALS**

A. General

Materials shall be furnished in accordance with the Contract Documents and the current edition of the Approved List of Suppliers and Materials for Water and Sewer Main Construction.

B. Materials Furnished by the County

The County will not furnish any materials for restoration other than those acceptable materials which are available from the trench excavation limits as shown on the Contract Documents.

C. Contractor's Options

Not applicable.

D. Detailed Material Requirements

Not applicable.

**PART 3 - EXECUTION**

A. General

After the completion of backfilling, all materials not used therein shall be removed and disposed of in such a manner and at such point or points as shall be approved or directed by the County; and all roads, sidewalks, and other places on the line of the work shall be left free of debris, clean, and in good order. Said cleaning-up shall be done by the Contractor without extra compensation; and if he shall fail to do such work within twenty four hours after receipt of notice, the County may arrange to have the cleaning-up done by others; and the cost shall be retained out of the monies due or to become due to the Contractor under the Contract. In case of emergency, the County may restore or remove and dispose of materials wherever necessary without giving previous notice to the Contractor. The Contractor will reimburse the County for all costs incurred.

B. Paved Areas

1. Immediately upon completion of the trench backfill and compaction as previously specified, the Contractor shall provide graded aggregate subbase, temporary bituminous surfacing material as per the Approved Plans and/or direction of the governing regulatory agency.
2. Weather permitting, the Contractor shall remove and dispose of the temporary

surfacing materials, cut-back the edge of the existing pavement as per the Contract Documents, and permanently patch-pave the area as specified in the Contract Documents and/or governing agency direction. This shall be done within 30 calendar days after backfilling and compacting the trench as described in the paragraph above or within the time period specified by the governing agency.

C. Concrete Improvements

Sidewalks, curbs, combination curb and gutter, drive aprons, and other concrete improvements removed, soiled, or damaged by the Contractor's activities shall be cleaned or replaced by the Contractor in kind, or as directed by the County and/or Contract Documents without extra compensation.

D. Non-paved Areas

1. Immediately upon completion of the trench backfill and compaction as previously specified, the Contractor shall temporarily stabilize the area in accordance with the Contract Documents.
2. Weather permitting, within 14 days after the completion of trench backfill and compaction, the Contractor shall permanently stabilize the area with seeding and mulching or sodding, as noted in the Contract Documents.

E. Street Signs, Mail Boxes, Fences, Shrubs, Trees, and Other Improvements

1. Existing street signs and traffic control devices stored or relocated by the Contractor will be reset by the Contractor after construction in the area is complete and the work approved by the County.
2. In case of emergency, the County may reset street signs and traffic control devices wherever necessary without giving previous notice to the contractor; and the cost of doing so shall be retained from any monies due to become due the contractor under the contract.
3. Mailboxes shall be carefully removed by the Contractor to the extent required to permit construction operations and as directed by the Postal Service. It shall be the Contractor's responsibility to temporarily reset mailboxes during construction to maintain service until the boxes are permanently reset in their original locations or at locations designated by the Postal Service. The Contractor shall comply with all Postal Service regulations regarding the location and height of all mailboxes disturbed by his activities.
4. Existing fences, paper boxes, signs, property markers, and other similar items shall be carefully removed by the Contractor to the extent required to permit construction operations and as directed by the County. The Contractor shall

safely store all items during the time that they are down and when possible, re-erect them in the original locations or at locations designated by the County.

5. Shrubs, hedges, and other plantings shall be transplanted with sufficient earth to insure that no damage to their major root system occurs. After transplanting has been accomplished, it shall be the Contractor's responsibility to water all plants until their growth is established.

END OF SECTION

## SECTION 02820

### LAWN RESTORATION

#### **PART 1 - GENERAL**

A. Description

Lawn Restoration shall include, but not necessarily be limited to, top soil preparation, seeding, fertilizing, mulching, liming as required, over seeding, and re-fertilizing all areas disturbed by construction and where designated for Lawn Restoration in accordance with the Contract Documents.

B. Related Work Included Elsewhere

1. Clearing and Grubbing: Section 02110
2. Solid Sodding: Section 02830
3. Soil Stabilization Matting: Section 02850

C. Quality Assurance

The County will inspect all materials before, during and after installation to insure compliance with the Contract Documents.

D. Establishment of Vegetation within Wetland Areas

Permanent soil stabilization measures within wetland and wetland buffers and other environmentally sensitive areas shall be performed in strict accordance with the Maryland Department of the Environment and/or Army Corps of Engineers Wetlands and Waterways Permit. The lawn restoration requirements herein do not pertain to special conditions associated with wetland areas.

E. Lawn restoration shall be performed by a professional landscape contractor in which over fifty percent of their business is landscape work. The Contractor shall provide evidence of landscapers work history and references for Cecil County review and approval prior to the work being performed.

F. The Contractor and landscape subcontractor shall obtain and file at the work site a copy of the Maryland Turf Grass Law and Regulations and Maryland Seed Law and Regulations available from the Maryland Department of Agriculture.

**PART 2 - MATERIALS**

A. Materials Furnished by the County

- 1. The County will not furnish any materials for turf establishment.

B. Contractor’s Options

- 1. Fertilizer may be furnished in either dry or liquid form unless otherwise noted.
- 2. Mulch may consist of straw, hay, salt hay, or wood cellulose fiber unless otherwise noted.

C. Detailed Material Requirements

1. Ground Limestone

Ground limestone shall contain not less than 80% calcium and magnesium carbonates. Dolomitic or magnesium limestone shall contain at least 10% magnesium as magnesium oxide. The limestone shall be ground to meet the following size gradation:

Sieve Sizes U.S. Standard	Percent Passing by Weight
No. 10	100
No. 20	98
No. 100	50

2. Fertilizer

- a. Fertilizer analysis shall be 10-10-40 for temporary seeding and 10-20-20 for permanent seeding. It shall be a standard commercial grade fertilizer meeting the requirements of all State Commercial fertilizer shall provide the minimum percentage of available nutrients specified.
- b. Fertilizer shall be furnished in bulk or new, clean, sealed, and properly labeled bags. Fertilizer failing to meet the specified analysis may be used as determined by the County providing sufficient materials are applied to comply with the specified nutrients per unit of measure without additional cost to the County.

3. Seed

- a. Seed lots must be state certified and blended under the supervision of the Maryland Department of Agriculture (MDA), Turf and Seed Section.

- b. All seed and labeling must fully comply with the Maryland Seed Law and these Specifications.
- c. Each container shall have permanently affixed to it an accurate analysis tag and a certification tag.
- d. All seed lots to be used in this mixture shall have been pretested by the Maryland Seed Laboratory to insure compliance with Specifications.
- e. A quality control sample of the delivered mixture may be submitted to the Maryland Seed Laboratory for testing prior to payment and any lots found not to comply with the Specifications shall be returned at the Contractor's expense.
- f. The Engineer's representative shall collect all seed certification tags and/or sod certification prior to the beginning of any seed or sod work.
- g. No seed shall be used after date of expiration.
- h. Seed type and application rates

(i) For sunny and partly shaded improved areas which are mowed regularly; sow the following mixtures at 195 pounds per acre or 4.5 pounds per 1,000 square feet between March 1 and May 31 and between August 15 and October 31:

<u>Grass Type</u>	<u>Percent</u>	<u>Certified Grass Species</u>
Tall Fescue	90-100	Adventure, Apache, Arid, Falcon, Finelawn I or Rebel II
Kentucky Blue Grass	0-10	Common, Kenblue, Vica, Ram I or Monopoly

(ii) For heavily shaded improved areas which are mowed regularly; sow the following mixtures at 175 pounds per acre or 4 pounds per 1,000 square feet between March 1 and May 31 and between August 15 and October 31:

<u>Grass Type</u>	<u>Percent</u>	<u>Certified Grass Species</u>
Tall Fescue	90-100	Adventure, Apache, Arid, Falcon, Finelawn I or Rebel II
Perennial Ryegrass	10	All Star, Blazer, Manhattan,

Palmer, Pennant, Pennfine,  
Premier, Prelude, Regal or  
Repell

Creeping Red Fescue  
and/or Chewings Fescue                      25                      Penlawn, Flyer, Longfellow,  
Victory or Jamestown

(iii) For unimproved areas not to be mowed; sow mixture at 175 pounds per acre or 4 pounds per 1,000 square feet between March 1 and May 31 and between August 15 and October 31:

<u>Grass Type</u>	<u>Percent</u>	<u>Certified Grass Species</u>
Tall Fescue	80	Kentucky 31 (K-31)
Perennial Ryegrass	20	Common

All seed varieties shall meet the following minimum specifications:

- 1) Minimum Purity 98%
  - 2) Minimum Germination 85%
  - 3) Maximum Other Crop 0.1%
  - 4) Maximum Weed Seed 0.1%
  - 5) Noxious Weeds None
- \* Must be free of ryegrass, timothy, orchard grass, bentgrass, Canada Bluegrass, clover, or any other contaminant which shall be unsightly and uncontrollable.
  - \*\* Must be free of dock, cheat, chess, chickweed, crabgrass, plantain, and black magic.
  - \*\*\* Must be free of all Maryland prohibited and restricted noxious weeds.

- 4. Mulch
  - a. Mulches shall be free of clay, stones, foreign substances, plant parts of Canada Thistle and Johnsongrass, and reasonably free of other weed seeds. Mulches containing Canada Thistle and Johnsongrass shall not be used for any purposes.
  - b. Straw, hay, and salt mulches shall not contain sticks larger than 1/4-inch

in diameter or other materials which would prevent matting down during application. No straw, hay, or salt hay mulches shall be used within 48 hours after cutting. Straw, hay, and salt hay shall be free from mold and other objectionable material and shall be in an air-dry condition suitable for placing with mulch blower equipment.

c. The following mulches may be acceptable by visual inspection provided they meet the above and following requirements:

- 1) Straw: Straw shall consist of thoroughly threshed wheat, rye, or oat straw.
- 2) Hay: Hay shall consist of native grasses or other plant material approved by the County. Hay shall be free of noxious weed seeds as specified in the Maryland Seed Law.
- 3) Salt Hay: Salt hay shall consist of well-cured beach grasses or other approved material.
- 4) Wood Cellulose Fiber: Wood cellulose fiber shall consist of specially prepared wood cellulose processed into a uniform fibrous physical state. Wood cellulose fiber shall contain a green dye that will provide easy visual inspection for uniformity of the slurry spread. The wood cellulose fiber, including dye, shall contain no germination or growth inhibiting properties.

The material shall be manufactured and processed in a manner that the wood cellulose fiber will blend with seed, fertilizer, and other additives to form a homogeneous slurry. The wood cellulose fiber shall perform satisfactorily in hydraulic seeding equipment without clogging or damaging the equipment.

The manufacturer shall certify that wood cellulose fiber meets the following requirements:

Requirements Specification Limits

Particle Length Approximately 3/8 inch  
Particle Thickness Approximately 3/64 inch  
Net Dry Weight Content Minimum stated on bag  
ph, ASTM D778 4.0 to 8.5  
Ash Content, ASTM D586 1.6% maximum  
Water Holding Capacity 90% minimum

The material shall be delivered in packages of uniform weight not exceeding 75 pounds net weight and bear the name of the

manufacturer, the net weight, and a supplemental statement of net weight content.

5) Mulch Binder

Mulch binder shall be emulsified asphalts or wood cellulose fiber meeting the requirements of Paragraph 4) above.

6) Water

Water used in the planting or care of vegetation shall be free from oil, acids, alkalis, salts, or any substance injurious to plant life. Water from streams, lakes, ponds, or similar sources shall not be used unless the source is approved by the County.

5. Topsoil

- a. Topsoil shall consist of natural surface agricultural soil capable of sustaining vigorous plant growth. Topsoil shall be free of stones, roots, rubbish and other objectionable materials including Bermuda grass, poison ivy and other items harmful to plant life. Organic matter, as determined by AASHTO Test T-194, shall be 1.5 to 10 percent by weight. The pH shall range between 5.0 and 7.5. The soil analysis shall meet the following in accordance with AASHTO M146: Sand (20 to 75% by weight), Silt ( 10 to 60% by weight), Clay (5 to 30% by weight).
- b. Topsoil on site may be salvaged for re-use provided that it meets the above specified requirements.
- c. The source of off-site manufactured topsoil shall originate from reputable local supplier with prior Cecil County approval.

**PART 3 - EXECUTION**

A. Seeding Seasons

Seed shall be sown from March 1 to May 31 and from August 15 to October 15 inclusive as soon as the soil is dry enough to allow proper penetration of a seedbed. Extensions beyond these time periods may be granted by the County, depending upon weather conditions for the period in question. Any planting outside of these seasons shall be solely at the Contractor's risk and shall not be subject to compensation until stabilization has been accomplished in accordance with these Specifications. No seeding shall be done on frozen ground or when the temperature is 32°F or lower.

B. Schedule of Procedure

The Contractor shall begin his work at a point or points approved by the County. When topsoil is required for areas to be seeded, all topsoiling shall be completed before seeding operations are started.

C. Topsoil Application

Topsoil shall be applied in accordance with the Maryland E&S Manual.

D. Soil Preparation

1. For unimproved areas which will not be mowed regularly: Areas of disturbance shall be graded to match the original condition. Soil shall be scarified to a depth of 2-inches. Remove all stones greater than 1-inch in diameter by means of manual or mechanical landscape rakes. Seed and mulch as specified below.
2. For improved areas which will be mowed regularly: Soil shall be lightly scarified if compacted. Remove all stones greater than 1-inch by means of manual or mechanical landscape rakes. Topsoil shall be placed to a uniform compacted depth of 2-inches and shall be graded to match original conditions.

E. Seeding

Seeding shall consist of soil preparation as specified above and application of seed, fertilizer, and mulch, as specified below. Seed application shall be by either of the following application methods as the Contractor may elect:

1. Dry Application Method

- a. Ground Limestone: Ground limestone, shall be applied, at rates as determined by soil test or no less than 50 pounds per 1000 square feet, separately before the application of any fertilizer or seed on seedbeds which have previously been prepared. Where ground limestone is required to be worked in, the seedbed shall again be properly graded and dressed for seeding. Limestone shall be worked into seedbeds as follows:

Seedbed	Depth of Limestone Incorporation
4 inches of topsoil	3 inches
2 inches of topsoil	2 inches

Subsoil, serrated cut  
slopes and other non  
topsoiled areas 3:1  
and steeper

Incorporation not  
required

- b. Fertilizer: Fertilizer of the analysis 10-20-20 shall be applied at a rate of 1,000 pounds per acre.
- c. Seed Application: Application rates shall be in accordance with Section D above. After seeding, the areas shall be lightly raked and rolled. Areas which do not “catch” shall be reseeded at an interval of fourteen (14) days, which shall continue until a satisfactory growth of grass is established over the entire area.

## 2. Wet Application Method

- a. General: Apply seed and fertilizer (ground limestone, if required) by spraying the material on previously prepared seedbeds in the form of an aqueous mixture using the methods and equipment described herein. The rates of application shall be the same as those specified for the Dry Application Method.
- b. Spraying Equipment: The spraying equipment shall have a water tank equipped with a bar or liquid level gage calibrated to read in increments not larger than 50 gallons over the entire range of the tank capacity. The gage shall be mounted to be visible to the nozzle operator. The tank shall also be equipped with an agitation system capable of keeping all the solids in the mixture in complete suspension at all times until used.
- c. Ground Limestone
  - 1) Ground limestone, if required, shall be sprayed separately from mixtures of seed and fertilizer on areas flatter than 3:1. The water-limestone mixture shall contain a maximum of 600 pounds per 100 gallons. The water limestone mixture shall be applied at a minimum rate of 1000 gallons per acre. The water-limestone mixture shall be worked into the topsoil. After working the ground limestone into the topsoil, the seedbed shall again be properly graded and dressed.
  - 2) Ground limestone shall not be required to be applied separately on slope areas 3:1 and steeper. The water-seed-fertilizer and limestone mixture shall be applied at a minimum rate of 1000 gallons per acre in the relative

proportions specified so that these combined solids do not exceed 600 pounds per 100 gallons.

d. Application

- 1) Mixtures of seed and fertilizer shall only be sprayed upon previously prepared seedbeds on which ground limestone, if required, has been incorporated. Seed and/or fertilizer shall be mixed together with water in the relative proportions specified so that these combined solids do not exceed 300 pounds/100 gallons. The water-seed-fertilizer mixture shall be applied at a minimum rate of 1000 gallons/acre.
- 2) All mixtures shall be constantly agitated from the time they are mixed until they are finally applied to the seedbed. All seed mixtures in aqueous agitation shall be used within eight hours after mixing, except for leguminous seed which shall be used within one hour after mixing. Seed mixtures not utilized within the time limits shall be wasted and disposed of at locations acceptable to the County.
- 3) The mixtures shall be applied by high pressure spray equipment which shall always be directed upward into the air so the mixtures will fall to the ground like rain in a uniform spray. Nozzles or sprays shall never be directed toward the ground in a manner to produce erosion or runoff.
- 4) Particular care shall be exercised to insure that application is made uniformly at the prescribed rate and to guard against misses and overlaps. Proper predetermined quantities of the mixture, as specified, shall be used to cover specified sections of known area. Checks on the rate and uniformity of application may be made by observing the degree of wetting of the ground or by distributing test sheets of paper or collecting containers over the area at intervals and observing the quantity of material deposited thereon.
- 5) The spray method shall not be used during periods of high winds which prohibit satisfactory spray patterns.
- 6) Seed and fertilizer applied by the spray method need not be raked into the soil.

- 7) Any spray or residual which disfigures or otherwise damages existing structures or vegetation shall be thoroughly cleaned from the damaged surface.

F. Mulch Application

1. Mulch materials shall be furnished, hauled, and evenly applied on the area shown in the Approved Plans and/or as directed by the County. All mulch shall be applied immediately after seeding. Mulch applied by hand shall provide a loose depth of not less than 1.5 inches nor more than 3 inches. Mulch applied by the blowing method shall provide a loose depth of not less than 1 inch nor more than 2 inches, and 95% of the mulch shall be 6 inches or more in length. Mulch applied by the above methods shall achieve a uniform distribution and depth so no more than 10% of the soil surface is exposed. Mulch applied either by hand or the blowing method shall be spread evenly over all seeded areas at the rate of 2.0 tons per acre.
2. If the mulch is to be secured with a mulch anchoring tool, the rate shall be 2.5 tons per acre. If the tracking method is used, the rate of mulch shall be 1.5 tons per acre.

G. Securing Mulch

Mulch may be secured by any of the following methods.

Where mulch has been secured wood cellulose fiber binder, it will not be permissible to walk on the slopes after the binder has been applied. The Contractor will be required to place temporary protective covers over existing signs just before seeding and mulching. The covering shall be immediately removed after seeding and mulching operations are completed.

1. Peg and String Method

If the peg and string method is used, the mulch shall be secured by stakes or wire pins driven into the ground on 5-foot centers or less. Binder twine shall be strung between adjacent stakes in straight lines and crisscrossed diagonally over the mulch, after which the stakes shall be driven nearly flush to the ground to draw the twine down tight onto the mulch.

2. Spray Method

If the spray method is used, all mulched surfaces shall be sprayed with the selected binder material so the surface has a uniform appearance.

Mulch binder may be sprayed on the mulched slope areas from either the top or the bottom of the slope. A spray nozzle of approved design must be used. The nozzle shall be operated at a distance of not less than 4 feet from the surface of the mulch. Uniform distribution of the binder material will be required. A pump or an air compressor of adequate capacity shall be used to insure the uniform distribution of binder material.

a. Chemical Binder

Wood cellulose fiber used as a binder shall be applied at a net dry weight of 750 pounds per acre. The wood cellulose fiber shall be mixed with water, and the mixture shall contain a maximum of 50 pounds of wood cellulose fiber per 100 gallons.

3. Mix Method

If the mix method is used, the mulch shall be blown onto the area by a mulch blower; and the binder material shall be sprayed into the mulch as it leaves the mulch blower. For rates of application, see Spray Method above.

H. Wood Cellulose Fiber

Wood cellulose fiber used as a mulch shall be applied at a net dry weight of 1,500 pounds per acre. The wood cellulose fiber shall be mixed with water at a maximum rate of 50 pounds of wood cellulose fiber per 100 gallons. This wood cellulose fiber will be permitted to be used in the following areas when approved, and as directed, by the County:

1. Narrow disturbed areas up to 8 feet wide adjacent to pavement where traffic created gusts of wind could cause problems with straw;
2. Deep or high slope areas inaccessible to straw application by a mulching machine.

I. Repair of Defective Areas

1. The responsibility for maintaining treated areas shall be as follows. Until the Project is finally accepted, the Contractor will be required to repair or replace any seeding or mulching that is defective or damaged. When, in the judgment of the County, such defects or damages are the result of poor workmanship or failure to meet the requirements of the Approved Plans, the cost of necessary repairs or replacement shall be borne by the

Contractor. However, once the Contractor has completed the seeding and mulching of any area in accordance with the provisions of the Approved Plans and to the satisfaction of the County, no additional work at his expense will be required. Subsequent repairs and replacements deemed necessary shall be made by the Contractor and will be paid for as additional work or extra work.

2. When either the Dry or Wet Application Method is used for work done out of season, it will be required that the Contractor establish a good stand of grass of uniform color and density. If, when the Contract has been completed, it is not possible to make an adequate determination of color, density and uniformity of such stand of grass, payment for the unaccepted portions of the areas will be withheld until these requirements have been met.

END OF SECTION

## SECTION 02830

### SODDING

#### **PART 1 - GENERAL**

##### A. Description

Sodding shall include, but not necessarily be limited to, furnishing, hauling, and placing grass sod on prepared areas in accordance with the Approved Plans.

##### B. Related Work Included Elsewhere

1. Clearing and Grubbing: Section 02110
2. Lawn Restoration: Section 02820
3. Soil Stabilization Matting: Section 02850

##### C. Quality Assurance

The County will inspect all materials before, during, and after installation to ensure compliance with the Contract Documents.

#### **PART 2 - MATERIALS**

##### A. Materials Furnished by the County

1. The County will not furnish any materials for sodding.
2. The Contractor may purchase water from the County or private water company potable water system. The Contractor shall contact the Division of Water and Sewer to coordinate its use.

##### B. Contractor's Options

Fertilizer may be furnished in either dry or liquid form unless otherwise noted.

##### C. Detailed Material Requirement

###### 1. Grass Sod

Grass sod shall be well rooted and produced locally. It shall, when placed, be live growing grass not less than 3-years old, of which not less than 96% shall be improved tall fescue (Rebel II, Rebel Falcon, Olympic) and not more than 4% Kentucky Bluegrass (Victa, Nassau) at the time of installation. It shall, when placed, have been cut and rolled (stored) not longer than 48 hours. It shall be cut

in strips not less than 12-inches nor more than 18-inches wide and have 3/4 inches of soil firmly attached to the roots. The sod thickness shall not be deficient more than 1/4-inch from the required thickness at or just before placement. This 1/4-inch tolerance does not relieve the Contractor of the responsibility of cutting the sod a full 3/4-inches thick. The thickness of sod is measured by the thickness of soil firmly attached to the root system. The height of grass or thickness of thatch has no bearing on the determination of sod thickness. The sod and attached soil shall be free from noxious weeds: Common Bermuda grass, Nutsedge, Quackgrass, Garlic, Johnsongrass, Poison Ivy or Poison Oak, and Canada Thistle. Any lot of sod containing the following weeds either individually or collectively exceeding one percent of the total plant population by plant count or surface area covered shall be rejected as follows:

Orchard-grass, Nimblewill, Annual Bluegrass, Crabgrass, Goosegrass and Foxtail. It shall not contain substances deleterious to growth or which might affect the survival or hardiness of the sod when transplanted.

2. Fertilizer shall be as specified in Section 02820.
3. Ground limestone shall be as specified in Section 02820.
4. Water shall be as specified in Section 02820.
5. Pegs shall be wooden wedges 1/2-inch x 1-inch x 6-inch to 1/2-inch x 1-inch x 12-inch.
6. Staples shall be made from No.11 or heavier steel wire bent to form a U. The staples shall average 1 to 1-1/2-inches wide. The staple shall be at least 6 inches long from top to bottom after bending.

### **PART 3 - EXECUTION**

#### **A. General**

Sod sections or strips shall be of a length as may be readily lifted without breaking, tearing or loss of soil.

Sections or strips shall be cut by approved sod cutters, hauled or carried to storage piles or the point of installation without breaking, and set in final place as indicated on the Contract Documents and as directed by the County. All sod in stacks shall be kept moist and protected from exposure to the air, sun and freezing. Any sod permitted by the Contractor to dry out may be rejected whenever, in the judgement of the County, its survival after placing is rendered doubtful. No payment will be made for rejected sod.

In no event shall more than 48 hours elapse between the cutting and placement of sod.

During wet weather, sod shall be allowed to dry sufficiently to prevent tearing as a result of handling and placing. During dry weather it shall be watered before cutting and lifting to insure its vitality and prevent the dropping off of soil in handling.

B. Ground Preparation

Before placing sod upon any topsoiled surfaces, all shaping and dressing of such surfaces shall be completed. The completed areas to be sodded shall present a smooth, uniform, well tilled surface true to line and cross-section. Any raking required to accomplish this shall be done immediately before placing the sod.

All areas to be sodded shall be fertilized and limed in accordance with Section 02820. The lime and fertilizer shall be worked into the top 2 inches of soil before placing sod.

C. Sod Placement

No sod shall be placed between the dates of June 1st and August 15th inclusive unless adequate irrigation is available to establish the sod nor any time when the temperature is below 32°F. No frozen sod shall be used. No sod shall be placed upon frozen soil.

Sod shall be lifted from trucks or storage piles and placed by approved methods with close joints and no overlapping. All cracks between blocks of sod shall be closed with small pieces of sod. All sod shall be tamped or rolled after laying to close the seams between the pieces and press the sod tight against the ground. A hand tamper shall weigh approximately 15 pounds and have a flat surface of approximately 100 square inches. A roller shall weigh 40 pounds per foot of width. Any slipping of sod is to be corrected by the Contractor without additional compensation.

D. Watering

The sod shall be watered a minimum of 3 times after placement. The sod and soil directly beneath the sod shall be kept moist, by additional waterings if necessary, until acceptance or it has become established. The first watering shall be immediately after laying the sod. The second and third waterings shall be as necessary within 2 weeks of the first watering. No sod will be accepted until the water requirements have been satisfied, and the sod appears in good health.

E. Sodded Slopes and Drainage Ditches

On slopes 2:1 and steeper, sod shall be laid with the long edges parallel to the contour starting at the bottom of the slope. Successive strips shall be neatly matched and all joints staggered or broken. When placing sod in drainage ditches, the length of the strip shall be laid perpendicular to the direction of the flow of the water. Where the sod may be displaced during sodding operations, the workmen, when replacing it, shall work from ladders or treaded planks to prevent further displacement.

Each strip or section of sod placed on slopes 2:1 and steeper and surface drainage V-shaped or flat bottom ditches or gutters shall be staked securely with at least 2 wooden pegs spaced not more than 2-feet apart with the flat side against the slope and driven flush with the top of sod.

F. Repair of Defective Areas

Until the project is conditionally accepted, the Contractor will be required to repair or replace any sod that is defective or damaged.

G. Contractor's Responsibility

Before final acceptance of the Project, it shall be the responsibility of the Contractor to remove all heaved staples, which have been in place a minimum of six months, from areas to be mowed, or as directed by the County.

END OF SECTION

SECTION 02850

SOIL STABILIZATION MATTING

**PART 1 - GENERAL**

A. Description

Soil stabilization matting shall include, but not necessarily be limited to, furnishing and placing excelsior matting overseeded areas, and securing with wire staples on seeded areas in accordance with the Contract Documents. Soil stabilization matting shall only be furnished and installed if required by the Contract Documents or if directed by the Engineer.

B. Related Work Included Elsewhere

Lawn Restoration; Section 02820.

C. Quality Assurance

The County will inspect all materials before, during, and after installation to ensure compliance within the Approved Plans.

**PART 2 - MATERIALS**

A. Materials Furnished by the County

The County will not furnish any materials for soil stabilization matting.

B. Contractor's Options Not applicable.

C. Detailed Material Requirements

1. Excelsior Matting

a. Excelsior matting shall be machine produced from wood which has been properly cured to achieve adequately curled and barbed fibers. A maximum of 20% of the fibers may be less than 6 inches in length.

b. The excelsior matting shall have a uniform thickness and distribution of fibers throughout. The top and bottom of the excelsior matting shall be covered with a biodegradable extruded plastic netting having a maximum mesh opening of 2 inches x 2 inches. The average break strength of any two strands running lengthwise shall be 5 pounds minimum. The net shall be entwined with the excelsior to aid handling and provide sufficient reinforcement against damage during handling

and placement.

- c. The excelsior matting shall be smolder resistant. A chemical treatment may be applied to the matting to make it smolder resistant. The chemical treatment, if used, shall be nonleaching, nontoxic to vegetation and germination of seed, and noninjurious to human skin. Rolls of the excelsior matting shall meet the following requirements: width - 48 +/- 1 inch; weight - 0.60 pounds per square yard minimum at 0% moisture; nominal roll length - 180 feet.
2. Staples shall be as specified in Section 02830.
3. "T"-pin staples shall be made of No. 8 wire with an 8-inch leg, 4" head and a 1-inch secondary leg.
4. Materials required for seeding shall meet the requirements of Section 02820, except mulch binder will not be required.

### **PART 3 - EXECUTION**

#### **A. General**

When topsoil is specified for areas where matting is being placed, topsoil placement shall be completed before the soil stabilization matting operations are started.

#### **B. Seeding**

Seeding shall be performed in accordance with the provisions of Section 02820, except that Fall season installation of soil stabilization matting shall end on September 30, and the rolling operation shall be omitted. The seed mixture shall be the same as in the areas immediately adjacent to the area where matting is to be placed.

#### **C. Placing and Securing**

The matting shall be placed prior to the first rain event or within 48 hours after seeding operations have been completed in the work areas, whichever is less. Matting shall be rolled on in the direction of the flow of water. Where more than one width of matting is required, the strips shall overlap at least 4 inches. Ends shall overlap at least 6 inches. The upgrade end of each strip of matting shall be turned down and buried to a depth of not less than 6 inches with the soil firmly tamped against it. Overlapping shall be done with the upgrade section on top. The County may require any other edge exposed to more than normal flow of water be buried in a similar manner. Edges of matting must be similarly buried around the edges of catch basins and other structures. Disturbed areas shall be fertilized and reseeded with the specified seed mixture for the area.

Matting shall be laid smoothly upon the seeded surface, and stretching shall be avoided.

Matting shall be securely fastened with staples driven vertically into the soil, flush with the surface. Matting shall be in firm contact with the soil in its entirety. Staples shall be placed 2 feet apart along the edges and center of the matting. On all overlapping edges, staples shall be placed 18 inches apart. At all ends of the matting, staples shall be placed 6 inches apart.

D. Contractor's Responsibility

Before final acceptance of the Project, it shall be the responsibility of the Contractor to remove all heaved staples, which have been in place a minimum of 6 months, from areas to be mowed, or as directed by the County.

END OF SECTION

SECTION 02860

TREE PROTECTION

**PART - 1 GENERAL**

A. Description

Tree protection shall consist of measures necessary for the survival of existing trees to remain in the vicinity of the proposed work and where designated in accordance with the Contract Documents.

B. Related Work Included Elsewhere

1. Clearing and Grubbing: Section 02110
2. Trench Excavation, Backfill and Compaction: Section 02250

**PART - 2 MATERIALS**

A. Materials furnished by the County

Not applicable.

B. Contractor's Options

Not applicable.

C. Detailed Material Requirements

1. Orange Safety Fence

Orange safety fencing shall be 4-foot high blaze orange polyethylene plastic with 5-foot metal stakes, staked at maximum 10-foot intervals.

**PART - 3 EXECUTION**

The Contractor shall engage the services of a subcontractor, licensed as a Tree Expert by the Maryland Department of Natural Resources to perform the following:

1. Prior to commencing any construction activities, recommend procedures to compensate for loss of roots (if any) and perform initial pruning of branches and stimulation of root growth where removed.
2. Inspect all trees to be saved at the completion of construction and perform follow-up care for any damage incurred.

3. Submit a written Tree Protection Certificate that trees have been protected during the course of construction in conformance with recognized standards in the industry. Certify that damaged trees were promptly and properly treated.

B. Establishment of Tree Protection Areas

Prior to commencing construction activities, the Contractor shall meet with the Engineer and Owner to establish Tree Protection Areas. Prior to commencing construction activities, the Contractor shall install orange safety fencing around all tree protection areas. The orange safety fence shall encompass all trees to be saved within and along the designated work area. At a minimum, the orange safety fencing shall extend to the edge of the tree dripline.

C. Root Protection Measures

1. The Contractor shall protect tree root systems throughout the contract duration. Tree roots shall be protected from smothering, flooding, excessive wetting, from dewatering operations, off-site run-off, spillage and other activities which could be hazardous to tree roots. Removal of topsoil within the tree protection area is prohibited.
2. The Contractor is prohibited from parking any construction equipment, or from storing or stockpiling materials within the tree protection areas. Foot and vehicular traffic within the tree protection area is prohibited.
3. If any excavation will occur beneath the dripline of any tree to be saved, the Contractor shall first prune the tree roots along the proposed outside edge of trench. Root pruning shall consist of using a trenching machine, vibrating knife or rock saw to a depth of 18-inches. When a trenching machine is used, the trench shall be immediately backfilled. Root pruning shall immediately be followed by fertilization.

D. Tree Pruning

1. All tree pruning shall be in accordance with the current edition of the National Arborist Association Standard for Pruning Shade Trees. All pruning tools and methods employed shall be in conformance with accepted arboricultural practices under the direct on-site supervision of the tree expert. Climbing spurs are prohibited.
2. Injuries to bark, trunk and limbs resulting from the construction shall be repaired by properly cutting, smoothing the wood if necessary, tracing the bark to the proper shape to ensure proper healing and only using approved tools, materials and methods.

3. All pruned material and debris from the pruning operations shall be removed and disposed of at an approved waste disposal facility.

E. Damaged Tree Replacement

Existing trees that have been designated to be saved but which are damaged beyond repair due to the construction operations, as determined by the tree expert shall be removed and replaced at no additional cost to the County. Replacement trees shall be the same genus, species, variety and size as the removed tree, except those trees having a caliper greater than 6-inches. The tree caliper shall be the diameter measured 4 ½ feet above the ground. For trees with a caliper greater than 6-inches shall have a minimum of two smaller caliper trees with a minimum 3-inch caliper.

END OF SECTION

## SECTION 02865

### TREES AND SHRUBS

#### 1.0 GENERAL

##### A. Description

This section includes requirements for tree and shrub planting at locations indicated and approved by the Engineer in accordance with the Contract Documents.

##### B. Submittals

1. In accordance with the General Conditions, submit itemized list showing sources of all plant items.
2. Submit samples of additional landscape materials incorporated into the work, except the plants specified under this Section.
3. With each shipment submit invoice or stock order giving name of plants, date plants were dug for shipment and certification that plant are free from disease.

##### C. Reference Documents

1. Plant measurement size and grading shall be in accordance with the current edition of American Standard for Nursery Stock as approved by the American Nursery and Landscape Association (ANLA).
2. The current edition of Standardized Plant Names as adopted by the American Joint Committee on Horticulture Nomenclature, shall be the authority for all plant names.

##### D. Inspection and Acceptance of Plant Materials

1. Plants will be subject to inspection and approval at the place of growth or upon delivery for conformity to specification requirements as to quality, size and variety. Such approval shall not impair the right of inspection during the progress of work or right of rejections due to damage suffered in handling, transportation or the planting process.
2. Rejected plants shall be removed immediately from the site by the Contractor.
3. All plants shall be labeled as to genus, species and size and shall bear an inspection certificate from the Board of the Department of Agriculture or other State agency of the State within which the nursery, where the plants were grown, is located.

E. Guarantee

The guarantee for trees and shrubs shall be one year from the conditional acceptance date.

F. Plant Replacements

1. Replace dead, weak, diseased, improperly sized and improperly marked plants.
2. Replacement plants shall be of the same type and size as specified on the Drawings and shall carry the same guarantee as the original stock.
3. If plant rejection occurs during the planting season, the plants shall be replaced at once. If not, they shall be replaced during the next appropriate planting season. However, the Contractor may elect to allow the rejected plant to remain through the next complete growing season at which time, if found to be dead, in an unhealthy or badly impaired condition, the rejected plant shall be replaced by the Contractor at no cost to the County. When making plant replacements, replace planting mulch to its initial specified depth and follow all procedures outlined in Planting Procedures.

G. Licensing

All trees and shrubs shall be installed by a Maryland licensed Landscape Contractor with previous successful experience in the planting and survival of trees and shrubs.

**PART -2 - MATERIALS**

A. Topsoil

1. Topsoil shall meet the requirements of topsoil as specified in Section 02820.
2. Topsoil shall be protected from the elements and shall not be handled or installed in a frozen or muddy condition.

B. Fertilizers and Additives

1. Fertilizer for trees and shrubs shall be an organic form such as cottonseed meal or bone meal, inorganic such as Super Phosphate. Do not use inorganic nitrite or nitrate fertilizers for starter solution in tree or shrub pits.
  - a. Super Phosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes, containing not less than 18 percent available phosphoric acid.
  - b. Bone Meal shall be commercial raw bone meal finely ground and shall

be a minimum analysis of one percent nitrogen and 18 percent phosphoric acid.

2. Peat moss shall be a sphagnum peat moss and shall be free from wood substances.
3. Manure shall be dehydrated, well-rotted cow manure.
4. Anti-desiccant shall be “Wilt-Pruf” or equal, delivered in manufacturer’s containers and used according to the manufacturer’s instructions.

#### C. Soil Mixes

1. Soil mix for all plants, except ericaceous plants shall consist of 200 pounds of manure and 36 cubic feet of peat moss of 12 cubic yards of topsoil. (Ericaceous plants include azaleas, rhododendron, pieres and other broad-leafed evergreens).
2. Soil mix for ericaceous plants shall consist of 50 cubic feet of peat moss to 12 cubic yards of topsoil, to which no lime has been added.
3. Soil mixtures shall be thoroughly mixed before using.

#### D. Mulch

1. All mulch shall be free of toxic substances or foreign materials that may harm plant life.
2. Mulch for tree, shrub planting and mulch bed preparation shall be ground bark or shredded bark.
  - a. Ground bark shall be 100 percent true pine-bark with organic content of not less than 90 percent with a white wood content not to exceed eight percent and shall be of a good uniform brown color. Note more than 50 percent shall be capable of passing through a  $\frac{3}{4}$  inch sieve.
  - b. Shredded bark shall be 100 percent true pine-bark peelings with organic content of not less than 90 percent. It shall be fibrous material of a good uniform brown color. Not more than 25 percent shall be able to pass through a  $\frac{3}{4}$  inch sieve.

#### E. Plant Material

1. Unless otherwise approved, plants shall be nursery grown.

2. Plants shall be hardy, grown under climatic conditions similar to those in the locality of the project.
3. Plants shall be typical of their species or variety and shall have a normal habit of growth. They shall be sound, healthy and vigorous, well branched and densely foliated when in leaf. They shall be free of diseases and insect pests, eggs or larvae. They shall have healthy, well-developed root systems. Plants that are weak or which have been cut back from larger grades to meet specifications will be rejected.
4. Plants shall conform to the measurements specified on the Drawings with the following exceptions:
  - a. Plants larger than specified may be used, if approved by the engineer, at no additional cost to the County. If the use of larger plants is approved, the spread of roots of ball of earth shall be increased in proportion to the size of the plant.
  - b. Up to ten percent of undersize plants in any one variety or grade may be used provided that there are sufficient plants above size to make the average equal to or above specified grade and provided that the undersized plants are larger than the average size of the next smaller grade.
5. Digging and Preparation of Shipment
  - a. Bare root shrubs shall be dug with adequate fibrous roots retained and shall be delivered to the site of the project prior to the plant material coming into leaf. Pack roots of these plants in moist straw or peat moss immediately after digging.
  - b. Balled and burlaped plants shall be dug with firm natural balls of earth, of sufficient diameter and depth to include most of fibrous roots.
  - c. Container grown stock shall have been grown in a container large enough for the root system to develop sufficiently to hold its soil together firmly. No plants shall be loose in the container.

F. Planting Stakes and Appurtenances

1. Vertical stakes shall be rough-sawn straight grain oak, reasonably free of knot holes, bark, wane, warp or splits.
2. Stake dimensions shall be 2-inch by 2-inch by 8-feet.

3. Stakes for guy wires shall be 1 ¾ inch by 1 ¾ inch by 30-inch.
4. Guy wire shall be pliable number 12 or 14 gauge galvanized wire.
5. Tree ties shall be 5/8 inch or ¾ inch reinforced corded garden hose.
6. Tree wrapping shall be first quality commercial paper tree wrap, in four inch to six inch strips or clean new burlap, seven or eight ounce weight per square yard, treated with a solution containing a bactericide, fungicide and insecticide.

### **PART 3 - EXECUTION**

#### **A. Seasons for Planting**

Trees and shrubs shall be planted between October 1 and May 15 only. No plants shall be planted during periods of freezing temperatures nor during frozen ground conditions. Preparations for planting may begin earlier than the specified season, provided the locations have been approved by the Engineer.

#### **B. Handling and Protection of Delivered Plants**

1. Roots or balls of plants shall be adequately protected at all times from sun and drying winds or frosts.
2. Balled and burlaped plants which cannot be planted immediately upon delivery shall be set on the ground and shall be well protected from soil, wet straw, peat moss or be set on the ground and shall be temporarily planted or heeled-in in trenches upon delivery.
3. Bundles of plants shall be opened and the plants separated before the roots are covered. Care shall be taken to prevent voids among the roots during planting operations, bare roots shall be covered with canvas, straw or other suitable material. No plant shall be bound with wire or rope at any time so as to damage the bark or break the branches.

#### **C. Planting Procedures**

1. Excavation for Planting
  - a. Notify the Engineer prior to beginning operations.
  - b. Provide stakes and stake out the locations for plant excavations as shown on the Drawings and as approved by the Engineer. Do not change locations without the approval of the Engineer.

- c. Plant in individual excavations with vertical sides and horizontal bottom.
- d. Excavations for trees shall be two feet greater in diameter than the ball of earth or spread of roots of the tree and sufficiently deep to allow for a layer of compacted soil mix beneath the ball or roots a minimum of six inches thick.
- e. Excavations for shrubs shall be twelve inches greater than the spread of the roots and a minimum of eighteen inches below finished grade or as necessary to allow a layer of compacted soil mix beneath the ball or roots a minimum of six inches thick.
- f. Allow a tolerance of one inch for the above dimensions.
- g. If excavations are made in advance of plating, backfill to grade with the specified soil mix, mark locations and record on the Drawings.

## 2. Planting

- a. Remove seals and tags only after inspection and acceptance of plants by the Engineer.
- b. After setting balled and burlaped plants, compact soil mix around base of balls, to fill all voids, up to one-half the depth of balls, tamp and thoroughly water. Loosen burlap around the top half of the balls and spread out away from the ball. If too bulky, cut burlap away and remove. Remove balling and tying materials or containers, other than burlap and jute twine, from excavation without damage to the soil ball. Cover all burlap and twine with at least two inches of soil mix. Then fill the remainder of excavation with soil mix, tamp and again water, all within the same day of planting.
- c. When container-grown plants are planted, remove the plant from the container, so as not to damage the root ball and plant as outlined for balled and burlaped plants.
- d. When bare root plants are set, spread the roots of the plant carefully in their natural positions and work soil mix around the roots, thoroughly tamp into place and water, all within the same day of planting.
- e. Watering shall mean full and thorough saturation of backfill in the excavations the day the plants are planted. Apply water by container or open-end hose under low pressure only.
- f. When planted, watered and fully settled, the plants shall be vertical and the back fill shall be flush with the surrounding surface.

- g. Form a soil shoulder at least three inches high around the outside of the excavation above finished grade, to entrap water.
- h. Wrap trees over 1 ½ inch caliper with the specified wrapping material. Wrap spirally from the ground line up to the lowest main branches and overlay approximately two inches. Secure wrapping material, at the bottom, middle and top with ties spaced a maximum of two feet apart.
- i. Mulch completed plantings with the specified mulching material. Spread mulch evenly to a minimum thickness of three inches over the entire area of the filled excavation and for shrub in beds, the entire area of the shrub bed. Apply mulch within four days after planting.
- j. Prune each tree and shrub in accordance with the American Association of Nurseryman Standards to reserve the natural appearance and character of the plant. Do not cut leaders of shade trees. Remove dead wood, broken or badly bruised branches or suckers using clean sharp pruning tools. Treat surface cuts over one inch diameter with specified tree wound dressing covering all exposed cambium.

3. Clean up after planting

- a. Remove waste materials continuously and promptly.
- b. Regrade and restore existing turf areas damaged and seed or sod when so directed, at no cost to the County.

D. Maintenance

1. Maintenance of planting material shall commence immediately after each plant is planted and shall continue until final acceptance. During such time, the Contractor shall perform all work necessary to establish and maintain the plants in a live, healthy condition.

Maintenance shall include the following:

- a. Water at the end of each 14 day period, if less than one inch of precipitation is recorded by the National Weather Service in the Metropolitan Area for that period. Each tree shall receive at least 5 gallons of water and each shrub shall receive at least two gallons.
- b. Clearing plant mulched area of weeds and grasses. Remove weeds when they have attained a height of four inches. The use of herbicides to control weeds and grasses will be acceptable only if all Maryland Department of Agriculture regulations are followed.

- c. Pruning of dead material and removal of succoring growth.
- d. Resetting settled plants to proper grade.
- e. Reshaping and remulching of washed out planting saucers.
- f. Tightening and repairing of guying and staking.
- g. Fertilizing of nutrient deficient plants.
- h. Replacing of dead, weak or diseased plants.

E. Final Inspection and Acceptance

1. Within twenty days of the end of the one-year guarantee period as described herein, the Engineer will inspect planting material. This inspection will be scheduled within ten days after the Contractor submits a written notice requesting such inspection.
2. If any tree or shrub must be replaced as determined by the County, the Contractor shall replace as described herein before. The warranty period shall be extended for one additional growing season until all trees and shrubs have successfully survived.

END OF SECTION

## SECTION 02870

### FENCES

#### **PART 1 - GENERAL**

A. Description

This work will include, but not necessarily be limited to, the construction of fence and gates in accordance with, and in reasonably close conformance to, the lines and grades shown on the Approved Plans.

B. Related Work Included Elsewhere

1. Clearing and Grubbing: Section 02110

C. Quality Assurance

The County will inspect all materials before, during and after installation to ensure compliance with the Approved Plans.

#### **PART 2 - MATERIALS**

A. Materials Furnished by the County

The County will not furnish any materials for fence installation.

B. Contractor's Options None.

C. Detailed Material Requirements

1. All fencing shall consist of chain link fabric topped with three strands of barbed wire mounted on extension arms projecting outward at 45°.

2. Barbed Wire

The barbed wire shall consist of three lines of aluminum coated steel barbed wire which is to be of the four point pattern composed of two strands of 12-1/2 gage line wires with 14 gage aluminum barbs spaced on approximately 5 inch centers. Minimum weights of aluminum coating shall be 0.30 ounces per square foot of wire surface.

3. Chain Link Fabric

- a. Fabric shall be aluminum coated steel chain link, No. 9 gage wire woven in a 2 inch mesh. Top and bottom selvages shall be barbed. The fabric

shall conform to ASTM Designation A491-74 in its entirety.

- b. The aluminum coating shall be a minimum of 0.4 ounces per square foot of wire surface for #6 and #9 gage fabric and 0.35 ounces per square foot for #11 gage. The weight of coating shall be determined by the strip test as defined in ASTM Specifications A428-68.

4. Fabric Connections

The chain link fabric shall be securely fastened to all terminal posts using 3/16" x 3/4" stretcher bars and heavy 11 gage tension bands. The fabric shall be fastened to all intermediate posts and top rails with #11 gage tie wires.

5. Tension Wire

The top and bottom tension wire shall be No. 7 gage aluminum coated spring coil or crimped wire. Minimum weight of aluminum coating shall be 0.40 ounce per square foot of wire surface.

6. Framework

- a. All posts and framework (including gates) shall be hot dipped zinc coated with a minimum of 1.8 ounces per square foot of surface and shall conform to ASTM A1 20-78.
- b. Terminal and corner posts shall be nominal 3-inches outside diameter, nominal weight 5.79 pounds per linear foot.
- c. Line posts shall be nominal 2 1/2-inches outside diameter, nominal weight 3.65 pounds per linear foot.
- d. The top rail and brace pipes shall be nominal 1-5/8-inches outside diameter standard weight pipe, wt. 2.27 pounds per linear foot.

7. Gates

- a. Posts for swing gates shall be 4-inch O.D. standard weight pipe, wt. 9.1 pounds per linear foot.
- b. Gate posts shall be equipped with top cap so designed to prevent moisture from entering the post.
- c. Gate frames shall be nominal 2-inches outside diameter standard weight pipe, wt. 2.72 pounds per linear foot. Gates may be fabricated using welded construction or heavy pressed steel or malleable corner fittings securely riveted. Hinges shall be of sufficient strength and design to

permit easy and trouble-free operation. Gates shall have center plunger rod to positively hold gates in open or closed positions. Gates shall have barb wire. All gates shall be equipped with a positive type latching device with a means for padlocking. An approved padlock with three keys shall be provided for each gate. Locks shall be keyed to the Cecil County system.

8. Portland Cement Concrete

Portland cement concrete for fence post encasement shall be Mix No. 1 as specified in Section 03300.

### **PART 3 - EXECUTION**

A. General

1. The fence shall be erected at locations shown on the Plans to grades conforming to existing ground contours by experienced fence erectors. The bottom of the fabric shall be placed a normal distance of 1-inch above the finished grade, however, over irregular ground, a minimum clearance of 1-inch and a maximum clearance of 6-inches will be permitted for a horizontal distance not to exceed 8 feet.
2. Any excavation or backfill required in order to comply with these provisions shall be made as approved by the County. The fence shall be true to line, taut, and shall comply with the best practice for chain link fence construction. For site fencing projects, the fence fabric shall be placed on the outside of the posts.
3. All posts shall be plumbed and placed at the specified spacing shown on the Approved Plans. Spacing of posts shall be as uniform as practicable under local conditions. The distance between line posts shall not exceed 10 feet.
4. Terminal posts shall be installed at all ends, abrupt changes in grade, and at changes in the horizontal alignment greater than 10 degrees. In no case shall the distance between terminal posts exceed 500 feet.
5. Post lengths must be adequate in all cases to accommodate the fabricated width of the fence fabric without stretching or compressing the fabric and to obtain, as a minimum, the distance required below the bottom of the fabric.
6. Horizontal brace rails shall be installed at all gate, pull, and corner posts. Horizontal brace rails with diagonal truss rods and turn buckle shall be installed at all terminal posts. Sufficient braces shall be supplied to allow complete bracing from each terminal post to all adjacent line posts. Braces shall be securely fastened to posts by heavy pressed steel and malleable fittings.

7. Fabric shall be tied to brace and top rails at 2-foot intervals maximum. Stretcher bars shall be attached to terminal posts by connectors equally spaced at 12-inch centers maximum. The fabric shall be fastened to all intermediate post at a spacing not to exceed 14-inches.
8. Tension wire shall be stretched taut and run continuously between terminal post near the top and bottom of the fabric and securely fastened to each intermediate post.
9. Gates shall be installed so as to be easily opened and closed by one person and shall be capable of being swung back parallel with the fence unless otherwise noted. Gates must be properly braced to eliminate any possible sagging condition.

B. Concrete

1. Concrete footings shall be constructed in accordance with dimensions shown on the Standard Details. Posts shall be centered in cylindrical concrete footings. The concrete shall be thoroughly compacted around the post by tamping or vibrating. The finish top surface shall be a smooth finish, slightly above the ground line, and uniformly sloped to drain away from the post. The post shall not be disturbed in any manner within 72 hours after the individual post footing is completed.
2. Hand mixed concrete shall not be used without written permission of the County. If permitted, the hand mixed batch shall not exceed 1/2 cubic yard.

END OF SECTION

SECTION 02905  
DIRECTIONAL BORING OF PRESSURE SEWER

1.0 GENERAL

A. The pressure sewer shall be located within the easement and within 1 foot horizontally and within 2-inches vertically of the alignment shown on the contract plans and shall be installed by directional boring. Directional boring shall be conducted so as to minimize the number and size of excavation holes.

B. Operating Expertise

The Contractor or his Subcontractor must demonstrate expertise in trenchless methods by providing the County a list of ten utility references for whom similar work has been performed within the last three years prior to the pre-construction meeting. The references should include a name and telephone number where contact can be made to verify the contractor capability. The Contractor must provide documentation showing successful completion of the projects used for reference. The pre-construction meeting may not be scheduled until after the County approves of the above expertise. Conventional trenching experience will not be considered applicable.

C. Submittals

1. The Contractor shall submit technical data for equipment, method of installation, and proposed sequence of construction for approval by the County. The submittal shall include information pertaining to working and receiving shaft, dewatering, method of spoils removal, size and capacity of equipment capabilities for installing pipes on a curve, type of cutter head, drilling fluid type, method of monitoring line and grade, and detection of surface movement.
2. Prior to the pre-construction meeting and County approval to perform the directional boring, the Contractor must submit the names of supervisory field personnel and historical information of directional boring experience. In addition, the Contractor must submit for approval the name plate data for the drilling equipment and mobile spoils removal unit and MSDS information for the drilling slurry compounds.

A. Related Work Specified Elsewhere

1. Trench Excavation, Backfill and Compaction: Section 02250
2. Low Pressure Sewer: Section 02731
3. Sewage Grinder Pumping Units: Section 05600

B. Quality Assurance

The County will inspect all materials before, during and after installation to ensure compliance with the Contract Documents.

2.0 MATERIALS

A. Materials shall be in accordance with Section 02731.

3.0 EXECUTION

A. Installation

- 1. Installation shall be in trenchless manner producing a continuous bore. The number of access pits shall be kept to a minimum.
- 2. The drilling system shall be remotely steerable and permit electronic monitoring of tunnel depth and location. Accurate placement of pipe at up to eight feet deep, within a + 2-inch window is required. The drilling device shall be capable of drilling a 90 degree, 35-foot radius curve.
- 3. The equipment must be capable of boring the following lengths in single bores, and successive boring pits will not be allowed to be any closer than the following distances:

Pipe Size	Boring Distance
1 in. to 1 2 in.	400 feet
2 in. to 2 2 in.	350 feet
3 in. to 6 in.	300 feet

- 4. Drilling must be performed by a fluid cutting process (high pressure/low volume), utilizing a liquid/clay slurry, i.e. bentonite. The clay slurry must be totally inert vacuum spoils recovery vehicle on site to remove the drilling spoils from the access pits. The spoils must then be transported from the job site and be properly disposed of. Under no circumstance will the drilling spoils be permitted to be disposed of into sanitary, storm, or other public or private drainage systems.
- 5. Mechanical, pneumatic, or water jetting methods will be considered unacceptable due to the possibility of surface subsidence.
- 6. Upon Owner request, the Contractor shall prove the accuracy of the electronic monitor every fifty (50) feet of directional bore in

the presence of the Owner during directional drilling operations via test pit every 50ft. of bore. If the above accuracy is not met, the Contractor shall adjust or provide the necessary equipment which will meet the accuracy requirements. All such calibration costs shall be at no cost to the Owner.

7. After an initial bore has been completed, a reamer head shall be installed at the termination pit, and the pipe and reamer head shall be pulled back to the starting pit. The reamer must also be capable of discharging liquid clay to facilitate the installation of the pipe into a stabilized and lubricated tunnel. Reaming diameter shall not exceed 1.5 times the outside diameter of the pipe being installed.
8. The pipe being pulled into the tunnel will be protected and supported so that it moves freely and is not damaged by stones and debris on the ground during installation.
9. Pullback forces shall not exceed the manufacturers recommended allowable pulling force for the product pipe.
10. The Contractor shall allow sufficient lengths of pipe to extend past the termination point to allow connections to adjacent pipe sections. Pulled pipe shall be allowed a minimum of twenty-four (24) hours of stabilization prior to making tie-ins. The extra length of pipe shall be sufficient to make all necessary connections and tests.
11. Upon completion of boring and pipe installation, the Contractor will remove all spoils from the starting and termination pits. All pits will be compacted as per County and contract documents and be restored to their original condition.

B. Safety

1. Because the directional boring may encounter existing buried electrical lines, the following safety requirements must be met.
  - a. All drilling equipment must have a permanent inherent alarm system capable of detecting an electrical current. The ground system shall be equipped with an audible alarm to warn the operator when the drill head nears electrified cable.
  - b. All crews shall be provided with grounded safety mats, heavy gauge ground cables with connectors, and hot boots and gloves.

- c. All supervisory personnel must be adequately trained and have direct supervisory experience in directional boring.

C. Obstruction/Alignment

1. The bore shall not deviate from the horizontal alignment shown on the drawings by more than one (1) foot. If obstructions are encountered during the drilling operation, the Owner shall be notified immediately. With approval of the Owner, the Contractor shall attempt to go around the obstruction. If a deviation of more than three (3) feet from the horizontal alignment is required to bypass the obstruction, the Owner shall be immediately consulted to determine if adjustments in the alignment are required. At no time shall the alignment be allowed to exit the sewer easement or right-of-way. To prevent dips and high points in the pipeline profile, a vertical deviation in the pipeline profile may not exceed two (2) inches.
2. The Contractor shall employ all means necessary to complete the pipe installation as specified at no additional cost to the Owner. Any deviation from the previously approved means and methods shall be approved by the Owner prior to the implementation.
3. The Contractor shall mark the location and depth of the alignment with spray paint on paved surfaces and wooden stakes on non-paved surfaces at twenty-five (25) foot intervals. The Contractor shall record the depth of the sewer at the twenty-five (25) foot intervals and provide a copy of the record to the Owner upon completion of the installation of each bore. The Contractor shall measure or survey locations where the horizontal alignment deviates from the proposed alignment and incorporate the changes in the as-built drawings.
4. If the bore pipe installation has deviated beyond the specified tolerances, it shall be the Owners option to require the Contractor to abandon the bore, or remove the installed pipe, and rebore or reinstall the pipe on the correct alignment at no additional cost to the Owner.

D. Detection

1. Tracer Wire: All non-metallic pipe shall have tracer wire secured with duct tape to the top of the pipe. The wire shall be continuous for the full length of the pipeline. Underground splice connections shall be made with solderless split bolt connectors and taped to

pipe.

2. Detector wire shall be terminated from each pipe run in each structure along the system, i.e. flushing connection vaults, air release vaults, service valve assembly vaults, etc. Allow adequate length of each wire in the structure, so it may be pulled one (1) foot out of the top of the structure for connection of detection equipment.
3. The detection wire shall be tested for continuity for each bored installation before acceptance by the Owner.
4. Detection tape is not required for pipe installed by directional boring.

END OF SECTION

## SECTION 03200

### CONCRETE REINFORCEMENT

#### **PART 1 - GENERAL**

##### A. Description

Concrete reinforcement shall include, but not necessarily be limited to, furnishing and placing various types and/or sizes of steel reinforcing for embedment in Portland cement concrete as specified in the Approved Plans.

##### B. Related Work Included Elsewhere

1. Cast-In-Place Concrete: Section 03300
2. Pre-Cast Concrete: Section 03400

##### C. Quality Assurance

The County will inspect all materials before, during and after placement to ensure compliance with the Approved Plans.

#### **PART 2 - MATERIALS**

##### A. Materials Furnished by the County

The County will not furnish any materials for concrete reinforcement.

##### B. Contractor's Options

Substitution of smaller size bars will be permitted only upon specific authorization by the County. Substituted bars shall provide a steel area equal to or larger than that called for by the design provided the spacing is not, reduced to a point where the clear distance between the bars is less than one and one-half times the nominal diameter of the bars, nor one and one-half times the maximum size of the course aggregate, nor 1-1/2 inches, and further provided that the planned cover is maintained. No additional compensation will be allowed because of the substitution of larger areas of steel.

##### C. Detailed Material Requirements

###### 1. General

Reinforcing steel shall conform to the requirements of ACI 318.

###### 2. Bar Reinforcement

Bar reinforcement shall consist of deformed bars meeting the requirements of AASHTO M31, Grade 60. Grade 40 may be used for #5 and smaller bars where indicated on the Plans.

3. Tie or Dowel Bars

Tie or dowel bars shall be round steel bars meeting the requirements of AASHTO M 31, Grade 40 or ASTM A 36.

4. Welded Steel Wire Fabric

Welded steel wire fabric shall meet the requirements of AASHTO M 55. When galvanizing is specified, the fabric shall be galvanized after fabrication.

5. Welded Deformed Steel Wire Fabric

Welded deformed steel wire fabric shall meet the requirements of AASHTO M 221.

6. Galvanizing

Galvanizing for deformed steel bars shall be in accordance with ASTM A 153.

### **PART 3 - EXECUTION**

A. Fabrication

1. General

After bar lists and bending diagrams have been approved, fabricate each unit of reinforcement to the type, shape, size, grade, and dimensions shown on the approved shop drawings.

2. Cutting and Bending

Perform cutting and bending of reinforcing bars before shipment to the site. Bend all bars cold in a manner that will not injure the material and in accordance with the Manual of Standard Practice of the Concrete Reinforcing Steel Institute.

B. Shipping, Handling, and Protection of Material

Reinforcing steel bars shall be shipped in standard bundles and tagged and marked in accordance with the provisions of the Code of Standard Practice of the Concrete Reinforcing Steel Institute. Bundles shall be kept intact and material undamaged and

properly identified until ready for use.

Reinforcing steel bars shall be stored on blocking, racks, or platforms so as not to be in contact with the ground.

Bars shall be kept free from dirt, paint, oil, grease, loose or thick rust, detrimental mill scale, or other foreign substances. However, when steel has on this surface detrimental rust, mill scale, dust, or dirt, it shall be cleaned by a method approved by the County.

### C. Placing and Fastening

The placing of bars shall conform to the recommended practices in “Placing Reinforcing Bars” as published by the Concrete Reinforcing Steel Institute.

Reinforcing steel shall be accurately placed in the position shown on the plans and firmly held during the depositing and setting of the concrete. Cover, or the distance between the external face of the bar and the face of the finished concrete, shall be as indicated on the Plans. Reinforcing steel bars embedded in concrete shall not be bent after they are in place. Bars shall be tied at all intersections with 16 1/2 gage black annealed wire except that where spacing is less than 1 foot each direction alternate intersections need not be tied. All intersections shall be tied in the top mat of reinforcement placed on the top slabs of box culverts. Abrupt bends shall be avoided except where one steel bar is bent around the other. Stirrups and ties shall always pass around the outside of main bars and be securely attached thereto. All reinforcing steel shall be securely held at the proper distance from the forms by means of plastic coated steel chains. Blocks for holding reinforcement away from contact with earth shall be precast concrete blocks of approved shape, mix, and dimensions and shall have tie wires embedded in them. Layers of bars shall be separated by approved plastic coated metal chairs or bolsters.

Any broken or damaged concrete spacer blocks shall be removed before concrete is placed. The use of pebbles, pieces of broken stone or brick, metal pipe, or wooden blocks as spacers will not be permitted. Reinforcing steel when placed in the work shall be free from flake rust, dirt, and foreign material before any concrete is placed. Any mortar which may be adhering to the reinforcing steel shall be removed. No concrete shall be deposited until the County has inspected the placing of the reinforcing steel and given permission to place the concrete. The Contractor shall allow the County ample time after the reinforcement and forms are in place to conduct the inspection. Any bars of incorrect size, length, or shape shall be removed and replaced with correct bars. Any bars located or spaced incorrectly shall be relocated or spaced correctly before approval is given to place concrete, and such replacements and corrections shall be at the Contractor's expense. All concrete placed in violation of these provisions shall be rejected and removed.

Contractor shall allow the County ample time after the reinforcement and forms are in place to conduct the inspection. Any bars of incorrect size, length, or shape shall be

removed and replaced with correct bars. Any bars located or spaced incorrectly shall be relocated or spaced correctly before permission is given to place concrete, and such replacements and corrections shall be at the Contractor's expense. All concrete placed in violation of these provisions shall be rejected and removed.

D. Splicing

Reinforcement shall be furnished in full lengths as indicated on the Plans. Splicing, except where shown on the Plans, will not be permitted without written approval from the County and if additional splices are used, the additional weight occasioned by such splices shall be at the Contractor's expense.

All splices shall conform to Class "B" in ACI 318 or as shown on the Plans. Splices shall be well distributed where conditions permit. Except where otherwise shown on the Plans, lap splices shall be made with the bars placed in contact and wired together. Lapped splices for reinforcement shall not be used for bar sizes larger than No. 11.

No welding of reinforcing steel or attachments thereto will be permitted without written authorization by the County, unless so indicated on the Plans. Welding, if permitted, shall be in accordance with AWS D1.4.

END OF SECTION

## SECTION 03300

### CAST-IN-PLACE CONCRETE

#### **PART 1 - GENERAL**

##### A. Description

Cast-in-place concrete shall include, Portland cement concrete and the construction of small below grade Portland cement concrete structures constructed to the lines and dimensions and at the locations shown on the Plans.

##### B. Related Work Elsewhere

1. Trench Excavation, Backfill, and Compaction: Section 02250
2. Aggregate Backfill: Section 02240
3. Water Mains: Section 02660
4. Water Valves and Appurtenances: Section 02662
5. Fire Hydrants: Section 02666
6. Sanitary Sewer Force Mains: Section 02720
7. Concrete Reinforcement: Section 03200

##### C. Quality Assurance

The County will inspect all materials before, during and after installation to ensure compliance with the Contract Documents.

#### **PART 2 - MATERIALS**

##### A. Materials Furnished by the County

1. The County will not furnish any materials for Portland cement concrete.
2. The Contractor may purchase water from the County or private water company potable water system in accordance with the current County or private water company policies and procedures.

##### B. Contractor's Options

1. The Contractor may furnish higher strength concrete than specified.

C. Detailed Material Requirements

1. Portland Cement

Portland cement shall be in accordance with AASHTO M 85 with the fineness determined in accordance with AASHTO T 153 and the time of setting determined in accordance with AASHTO T 131.

2. Fine Aggregate

Fine aggregate shall meet the gradation requirements contained in Table 03300-1 and shall be in accordance with the quality requirements of AASHTO M 6.

3. Coarse Aggregate

Coarse aggregate shall be in accordance with the Class A quality requirements of AASHTO M 80 using sodium sulfate to determine the soundness. Grading of aggregate shall be in accordance with AASHTO M 43, size numbers 57, 67, or 7, Table 03300-1.

4. Aggregate Gradations

TABLE 03300-1

Mass Percent Passing

Sieves Sizes U.S. Standard	AASHTO M 43		
	No 57	No. 67	No. 7
1-1/2 inch	100	-	-
1 inch	95-100	100	-
3/4 inch	-	90-100	100
1/2 inch	25-60	-	90-100
3/8 inch	-	20-25	40-70
No. 4	0-10	0-10	0-15
No. 8	0-5	0-5	0-5
No. 16	-	-	-
No. 50	-	-	-
No. 100	-	-	-

5. Water shall be potable.

6. Admixtures

Admixtures to be used in concrete (except for Air entrainments) shall be subject

to written prior approval by the County. Admixtures for concrete shall not contribute more than 200 ppm of chlorides based on the cement content when tested in accordance with MSMT 610. The relative durability factor of concrete with Admixtures shall be determined in accordance with ASTM C 666, Procedure B.

a. Air Entraining

Air entraining admixtures shall be in accordance with AASHTO M 154.

b. Admixtures

Admixtures shall be in accordance with AASHTO M 194.

c. High Range Water Reducing Admixtures

When specified, high range reducing admixtures shall be liquid and meet the requirements of AASHTO M 194, Type F & G. When this material is used in patching, the admixture shall be liquid and meet the requirements of AASHTO M 194, Type F, for air entrained concrete with the following exceptions.

1. The water content shall be a maximum of 85% of that of the control.
2. The relative durability factor shall be a minimum of 90 when tested in accordance with ASTM C 666, Procedure B.
3. The 12 hours compressive strength for Type F admixture shall be 180% of that of control.

7. Fly Ash

Fly Ash may be used with written prior County approval.

Fly ash shall be in accordance with AASHTO M 295, pozzolan Class C or F.

8. Concrete Reinforcement

Concrete reinforcement shall be the size and type specified and shall be in accordance with the requirements of Section 03200.

9. Waterstops

Waterstops shall be made of rubber or polyvinyl chloride. The rubber type may be natural rubber, suitable synthetic rubber, or a combination of natural and

suitable synthetic rubber. The polyvinyl chloride shall contain at least 90% virgin polyvinyl chloride. The remaining 10% may include one or more monomers copolymerized with vinyl chloride or consist of other resins mechanically blended with polyvinyl.

The waterstop shall be of the shape and dimensions shown on the plans. The cross section shall be uniform along the length and transversely symmetrical so that the thickness at any given distance for either edge of the waterstop shall be uniform. The waterstop shall be dense, homogeneous, and free from holes and other imperfections.

The water stop shall meet the following requirements:

Tensile Strength, ASTM D 412, psi mm.	2000
Elongation at Break, ASTM D 412, % mm	300
Hardness, Rubber, Type A Durometer, ASTM D 2240	55±5
Hardness, PVC, Type A Durometer, ASTM D 2240	75±5

10. Forms

Forms shall be constructed of wood, steel, or other approved material. Wall ties approved ties approved by the County shall be used where necessary. Surfaces of metal forms shall be free from irregularities, dent and sags. Knot holes and broken places in the wood forms shall be smooth, uniform, and free from loose knots and other defects that would show defects in the finished concrete surfaces. For unexposed surfaces is meant any concrete surface not exposed to view on completion of the project. Interior and exterior corners shall have chamfer strips. The Contract may be required to submit details of forming to the County before work proceeds.

11. Form Release Compounds

Form release compounds shall effectively prevent the bonding of the concrete to the forms. The form release compounds shall not cause discoloration of the concrete nor adversely affect the quality or rate of hardening at the interface of the forms. The compounds will be tested in accordance with MSMT 503

12. Portland Cement Concrete Curing Materials

Curing material shall be burlap cloth, sheet materials, or liquid membranes forming compounds.

a. Burlap

Burlap cloth shall be made from jute or kenaf and shall be in accordance with AASHTO M 182, Class 1, 2, or 3.

b. Burlap Polyethylene Sheeting

Sheet material shall be in accordance with AASHTO M 171 except that tensile strength and elongation requirements are waived. White burlap polyethylene sheeting shall give a finished product weight of not less than 10 ounces per square yard.

c. Liquid Membrane

Liquid membrane-forming compounds shall be in accordance with AASHTO M 148.

Field control testing of the white pigmented curing compounds will be on the basis of weight per gallon. The samples shall not deviate more than plus or minus 0.3 pounds per gallon from the original source sample.

13. Vapor Barrier

a. Building paper shall be Sisal-Kraft building paper, conforming to requirements of FSS UUB 790A.

b. Polyethylene sheeting shall be 0.006 inch thick, conforming to requirements of ASTM D 2103.

### **PART 3 - EXECUTION**

A. General

1. Concrete shall be mixed as specified in this Section and shall be delivered to the site in accordance with ASTM C 94.
2. The Contractor will be required to use concrete equipment of sufficient capacity to complete any unit, as indicated on Approved Plans, in one continuous operation consistent with placement operations as approved by the County.
3. Hand mixing may be permitted with written approval of the County for small volumes of concrete. However, its intended use is for small isolated areas where structural integrity is not critical.
4. Before placing any concrete, the Contractor shall install all sleeves, anchors, fittings, pipes, conduits, or other special devices called for in the Approved Plans. No concrete shall be placed until this work has been approved by the

County. The Contractor shall ascertain that all material to be installed in the concrete by other trades has been placed prior to pouring any concrete. Any concrete poured without prior provisions having been made for inclusion of the indicated inserts and materials will be subject to rejection by the County and/or correction at the Contractor's expense.

5. Coat aluminum accessories and embedded items with an inert compound capable of effecting isolation of the deleterious effect of the aluminum on the concrete.
6. Design loads may not be imposed on Cast-in-Place concrete until the concrete has cured to design strength. This includes the pressurization of pipelines. The concrete strength shall be verified by the sampling of fresh concrete and completion of concrete test cylinders as indicated in paragraph B below.

**B. Concrete Mixes**

The concrete shall be proportioned by weight. Water and admixtures may be proportioned by volume or weight. The mix shall be homogeneous, placeable, and uniformly workable. Coarse aggregate shall be maintained at a uniform moisture content at least equaling its absorbed moisture. Water, if used for wetting, shall meet the requirements of this Section.

Portland cement concrete mixtures shall conform to the Maryland SHA Standard Specifications for Construction and Materials (Latest Edition) and are noted below for your convenience.

Mix No.	28 Day Specified Compressive Strength Psi (MPa)	Mm. Cement Factor pounds Per cubic yard (kg/m <sup>3</sup> )	Coarse Aggregate M43	Max. Water/Cement Ratio By wt	Slump Range In. (mm)	Total Air Content %
1	2500 (17.2)	455 (270)	57,67	0.55	2-5 (50-125)	5-8
2	3000 (20.7)	530 (315)	57,67	0.50	2-5 (50-125)	5-8
3	3500 (24.1)	580 (345)	57,67	0.50	2-5 (50-125)	5-8
4	3500 (24.1)	615 (365)	57,67	0.55	4-8 (100-200)	N/A
5	3500 (24.1)	580 (345)	7	0.50	2-5 (50-125)	5-8
6	4500 (31.0)	615 (365)	57,67	0.45	2-5 (50-125)	5-8
7	350 (2.4) Split tensile	580 (345)	57	0.50	1-1/2-3 (40-75), 2-1/2 max if slip- formed	5-8

Note 1: When concrete is exposed to sewage or water exceeding 15000 ppm sodium chloride content, Type II cement shall be used.

Note 2: When synthetic fibers are used, the slump shall not exceed 5 in.

C. Mixers and Agitators

1. All mixers shall display a current Maryland State Highway Administration approval stamp. Mixers and agitators and mixing and delivery of ready-mixed concrete shall meet the requirements of AASHTO M 157 with the following exceptions:
  - a. Transit mixed concrete will not be permitted. The following requirements shall apply when additional water is added on the job site:
    - 1) No water shall be added after partial discharge of the batch.
    - 2) The water-cement ratio shall not be exceeded.
    - 3) Acceptance will be based upon a retest of the slump and air content.
  - b. All concrete shall be discharged within 1 hour after the mixing water is added or 1 1/2 hours after the addition of the cement to the aggregates, whichever is the lesser time.
  - c. No mixer or agitator containing free water in the drum shall be loaded.

D. Hand Mixing Portland Cement Concrete

1. No hand mixing of concrete shall be allowed without first obtaining permission from the County.
2. The amount of concrete shall be small enough in quantity that in the judgment of the County, the delivery of the same is impractical.
3. Scheduling of mixing and placing shall be coordinated with the resident County inspector so that all work by the contractor is under the supervision of the resident inspector.
4. Under no circumstances shall hand mixing of concrete be allowed for any permanent buttresses that will not be subject to the 150 pound plus pressure test.

E. Forms

1. Design Criteria

Design of the forms shall be the Contractor's responsibility. Forms shall be designed for strength and deflection to resist all loads and pressure of wet concrete. The design shall provide for rate of pour, effect of vibration, and use of retarders, etc. In addition, horizontal surfaces shall have applied to them a

live load of 50 pounds per square foot. This load is to be used in the design of the forms for strength only and is not to be used in computing deflections. However, in the design of forms for horizontal slabs, in no case shall this loading be less than a total of 120 pounds per square foot. (This does not apply to form joists, form wales, etc.) No form member or support thereof shall have a deflection in excess of  $L/240$  of its span length, and in no case shall said deflection exceed 1/4 inch.

2. Concrete forms shall be built true to line and grade, mortar-tight, and sufficiently rigid to prevent displacement or sagging between supports. All form work shall be provided with adequate clean out openings to permit inspection and easy cleaning after all reinforcement has been placed.

3. Forms at Construction Joints and Corners

At construction joints in concrete, ties or bolts shall be provided 3 to 6 inches from each side of the joint for tightening the forms against the hardened concrete (first pour) immediately prior to placing fresh concrete. At joints where forms have been removed and reconstructed, the form surface shall extend over the concrete already in place; and the forms shall be drawn tightly against the previously placed concrete immediately prior to placing the fresh concrete. Where forms have been extended, the forms shall be retightened against the concrete already in place immediately before placing fresh concrete.

Forms shall be filleted at all exposed sharp corners, except when otherwise indicated on the Plans and shall be given a bevel or draft in the case of all projections, such as girders, copings, etc., sufficient to insure easy removal.

4. Bracing and Maintenance

Special attention shall be paid to bracing; and where the forms appear to be insufficiently braced or unsatisfactorily built, either before or during the placing of concrete, the County will order work stopped until the defects have been corrected. All forms shall be so maintained as to eliminate the formation of joints due to the shrinkage of lumber. All forms shall be set and maintained true to the line designated until the concrete is sufficiently hardened. For narrow walls where access to the bottom of the forms is not readily attainable provide temporary openings and at such other locations as may be necessary to clean out all chips, dirt, sawdust, or other extraneous material immediately prior to placing concrete. Existing forms may be extended after the concrete in said forms has been placed for at least 12 hours, provided such form extension can be done without any damage to the previously placed concrete.

Unit stresses for forms, form supports, false work, and bracing shall not exceed the AASHTO Specification.

5. Form Removal

All forms for concrete work shall be removed and disposed of by the Contractor after form work requirements have been compiled with, except those which are designated to remain in place.

Forms shall remain in place a sufficient time to allow the concrete to set properly and the Contractor shall assume all responsibility for removing same. In no case shall forms be removed until concrete has sufficient strength to carry its own weight and the loads upon it with safety. The Director, however, may, when he deems it advisable, order the forms to remain for a longer time, but his acquiescence in permitting the removal of forms shall not relieve the Contractor of responsibility for same.

Forms for pipe end walls may be removed after the concrete has been in place for a period of 24 hours unless it is necessary to protect the concrete against cold weather, in which case the forms shall remain in place for the entire protection period.

Forms for vertical surfaces shall remain in place for a period of 48 hours. If, however, forms are removed before the concrete is 7 days old, the vertical surfaces shall be immediately covered with curing material and the concrete kept wet and so covered until the concrete is 7 days old. Horizontal form, and false work, carrying loads shall remain in place for a minimum of 7 days and until the concrete has attained a compressive strength of 3000 psi. Internal bulkheads used for forming construction joints, contraction joints, expansion joints, etc. may be removed after the concrete has been in place for 24 hours, if it is necessary to do so for the continuance of the work without interruption.

Special care shall be taken not to break concrete edges in taking down forms. Any portion of concrete damaged while stripping forms may be ordered torn down and recast at the discretion of the County. Upon removal of forms, the County shall be notified by the Contractor. The County after inspecting the surfaces newly stripped, will designate what honey-combed parts, if any, shall be pointed up and how the slightly damaged portions of concrete, if any, shall be repaired or replaced. No freshly stripped surfaces shall be pointed up or touched in any manner before having been inspected by the County.

In all cases, the Contractor shall assume all responsibility arising from the removal of forms and shall assure himself that the concrete is properly cured to sustain loads before forms are removed.

F. Concreting

1. Before placing concrete, all sawdust, chips, and other construction

debris and extraneous matter shall be removed from interior of forms. No struts, stays, and braces, serving temporarily to hold the forms in correct shape and alignment, pending the placing of concrete at their locations, will be permitted.

All concrete shall be placed in the dry, unless Plans and/or "Special Provisions" require the placement of tremie concrete.

All concrete shall be placed in a continuous operations.

Concrete, after being placed in the forms, shall be thoroughly compacted and shall be spaded, tamped, or vibrated to the satisfaction of the County.

Chuting of concrete will be allowed only as approved by the County. No concrete shall have a free fall of over three (3) feet and if this height is exceeded, it shall be conveyed in place by approved spouts and chutes. Open troughs and chutes shall be metal or metal lined. Where steep slopes are required, the chute shall be equipped with baffles or be in short length that reverse the direction of movement. All chutes, troughs and pipes shall be kept clean and free from coatings or hardened concrete by thoroughly flushing with water after each run.

2. Retempering concrete by the addition of water shall not be permitted. The addition of water to the batch in the mixer, after ten (10) minutes have elapsed after the initial charging or the addition of water at any time after the concrete has been removed from the mixer, shall be construed as retempering. Batches of concrete prepared contrary to these specification shall be rejected and immediately removed from the project.

The concrete shall be mixed only in the quantity required for immediate use and concrete not in place within one hour from the time the ingredients were charged into the mixing drums, or that has developed initial set, shall not be used.

3. Cold Weather Specifications

Under no circumstances will concrete be permitted to be placed on frozen soil. Construction of plain and reinforced cement concrete pavements, curbs, gutters, combination curb and gutters, and sidewalks, except by specific written authorization and under very definite Special Provisions, shall not be continued when a descending air temperature in the shade and away from artificial heat falls below 45°, or resumed until an ascending air temperature in the shade and away from artificial heat reaches 40°F.

If temperature is below 45°F then one or more of the following methods shall be used to obtain the required temperature all as approved by the County.

- a. When the method of heated mixing water is used, the water shall not be above 170°F when introduced into the mix.
- b. When the method of heated aggregates is used, aggregates containing frozen lumps, ice, or snow shall be allowed to enter the mixer. Aggregates may be heated by steam coils or other dry heat but not by discharging live steam or hot water into them. Heating by means of a flame thrower or any direct flame will not be permitted.

Adequate protection of concrete against damage by frost during the making and early curing period is absolutely essential whenever temperatures below 40°F are likely to occur within that period.

#### 4. Construction Joints

Construction joints shall be kept to a minimum and will be permitted only where shown on the approved Plans and/or shop drawings.

In order to bond successive courses, suitable keys shall be formed at the top of the lift where construction joints are permitted and at other levels where work is interrupted. These keys shall be as indicated on the Plans. At horizontal construction joints, the pour shall be allowed to set for about 12 hours before placing concrete above same.

After concrete has been placed and before it has hardened, all laitance and foreign material shall be removed from the surface. Before placing fresh concrete adjacent to hardened concrete, the surface of the hardened concrete shall be cleaned thoroughly of any remaining laitance or foreign material, scrubbed with wire brooms and clean water, and thoroughly drenched with water until saturated. It shall be kept saturated until the new concrete is placed.

Unless otherwise specified, the top surface of the concrete shall be leveled whenever a pour of concrete is stopped; and to insure a level, straight joint on exposed face, a strip of sheathing shall be attached to the form at the exposed face where the joint occurs. The concrete shall be carried not more than 1/2 inch above the underside of this strip. About 1 hour after concrete is placed, the strip shall be removed; and any irregularities in the joint line shall be leveled off with a wood float (use steel trowel at exposed face of joint). All laitance shall be removed. To avoid visible joints at chamfers, the top surface of the concrete

shall be steel troweled adjacent to the chamfer using the top surface of the chamfer strip as a guide.

5. Consolidation

All concrete shall be internally vibrated unless herein noted otherwise. Vibration shall be in accordance with the following requirements:

- a. All concrete shall be deposited in the forms in its final position and shall be placed in layers of uniform thickness. All concrete shall be consolidated by vibratory methods, unless otherwise specified.

Vibration shall be internal and applied directly to the concrete, except when the use of other methods is authorized by the County or provided herein. The County will be the final judge as to which sections are unsuited for internal vibration.

The Contractor shall provide a sufficient number of vibrators to properly consolidate each batch immediately after it is placed in the forms and before the next batch is delivered, without delaying such delivery. The vibration shall be of sufficient intensity and duration to thoroughly consolidate the concrete, but it shall not be continued to such an extent as to cause segregation. Vibration shall not be continued at any one point to the extent that any localized areas of grout are formed.

Vibration shall be applied at points uniformly spaced not further apart than twice the radius over which the vibration is visibly effective.

Vibration shall not be used to transport concrete in the forms or to make it flow in the forms over distances so great as to cause segregation. Vibration shall not be applied directly or through the reinforcement or forms to sections or layer of concrete which have hardened to such a degree that the concrete ceases to be plastic under vibration.

Vibration shall be supplemented by such spading, along form surfaces, in corners, and at locations impossible to reach with the vibrators, as is necessary to insure smooth surfaces and dense concrete.

The provisions of this section shall apply to precast concrete cribbing and other precast members or units, except that if approved by the County the manufacturer's methods of vibrating may be used.

- b. Internal vibrators shall be of a type and design approved by the County. They shall be capable of transmitting vibration to the concrete at frequencies of not less than 4500 impulses per minute. The intensity of application shall be such as to visibly affect a mass of concrete of 1 inch

slumps over a radius of at least 18 inches.

Internal vibration shall be applied directly to the concrete at the point of deposit and in the area of freshly deposited concrete. Vibrators shall be inserted in and withdrawn from the concrete slowly. Internal vibrators shall be manipulated so as to thoroughly work the concrete around the reinforcement and imbedded fixtures and into the corners and angles of the forms.

6. Concrete Surface

a. General

Concrete surfaces shall be finished in accordance with one of the following designations. Unless otherwise specified, all concrete work shall have a “Grout Finish” for vertical surfaces and “Toweled Finish for horizontal surfaces. Strict compliance with the Specifications and the intent pertaining to finished surfaces will be enforced. Any concrete structure or concrete work which exhibits surfaces with defective finish will not be accepted until finishing has been completed in accordance with the Specifications. All concrete surfaces shall be finished within 24 hours after the forms are removed. If the concrete surfaces are not finished as specified within the time limit mentioned, all other work shall be suspended until the concrete surfaces required to be finished are completed.

<u>Application</u>	<u>Finished Designation</u>
<u>Structures</u>	
For all concrete surfaces not exposed to public view and not to be waterproofed	Rough Form Finish
For all concrete wall surfaces exposed to public view	Grout Finish
Tops of footings	Float Finish
Horizontal construction joints	Left Rough
Slabs & Miscellaneous Paving	Floated Finish
<u>Incidental Works</u>	
Sidewalks, curb, combination curb	Broom or Belt Finish

and gutter, concrete paving, safety  
curb, median paving

b. Rough Form Finish

Immediately following the removal of forms, all fins and irregular projections shall be removed from all surfaces except from those which are not exposed or not to be waterproofed. On all surfaces, the cavities produced by form ties and all other holes, honeycomb spots, broken corners or edges, and other defects shall be thoroughly cleaned and, after having been kept saturated with water for a period of not less than 3 hours, shall be carefully pointed and trued with a mortar of cement and fine aggregate mixed in proportions used in the grade of the concrete being finished. Any excess mortar at the surface of the concrete due to filling form tie holes shall be struck off flush with a cloth. The mortar patches shall be cured as specified under Curing. All construction and expansion joints in the completed work shall be left carefully tooled and free of all mortar and concrete. The joint filler shall be left exposed for its length with clean and true edges.

The resulting surfaces shall be true and uniform. All surfaces shall be repaired to the satisfaction of the County.

c. Grout Finish

All fins, projections, etc. shall be removed to the satisfaction of, and by means approved by, the County (stone, chipping hammer, sandblasting, etc.). No cleaning operations shall be undertaken until all contiguous surfaces to be cleaned are completed and accepted. Cleaning as the work progresses will not be permitted. The surface of the concrete shall then be saturated with water and kept wet for at least 2 hours. Proceeding by sections, a grout mix of 1 part Portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having the consistency of thick paint shall be thoroughly rubbed onto the surface using burlap pads or cork floats completely filling all voids, pits, and irregularities. While the grout is still plastic, remove all unnecessary grout by working the surface with a rubber float or burlap. After this grout has dried sufficiently so that it will not smear, the surface shall be wiped off with dry, clean burlap so as to leave a clean uniform surface. This surface shall then be cured as required, except that only colorless liquid curing compound will be permitted for this method.

d. Floated Finish

After the concrete has been placed, consolidated, struck off, and leveled, the concrete shall not be worked further until ready for floating. Floating

with a hand float or with a bladed power trowel equipped with float shoes, or with a powered disc float shall begin when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation. During or after the first floating, planeness of surface shall be checked with a 10 foot straightedge applied at not less than two different angles. All high spots shall be cut down and all low spots filled during this procedure to produce a smooth surface. The slab shall then be refloated immediately to a uniform sandy texture.

e. Broom or Belt Finish

Immediately after the concrete has received afloat finish, it shall be given a coarse transverse scored texture by drawing a broom or burlap belt across the surface.

7. Curing

Except for buttresses without steel reinforcement, provisions shall be made for curing all concrete. Curing shall start as soon as concrete has set sufficiently so that curing applications will not damage the surfaces. Curing will also be required while protecting concrete against cold weather.

The following are methods to be used for curing:

- a. Two layers of burlaps shall be used. Successive strips of each layer shall be overlapped a minimum of 6 inches. The second layer shall be placed not less than 45 degrees to the first layer; or the 6 inches overlap of the second layer may be placed midway (one-half width) of this first layer. The layers of burlap shall be kept thoroughly saturated with curing water for the full time specified for curing.
- b. The material for liquid membrane-forming compounds shall have a fugitive dye or be white pigmented. The materials shall be thoroughly agitated before use and applied by sprayers.
- c. When curing concrete structural slabs, etc., burlap-polyethylene mats or white polyethylene sheets may be used atop the wet burlap on unobstructed flat and reasonably level surfaces.

The burlap-polyethylene mats or white polyethylene sheets shall be placed only on unobstructed flat and reasonably level surfaces. They will not be permitted on vertical surfaces, such as walls, columns, abutments, etc.

Adjacent mats or sheets shall be lapped no less than 1 foot. The ends shall be brought down around the sides of the concrete being cured and

securely fastened to the satisfaction of the County to make an airtight seal that will be unaffected by wind.

The burlap-polyethylene mats must be placed on no less than one layer of wet burlap with the burlap side of the mat facing down. White polyethylene sheets, if used, must be placed on no less than two layers of wet burlap.

The burlap-polyethylene mats or white polyethylene sheets must remain in place for the same length of time as required for burlap mats. These protective coverings need not be wetted down; however, the covered burlap or cotton mats must be kept wet for the time interval required by the Specifications.

- d. The burlap must be thoroughly saturated just prior to placement. The requirement for keeping the concrete surfaces saturated at all times during the curing period, regardless of the covering, will be strictly enforced. This saturation of the surfaces must be employed even in areas where there is no ready water supply. The Contractor must furnish, at his expense, sufficient water to satisfy this requirement.

All vertical surfaces may be cured by leaving forms in place for 7 days. If forms are removed after 48 hours, then the remainder of the 7 days of cure shall be by method b.

Immediately after the finishing operation for sidewalks and slabs, the areas of future construction joints shall be covered with two layers of wet burlap which shall extend 6 inches outside the joint area. The finished concrete surface shall then be sprayed with a liquid compound as specified in curing method b. The material shall be applied uniformly at the rate of 150 to 200 square feet per gallon, one half applied in a longitudinal direction and the second half in a transverse direction. After 1 day or as soon as the concrete may be walked upon without damage, the concrete shall be cured using method a or c for the remainder of the 7 day curing period.

All other horizontal surfaces shall be cured using either method "a" or "c" above for a period of 7 days.

## 8. Prevention and Removal of Stains on Concrete

The Contractor shall prevent rust of unpainted structural steel, staining by bituminous materials, or any other substance from discoloring any portion of the concrete. The Contractor, therefore, shall devise and use construction procedures or methods that prevent staining of any of the concrete. If, however,

any portion of the concrete is stained, the Contractor shall remove such stains and restore the concrete to its original color without damage to the concrete all at his expense and as approved by the County. No chemical solvents will be allowed unless previously approved by the County.

9. Field Quality Control

A. Inspection

1. For developer projects, the Contractor or Developer shall arrange for the inspection and testing of cast-in-place concrete with reinforcement. For County capital projects, the County will arrange for and pay all costs associated with concrete sampling and testing.
2. When all rebar has been placed to the satisfaction of the inspector and the Contractor is ready to place concrete, the Contractor shall notify the County inspector. No concrete shall be deposited before the County has reviewed the reinforcing and given permission to proceed. Such inspection and permission to proceed shall in no way release the Contractor of the responsibility for proper placement of reinforcing and placement of concrete and the responsibility for adherence to the requirements of the Contract Documents.
3. Contractor shall notify the County inspector of concrete pour at least one working day in advance. Notification will not be considered without the County Inspector acknowledging receipt of prior notification.
4. The Contractor shall provide unobstructed access to work areas for the concrete inspector/technician, furnish a wheel barrow for concrete sampling and a suitable storage box for initial curing of cylinders, as specified in ASTM C 31. He shall also make running water available at the testing site. The storage box shall be at a location in the vicinity of the cast-in-place concrete structure and shall be within heated and/or protected areas identical to the cast-in-place concrete.

B. Sampling

1. Contractor shall provide and furnish concrete sample for testing.
2. Samples will be taken by the Concrete Inspection Agency in accordance with ASTM C 172 and cylinders molded in accordance with ASTM C 31.

3. A minimum of four test cylinders shall be made for every fifty (50) cubic yards of concrete (or fraction thereof) placed in once day.
4. Test cylinders shall be cured per ASTM C31.

C. Tests

1. Slump tests in accordance with ASTM C 143. Make tests periodically, when cylinders are made and when a change in consistency of concrete is noted. Unless otherwise noted the slump shall be 2 inches minimum and 4 inches maximum. For slabs, the maximum slump shall be 3 ½ inches.
2. Test for air content in accordance with ASTM C 231 or C 138.
3. Compression and strength tests: Each test will consist of 4 standard 6” by 12” cylinders; 2 cylinders to be tested at the age of 7 days and 2 cylinders at the age of 28 days. Specimens made to check the adequacy of the design for strength of concrete or as a basis for acceptance of concrete will be made and laboratory cured in accordance with ASTM C 31. Additional test of specimens cured entirely under field conditions will be utilized to check the adequacy of curing and protection of the concrete as directed. Make strength tests in accordance with ASTM C 39.
4. The average of five consecutive strength tests shall be equal or greater than the specified strength and not more than one test in ten shall have an average value less than 90% of the specified value. When the average compressive tests for 5 consecutive cylinders falls below the specified strength adjust the design mix and water content to produce the specified strength or concrete that is subsequently in place. In addition, the Engineer may order additional curing for that portion of the structure where the questionable concrete has been placed. IN the event that such additional curing does not give the strength required as determined by load tests made in accordance with ACI 318 or cored cylinder tests, the Engineer may order defective parts removed and replaced or reinforced, all at expense of Contractor.
5. The expense of any and all re-inspection and/or re-testing required due to failure of concrete to meet requirements shall be borne by the Contractor and/or Developer.

D. Reports

1. Test reports shall include the following:
  - a. Exact mix, include quantities of admixtures, etc.
  - b. Date of pour.
  - c. Exact location of pour in building.
  - d. Slump.
  - e. Truck Number.
  - f. Type of break.
  - g. Air entrainment.
  - h. Water content including aggregate moisture.
  
2. Field inspection reports shall include the following:
  - a. Extent of reinforcement and formwork inspected.
  - b. Date of inspection.
  - c. Any problems encountered or instructions given to the Contractor.

END OF SECTION

## SECTION 03400

### PRECAST CONCRETE UTILITY STRUCTURES

#### **PART 1 - GENERAL**

##### A. Description

Precast concrete utility structures shall include, but not necessarily be limited to, furnishing and installing precast concrete structures, manholes, valve and meter vaults, grade rings, and other miscellaneous structures of the configuration and to the extent indicated and in accordance with the Contract Documents.

##### B. Related Work Included Elsewhere

1. Trench Excavation, Backfill, and Compaction: Section 02250
2. Water Valves and Appurtenances: Section 02662
3. Water Services and Appurtenances: Section 02664
4. Sanitary Sewer Manholes: Section 02710

##### C. Quality Assurance

1. All manufacturers of pre-cast concrete utility structures shall possess a current certification from the National Pre-Cast Concrete Associate (NPCA). The manufacturer shall submit the current certification to the County upon request.
2. The County will inspect all materials prior to installation. Any pre-cast concrete sections which are not in compliance with the required dimensions; which are not true, square, plumb, symmetrical; which have honey-combing cracks, chips; which do not have smooth surfaces; or otherwise have visible materials defects shall be rejected and removed from the project site. Rejected materials may not be repaired but shall be replaced with new products.

#### **PART 2 - MATERIALS**

##### A. Materials Furnished by the County

The County will not furnish any materials for precast concrete utility structures.

##### B. Contractor's Options

None.

## C. Detailed Material Requirements

### **PART 1 - GENERAL**

#### a. Design Criteria

1. Structural design for pre-cast units shall be prepared by a Maryland registered Engineer for the pre-cast concrete manufacturer. Units shall be designed for HS 20 load designation or 300 pounds per square foot live load, whichever is most critical for determining the concrete and steel stresses.
2. Where more than one standard is referenced for any given unit, should there be a conflict, the more stringent requirement determined by the County, shall apply.
3. Unit configuration shall be as shown on the Plans and/or Standard Details.
4. Distribution of earth loading and live load shall be in accordance with ASTM C 857 or ASTM C 890.
5. Walls shall be designed using an equivalent fluid pressure of 83 pounds per cubic foot and a 2 foot surcharge. The units shall also be designed to resist all stress encountered during casting, handling and erection.

#### b. Pre-cast Concrete Manholes and Vaults

1. The pre-cast units shall be factory cast. Job site casting will not be permitted. Concrete in the pre-cast elements shall be continuously placed to prevent formation of seams. The finished units shall be free of voids and cracks. Exposed corners and edges shall be beveled. All inserts shall be securely attached or embedded in their proper location.
2. Concrete strength of all pre-cast units at 28 days shall be 4000 psi minimum, unless otherwise specified. It shall be the pre-cast unit manufacturer's responsibility to insure that the specified concrete strength is maintained throughout production of the units. Mix design shall be those previously used by the manufacturer which have proven satisfactory for casting units similar to those specified and producing the required strength. All pre-cast concrete shall be air entrained in accordance with AASHTO M154. Admixtures containing calcium chloride shall not be used.
3. Vault wall sleeves or gaskets for piping, sumps, steps, access hatches and other inserts as shown on the Plans and/or Standard Details shall be

cast into the structure or inserted at the place of manufacturer.

- c. Product Handling
  1. No pre-cast unit shall be shipped in less than 7 days from date of manufacturer, unless the unit has been tested and is shown to be in full compliance with the Specifications. Date of manufacturer shall be stamped on each unit.
  2. Pre-cast sections shall be transported and handled with proper equipment to protect the elements from damage. Sections shall be handled by means of lifting inserts embedded in the concrete. Damaged sections shall be replaced with new unused materials.

## **PART 2 - PRE-CAST CONCRETE MANHOLES**

- a. Pre-cast concrete manhole bases, risers, cone sections and grade rings shall meet the material and manufacturing requirements of ASTM C478, except the minimum 28-day compressive strength of the concrete shall be 4000 psi. Joints shall meet the requirements of ASTM C443, shall be self-centering and shall form a tight joint free from water leakage and seepage.
  - b. Pre-cast concrete manholes and grade rings shall meet the requirements of ASTM C478 except that the minimum compressive strength of the concrete shall be 4000 psi. The maximum individual grade ring height shall be 3 inches. Grade rings shall include steel reinforcement.
  - c. Each manhole section shall be clearly marked inside with the following:
    - ASTM Designation
    - Date of manufacturer
    - Name or trademark of manufacture
    - Manhole No. which corresponds to the Contract Drawings
  - d. All other manhole material components shall be in accordance with Section 02710 and the Standard Details.
3. Pre-Cast Concrete Vaults
    - a. Pre-cast concrete utility vault bases, risers and top slabs shall meet the material and manufacturing requirements of ASTM C857 and C858, except the minimum 28-day compressive strength of the concrete shall be 4000 psi. Joints shall meet the requirements of ASTM C443, shall be self-centering and shall form a tight joint, free from water leakage and seepage.

- b. Each section of the vault shall be clearly marked on the inside with the following:
  - ASTM Designation
  - Vault Size
  - Date of manufacturer
  - Name or trademark of manufacturer
4. Joints
  - a. Joints shall be sealed with manufacturer-supplied gaskets or mastic sealing compound which meets the recommendation of the manufacturer. Joints shall provide a water-proof joint free from water leakage or seepage.
5. Steps

Steps shall be as specified in the Standard Details
6. Granular Bedding

Granular bedding shall meet the requirements of AASHTO M 43, No. 57.
7. Pipe Penetrations

Pipe penetrations for pipe openings shall be cast into the pre-cast sections.

  - a. A banded-boot type rubber gasket shall be provided for a vertical pipeline alignments greater than 18% and less than 46.5% slopes.
  - b. A compression type rubber gasket shall be provided for a vertical pipeline alignment less than 18% slope.
  - c. A mechanically compressed rubberized gasket shall be used for cored openings.

### **PART 3 - EXECUTION**

#### **A Installation**

1. Pre-cast sections shall be transported and handled with proper equipment to protect the units from damage. Sections shall be handled by means of lifting inserts embedded in the concrete. All pre-cast concrete unit construction shall consist of new and un-used products, free from defects. Repairs to pre-cast concrete units shall be strictly prohibited, before and after shipment. Pre-cast concrete units damaged as a result of installation shall be removed and disposed of by the Contractor at no cost to the County and not returned to the project site.

Damaged pre-cast units shall be replaced with new un-used pre-cast units from the same manufacturer. Injection of grout sealant in the surrounding soils to correct joint leakage is prohibited.

2. Excavation, foundation preparation, backfill, and compaction shall be as specified in Section 02250.
3. Precast units shall be installed where and as shown on the Approved Plans and Standard Details or as directed by the County.
4. Mating surfaces shall be cleaned of all foreign materials such as dirt, mud, stones, etc., and where appropriate, joint sealing materials applied prior to assembly of the units. If mastic is used as a joint sealant, it shall be re-applied with new material every time the pre-cast units are re-set or re-positioned.
5. Grade rings shall be set on a full bed of mortar.

END OF SECTION

## SECTION 04100

### MORTAR

#### **PART 1 - GENERAL**

##### A. Description

Mortar shall include, but not necessarily be limited to, furnishing site mixed mortar for masonry, pipe connections, grouting, and other uses as specified in the Approved Plans or as directed by the County.

##### B. Related Work Included Elsewhere

1. Removal or Abandonment of Existing Utilities: Section 02050
2. Water Valves and Appurtenances: Section 02662
3. Water Services and Appurtenances: Section 02664
4. Sanitary Sewer Manholes: Section 02710
5. Brick Masonry: Section 04200

##### C. Quality Assurance

The County will inspect all materials before, during and after installation to ensure compliance with the Contract Documents.

#### **PART 2 - MATERIALS**

##### A. Materials Furnished by the County

1. The County will not furnish any materials for mortar.
2. The Contractor may purchase water from the County or private water companies potable water system in accordance with the current County or private water company Policies and Procedures.

##### B. Contractor's Options

Not applicable.

##### C. Detailed Material Requirements

1. Water shall be potable.

2. Portland Cement

Portland cement shall meet the requirements of ASTM C150

3. Mortar

a. Sewer and Water Main Construction

Proportions of mortar shall be 1 part Type II Portland Cement (ASTM C150) and 3 parts masonry sand meeting ASTM C144.

b. Mortar for Parging Masonry Walls below grade.

Proportions of mortar shall be 1 part Type I Portland Cement (ASTM C150), and ¼ part hydrated lime (ASTM C207, Type d) and 3 parts sand.

c. Mortar for laying Concrete Block Walls, Brick Walls and Unit Masonry Structures

i. Below grade mortar shall be ASTM C270 (Masonry Cement) or ASTM C91 (Portland/Lime Blend), Type M.

ii. Above grade, mortar shall be ASTM C270 (Masonry Cement) or ASTM C91 (Portland/Lime Blend), Type S (air-entrained).

4. Hydrated Lime for Masonry

Hydrated lime for masonry shall meet the chemical requirements of ASTM C 207, Type N.

5. Grout

Grout used for anchor bolts, pipe handrail posts and miscellaneous items shall be composed in accordance with one of the following:

a. One part Portland Cement and one part mortar sand by dry loose volume;

b. An epoxy or polyester anchoring system may be used as approved by the County and in accordance with the manufacturer's recommendations. Strength values shall be as indicated on the Contract Documents.

c. Non-shrink grout shall be used when specified. The grout shall have a minimum compressive strength of 5000 psi in seven days when tested

with AASHTO T106 except that the cube molds shall remain intact with a top firmly attached throughout the curing period. The non-shrink grout shall have a minimum expansion of 0.0 percent after seven days when tested in accordance with AASHTO T160.

6. Rapid-set Grout Mix for Brick Manhole Conversion – Only
  - a. Rapid-set mortar for use with the conversion of brick manhole sections to pre-cast concrete sections shall be a quick setting, high strength, self bonding and curing concrete patching and finishing compound. The mortar shall come from the manufacturer in bags, uniformly pre-mixed, consisting of Portland cements and graded washed silica aggregates with polymer modification to promote a lasting surface adhesion. The product shall meet the minimum properties: Compressive strength in accordance with ASTM C109, air cure, 1 hour at 225 psi, 24 hours at 3340 psi, 7 days at 5050 psi and 28 days at 5800 psi; flexural strength in accordance with ASTM C348, 28 days at 900 psi; Shear bond to concrete 28 days at 250 psi; Freeze thaw stability in accordance with ASTM C290, compressive 300 cycles at 6000 psi; chemical resistance shall be “good” against de-icing salts and mild acids.

### **PART 3 - EXECUTION**

#### **A. Mixing**

1. Mortar may be mixed in an approved mixing machine or manually in a tight box. The dry materials shall be mixed until the mixture assumes a uniform color and consistency. Water shall be added as the mixing continues until the proper consistency has been attained for the intended use.
2. Mortar shall be mixed only in quantities that satisfy immediate use. Retempering of mortar shall not be permitted.

#### **B. Curing**

Mortar within brickwork for manhole channels and benches shall be cured a minimum of 24 hours before being exposed to sewage.

END OF SECTION

SECTION 04200

BRICK MASONRY

**PART 1- GENERAL**

A. Description

Brick masonry shall include, but not necessarily be limited to, furnishing and installing brick masonry above and below grade to the sizes and shapes and at the locations indicated in accordance with the Approved Plans or as directed by the County. When used to adjust manhole cover elevations, inlet structures elevations, etc., brickwork shall be limited to one (1) foot.

B. Related Work Included Elsewhere

1. Removal or Abandonment of Existing Utilities: Section 02050
2. Boring and/or Jacking Pipe: Section 02300
3. Tunneling: Section 02400
4. Water Valves and Appurtenances: Section 02662
5. Water Services and Appurtenances: Section 02664
6. Fire Hydrants: Section 02666
7. Sanitary Sewer Manholes: Section 02710

C. Quality Assurance

The County will inspect all materials before, during and after installation to ensure compliance with the Contract Documents.

**PART 2 – MATERIALS**

A. Materials Furnished by the County

The County will not furnish any materials for brick masonry.

B. Contractor's Options

None.

C. Detailed Material Requirements

1. Sewer brick shall be grade SM, have dimensions not exceeding 2 1/4" x 3 3/4" x 8", and meet the requirements of ASTM Designation C32. The bricks shall have a fine-grained uniform, and dense structure, free from lumps of lime, laminations, cracks, checks, soluble salts or other defects which may in any way impair their strength, durability, appearance, or usefulness for the purpose intended. Bricks shall emit a clear, metallic ring when struck with a hammer.
2. Mortar shall be as specified in Section 04100.
3. Approved Manufacturers

All brick masonry shall be supplied by the following manufacturers:

- a. Brick – SM Grade
  - Boral Brick Company
  - Glen Geary Brick Company
  - Cherokee of Maryland

### **PART 3 - EXECUTION**

#### **A. Environmental Requirements**

1. General
  - a. Cover completed work each day to prevent rain or melting snow from penetrating the mortar of upper courses. Do not uncover until immediately before new work is to be laid. Protect new masonry for a period of not less than 72 hours immediately following laying. This time period may be extended by the County.
  - b. Spray masonry laid during the period from April to November, inclusive, with sufficient water so as to be moist, but not saturated with water just prior to use.
2. Cold Weather Protection
  - a. No brick masonry work or pointing shall be done when there is frost in the brick or when the air temperature is below 40° F, unless the Contractor has on the project ready to use, if and when directed, suitable housing, covering, tarpaulins, etc. and artificial heating devices necessary to keep the atmosphere surrounding the masonry at a temperature of not less than 40°F.

- b. Protect work by heating and maintaining the temperature of the masonry materials at not less than 40°F but not more than 160°F and maintaining an air temperature above 40°F on both sides of the masonry for not less than 72 hours. Work will not be permitted with or on frozen materials. When the temperature reaches or is above 40°F proceed as under warm weather conditions.
  - 3. Hot Weather Protection
    - a. During hot weather, protect masonry from direct rays of sun. Cover, and/or wet all finished work for a period of 7 days after laying.
    - b. Do not erect masonry when the ambient air is warmer than 99°F in the shade and has a relative humidity of less than 40% unless the work is prevented from drying out for not less than 48 hours after having been installed.
- B. General
- 1. Keep joints equal to the difference between the actual and nominal dimensions of the unit being installed.
  - 2. Tothing of new work into existing work will not be permitted.
- C. Preparation
- 1. Clean dirt, debris, oil, grease, and other foreign substances which would affect bond of mortar, from all surfaces to receive mortar.
  - 2. Lay out brickwork to establish accurate spacing of bond pattern, to ensure uniform joint widths, and to locate openings, returns, and offsets. Arrange units in a manner which will result in few or no units to be cut.
  - 3. Wetting Bricks
    - a. Brick having absorption rates in excess of 0.025 ounces per square inch per minute, when tested in accordance with ASTM C 67 shall be wetted, so that the rate of absorption does not exceed that rate.
    - b. Wetting methods shall ensure that each brick, immediately before being installed, is nearly saturated but brick surfaces are dry.
- D. Erection
- 1. Workmanship

- a. All brickwork shall be laid by competent mechanics and any workman not deemed to be such by the County shall be removed from the work at once.
- b. Lay masonry plumb, true to line, with level and accurately spaced courses. Where bricks are laid on their side for the manhole channel, the joint spacing shall not exceed 3/16-inch. On manhole benches where brick is laid flat, the joint spacing shall be no more than 1/2 –inch.
- c. Build in wood blocking, strips, grounds, wedges, pipe sleeves, frames, and similar items of material necessary to properly secure the work for other trades.
- d. Remove mortar which has splashed or been smeared on finished surfaces with stiff bristle brushes as the work progresses.
- e. Special care shall be taken in laying brick in inverts of manholes, transition sections, junction chambers, brick wyes and similar structures to insure a uniform flow of water through the sections. In such locations joints shall not exceed three-sixteenths (3/16) inch thickness and each brick shall be laid in full mortar joints on bottom side and end performed in one operation; no grouting or working in of mortar after laying the brick will be permitted.
- f. All brick work for manhole adjustments shall be installed flat in a radial pattern not placed on edge in any course. The face of brick manhole interiors shall not be parged.

## 2. Parging

- a. Parge exterior masonry in contact with the earth with two coats of Portland cement mortar, each 3/8 inch thick. The first coat shall be cross-scratched; the second coat shall be troweled smooth, beveled at the top, and coved out at the edge of the footing. Extend parging not more than 4 inches above grade, unless otherwise, and keep damp for at least 3 days.
- b. Parging the interior surfaces of a manhole is not permitted without prior County approval.

## 3. Brick

- a. Lay brick work in common bond. Fill all joints between bricks completely with mortar. Form bed joints with a thick layer of mortar, which shall be smoothed. The practice of buttering at the corners of brick and then throwing mortar or scappings into the empty joints will

not be permitted. Lay closure brick with a bed joint and with head joints. Place the brick carefully without disturbing the joints. Place the brick carefully without disturbing the brick previously laid. Properly bond each course. Dry or butt joints will not be permitted. Provide grouting where indicated.

- b. Use sewer brick whenever brick construction is exposed to sewage flow. Lay sewer brick on edge so that the 2 1/4 by 8 inch side is exposed to the flow.
- c. Channel configurations shall be constructed as per the Standard Details.
- d. All manhole frame and cover adjustments brick work will be installed in a flat radial pattern.

END OF SECTION

## SECTION 05500

### MISCELLANEOUS METALS

#### **PART 1 - GENERAL**

##### A. Description

Miscellaneous metals shall include, but not necessarily be limited to, furnishing and installing anchors, fasteners, hardware, castings, utility specialties, and other miscellaneous metal items in accordance with the Approved Plans or as directed by the County.

##### B. Related Work Included Elsewhere

1. Boring and/or Jacking Pipe: Section 02300
2. Tunneling: Section 02400
3. Water Mains: Section 02660
4. Water Valves and Appurtenances: Section 02662
5. Water Services, Water Meter Settings, and Vaults: Section 02664
6. Fire Hydrants: Section 02666
7. Sanitary Sewer Manholes: Section 02710

##### C. Quality Assurance

1. The County will inspect all materials before, during, and after installation to ensure compliance with the Approved Plans.
2. All miscellaneous metal items and fabrications shall be anchored firm and tight, in true alignment with neat fits, and without distortions, unsightly fastenings, raw edges, or protrusions.

#### **PART 2 - MATERIALS**

##### A. General

1. Materials shall be furnished in accordance with the Approved Plans.

##### B. Materials Furnished by the County

The County will not furnish any miscellaneous metals.

C. Contractor's Options

Not applicable.

D. Detailed Material Requirements

1. Whenever practicable, items shall be standard products, meeting the requirements specified herein, of a manufacturer regularly engaged in production of such items.
2. All fasteners, hangers, or other miscellaneous connections or accessories shall be of the same material or compatible with the item being fastened or hung.
3. Shapes and Bars
  - a. Mild steel shall conform to requirements of ASTM A 36.
  - b. Stainless steel shall conform to requirements of ASTM A 276, Type 304.
  - c. Aluminum shall conform to requirements of ASTM B 221, Alloy 6061-T6.
4. Plate, Sheet, Strip
  - a. Mild steel shall conform to requirements of ASTM A 36, or A 283, Grade C.
  - b. High strength steel shall conform to requirements of ASTM A 242.
  - c. Corrosion resistant steel shall conform to requirements ASTM A 242; 0.25 to 0.75 percent copper.
  - d. Stainless steel shall conform to requirements of ASTM A 240, Type 304.
  - e. Aluminum shall conform to requirements of ASTM B 209, Alloy 6061-T6.
5. Mild steel forgings shall conform to requirements of ASTM A 668, Class F.
6. Castings

- a. Unless noted otherwise, gray iron shall conform to requirements of ASTM A48, and AASHTO Designation M306, Class 30 B.
  - b. Malleable iron shall conform to requirements of ASTM A 47, Grade 35018.
  - c. Ductile iron shall conform to requirements of ASTM A 536, Grade 60-40-18.
  - d. Nodular iron shall conform to requirements of ASTM A 220, Grade 45008.
  - e. Steel shall conform to requirements of ASTM A 27, Grade 65-35. The supplementary requirements of ASTM A 27 for tolerances and deviations shall also apply.
  - f. Chromium alloy-steel castings shall conform to the requirements of ASTM A 743, A 744, and A 297. The grade shall be as specified in the “Special Provisions” for the particular use requirement of the casting.
  - g. Aluminum shall conform to requirements of ASTM B 108, Alloy ANSI 356.0, T6.
7. Bolts, nuts, washers
- a. General
    - 1) Provide galvanized for use with galvanized material.
    - 2) Provide stainless for use with corrosion resistant metals.
  - b. Stainless
    - 1) Bolts shall conform to requirements of ASTM A 320, Type 304.
    - 2) Nuts shall conform to requirements of ASTM A 194, Grade 8.
    - 3) Washers shall be Type 304.
  - c. Expansion bolts shall be the metal shield type.
  - d. Steel drive bolts shall be the split shank type.
  - e. Headed steel anchors shall be fabricated from cold finished carbon steel conforming to requirements of ASTM A 108.

- f. Castwashers, ogee washers and special castwashers shall meet the requirements of ASTM A 47. Cast washers shall be mechanically or hot-dip galvanized. The coating shall meet the thickness, adherence, and quality requirement of ASTM A 153.
  - g. Bronze bolts, nuts, and washer shall meet the requirements of ASTM B 21, UNS No. C46400.
8. Hardware
- Spikes, wood screws, staples, brads, lag screws, carriage bolts, and other parts coming under the general heading of "Hardware" shall be composed of carbon steel and shall meet the requirements of FSS FF-N-105.
9. Checkered safety plate
- a. Aluminum shall conform to requirements of ASTM B 221, Alloy 6063, T6.
10. Approved manufacturers
- All miscellaneous metals shall be provided by the following manufacturers:
- a. Frame and Covers
    - Emporia Foundry/Campbell
    - E.A. Quirin Brothers
    - East Jordan/BC
    - Capitol Foundry of Virginia, Inc.
    - Neenah

### **PART 3 - EXECUTION**

#### **A. Fabrication**

- 1. General
  - a. Fabricate all work true to shape, size and tolerances as indicated in the Approved Plans and on approved Shop Drawings; with straight lines, square corners, or smooth bends; free from twists, kinks, warps, dents, and other imperfections.
  - b. Thickness of the metal and details of assembly and support shall provide sufficient strength and stiffness to resist distortion during shipment, handling, installation, and under severe service conditions. Dress exposed edges and ends of metal smooth, with no sharp edges and with

corners slightly rounded. Construct connections and joints exposed to weather to exclude water.

- c. Provide sufficient quantity and size of anchors for the proper fastening of the work.

## 2. Fabricated Products

- a. Pipe wall sleeves in concrete construction shall be standard weight, black steel pipe, with anchors welded to exterior, size as required to accommodate passage of conduits, pipes, ducts, and similar items with proper clearance.

- b. Hatch Doors

Provide hatch doors that meet the requirements noted in the standard details and/or Approved Plans.

- c. Connections

- 1) Shop connections in weldable materials, not designed for service removal, shall be welded. All welding shall conform to AWS D1 .1 requirements. Grind all exposed welds smooth. Remove weld, brazing, and solder spater, flux, slag, and oxides from finished surfaces. Use sheet metal lock seams only when indicated on the Plans or approved shop drawings.

- 2) Complete all provisions for bolted field connections in the shop unless otherwise indicated.

- 3) Match exposed work to produce continuity of line and design. Fabricate and fasten metal work so that the work will not be distorted, the finish impaired, nor the fasteners overstressed from the expansion and contraction of the metal. Conceal fastenings whenever practicable.

- d. Castings and Forgings

- 1) Fabricate castings and forgings to the sizes and shapes indicated. Castings and forgings shall be uniform quality, true to pattern; strong, tough, of even grain; sound; smooth; without cold sheets, scabs, blisters and sand holes, cracks or other defects. Plugs, filled holes, and welding will not be allowed. Castings shall be of thickness and configurations shown on the Standard Details. Abrasive blast as required to remove scale and to achieve a uniform smooth clean surface. Paint with asphaltum or coal tar

paint meeting requirements of AWWA C 203, where indicated. Provide raised letters where indicated.

- 2) Valve boxes shall be Class 30B, round head, screw type consisting of snug fitting top, bottom sections, and screw type extension. Lid shall be removable only by lifting straight up from the shaft shoulder.
  - 3) Meter setting fittings, yokes, and appurtenances for 3/4 through 2-inch metered water supplies, and meter pit frames, lids, and covers shall be as specified on the Standard Details.
  - 4) Manhole frames and covers shall be cast from material meeting the requirements of ASTM A48, Class 30B. Weights, configuration, and lettering shall be as shown on the Standard Details.
- e. Miscellaneous anchors, strap anchors, clip angles, and plates, hangers, etc., and other items, together with all miscellaneous structural shapes required for construction of the work shown on the Plans, shall be furnished in accordance with the requirements of the Approved Plans.

**B. Painting and Coatings**

1. Where indicated, shop and/or field paint miscellaneous metal items according to the paint systems specified in the Approved Plans.
2. Galvanized touch up shall be zinc dust coating conforming to requirements of Military Specification P-2691 5.
3. Bituminous corrosion protection shall conform to requirements of Military Specification C-18480.
4. Coat aluminum accessories and items embedded in concrete with an inert compound capable of effecting isolation of the deleterious effect of the aluminum on the concrete.

**C. Delivery, Handling, and Storage**

1. Identify, and match mark if applicable, all materials, items, and fabrications; for installation and field assembly.
2. Wherever practicable, deliver items to job site as complete units, ready for installation or erection, with all anchors, hangers, fasteners, and miscellaneous metal items required for installation.

3. Provide adequate storage facilities at the job site for the protection and storage of all delivered materials. Handle and store in such a manner as to not damage factory finishes. The Contractor shall repair damaged finishes at no cost to the County.

D. Erection and Installation

1. Erection and installation of miscellaneous metal items shall be in accordance with requirements specified elsewhere in the Approved Plans.
2. Miscellaneous metal items and fabrication shall be installed in their proper locations as shown or directed and shall be anchored, rigid and secure, plumb and level unless otherwise shown, and in true alignment with related and adjoining work.
3. The Contractor shall provide shims, washers, anchors, and such additional work as necessary to achieve a satisfactory installation.

END OF SECTION

## SECTION 11307

### SEWAGE GRINDER PUMPING UNITS

#### **PART 1 - GENERAL**

##### A. Description

Sewage Grinder Pumping unit installation shall include but not necessarily be limited to furnishing and installing the sewage grinder pumping (SGP) units including accessway, tank, pumps and motors, check valves and control and alarm panels of the size and type shown on the plans and in accordance with the Contract Documents.

##### B. Submittals

Shop drawings shall be furnished for review and approval to the Engineer with subsequent review and approval by the Cecil County Division of Water and Sewer for the following items:

1. Sewage grinder pump units including accessway, tank, pumps and motors, check valves, controls and wiring.
2. An affidavit from the pump supplier that the required quantity of grinder pump cores, electrical cable, supply/control and control panels are stored and will be made available at the local pump suppliers warehouse until such time as the lots are developed and connected to public sewer.

##### C. Related Work Specified Elsewhere

1. Trench Excavation, Backfill and Compaction: Section 02250
2. Gravity Sanitary Sewer and House Connections: Section 02700
3. Low Pressure Sewer: Section 02731
4. Sanitary Sewer Force Mains: Section 02720
5. Cast-in-place Concrete: Section 03300

##### D. Quality Assurance

1. The County will inspect all materials before, during and after installation to ensure compliance with the Contract Documents.
2. The grinder pump shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the completely assembled and wired Grinder Pump Station shall be listed by Underwriters Laboratories, Inc., to be safe and appropriate for the intended use.

3. The grinder pump shall meet accepted standards for plumbing equipment for use in or near residences, shall be free from noise, odor or health hazards and shall have been tested by an independent laboratory to certify its capability to perform as specified in either individual or low pressure sewer system applications. As evidence of compliance with this requirement, the grinder pump shall bear the seal of NSF International.

## **PART 2- MATERIALS**

### **A. General**

1. Materials shall be furnished in accordance with the Contract Documents and the current edition of the Approved list of Suppliers and Materials for Water and Sewer main construction.

### **B. Sewage Grinder Pump Units**

1. The Contractor shall furnish new, factory-built sewage grinder pump units consisting of simplex or duplex grinder pump core units and all necessary parts and equipment installed in high density polyethylene tanks.
2. Sewage grinder pump units shall be as manufactured by the Environment/One Corp., 2772 Balltown Road, Niskayuna, New York 12309 or approved equal. The equipment specified shall be a product of a company experienced in the design and manufacture of sewage grinder pumps (progressive cavity type) for specific use in low pressure sewer applications. The company shall submit detailed product specifications, submit evidence of an established service program (over 15 years experience) and shall be responsible for maintaining a continuing inventory of grinder pump replacement parts.
3. Operating Conditions: The pumps shall be of a semi-positive displacement type. Each pump shall be capable of delivering 11 GPM against a normal rated total dynamic head of 92 feet. At zero head, the output shall be 15 GPM, minimum. The pumps shall be capable of intermittent (3 minute's minimum) operation at any head up to 185 feet total dynamic head with a minimum flow of 7.8 GPM. The electrical rating of each pump motor shall be 8 amperes, 1 phase, 240 volts and 60 Hertz.
4. Tanks
  - a. Sewage grinder pump basins (tanks) and integral accessway shall be manufactured by the Environment/One Corp., 2773 Balltown Road, Niskayuna, New York 12309 or approved equal. The tank shall be of high density polyethylene (HDPE) corrugated double wall construction, minimum ¼-inch thick. The internal wall shall be generally smooth with the outside wall having a minimum of 1 ½ inch corrugations for

stiffness. Tank bottom and all other construction seams shall be thermally welded and factory tested for lead tightness.

- b. All tanks shall be furnished with inlet grommet(s) to accept a 6" nominal diameter PVC SDR 35 sewer house connection and comply with ASTM D 3034 and F1336.

5. Accessways: The accessways shall be of corrugated HDPE as specified for the tank for the required Model Unit(s). It shall have an access opening at the top with a lockable cover with skirt capable for supporting a 150 pound per square foot loading.

- a. The accessway shall be an integral extension of the tank and include a tamper-proof cover assembly with water-tight capability.
- b. The basin shall have all necessary penetrations molded in and factory sealed. Field penetrations will be prohibited.
- c. All discharge piping within and penetrating the basin shall be 340 stainless steel and terminate outside the basin with a 1 ¼ inch female NPT fitting. The discharge piping shall include a stainless steel ball valve rated for 200 psi. All penetrations shall be warranted to be water tight.
- d. The accessway shall include a single NEMA 6P electrical quick disconnect for all power and control functions, factory installed with accessway penetrations warranted to be watertight. The accessway shall also include a 2 inch PVC vent to prevent sewage gases from accumulating in the tank. Junction boxes within the basin are prohibited.

6. Pump Core Units

- a. The grinder pump shall have a cartridge type easily removable core assembly containing pump, motor, grinder, polypropylene rope, stainless steel valve actuator, controls, check valves, anti-siphon valve and wiring. The core unit shall have two lifting eyes provided in the top housing to facilitate easy removal of the core unit from the tank if necessary. The core mounting plate shall be equipped with captive mounting bolts which permit installation/removal of the cores from the surface without entering the accessway by means of a long-stem wrench.
- b. The watertight integrity of the core unit, including wiring and access cover, shall be established by 100% factory test at a minimum of 5 psi.
- c. The Contractor shall furnish the following additional spare pump core, identical to the approved pump cores and deliver it to the North East

River Advanced Wastewater Treatment Plant, Charlestown, Maryland, and attention Superintendent of Water and Wastewater according to the following schedule:

<u>Number of Grinder Pumps</u>	<u>Number of Required Spare Cores</u>
2-20 Units	1 Core
21-50 Units	2 Cores
51-150 Units	5 Cores

7. Pumps: each pump shall be an integral, vertical rotor, motor driven, solids Handling pump of the progressing cavity type with mechanical seal. The rotor shall be through-hardened, high polished, precipitation hardened stainless steel. The stator shall be of a specifically compounded ethylene propylene synthetic elastomer. The material shall be suitable for domestic wastewater service. Its physical properties shall include high tear and abrasion resistance, grease resistance, water and detergent resistance, temperature, stability and wear resistance. The pump shall have two-bearing design including both upper and lower ball bearings. Sleeve bearings will not be acceptable.
  
8. Grinder
  - a. The grinder shall be positioned immediately below the pumping element and shall be direct-driven by a single one piece stainless steel motor shaft. The grinder impeller assembly shall be securely fastened to the pump motor shaft by means of a threaded connection attaching the impeller to the motor shaft. Attachments by pins or keys are prohibited. The grinder shall be a one piece forged 4140 cutter wheel of the rotating type with inductively hardened cutter teeth (Rockwell 55-58c). The shredder ring shall have a staggered tooth pattern with only one edge engaged at a time. This assembly shall operate without objectionable noise or vibration over the entire range of recommended operating procedures.
  
  - b. The grinder shall be constructed so as to eliminate clogging and jamming under all normal operating conditions including starting. Sufficient vortex action shall be created to scour tank free of deposits or sludge banks which would impair the operation of the pump. These requirements shall be accomplished by the following items in conjunction with the grinder pump tank:
    - i. The grinder shall be positioned in such a way that solids are fed in an up-flow direction.

- ii. At maximum flow rate through the cutting mechanism must not exceed 4 feet per second.
- iii. The impeller must rotate nominal speed of no greater than 1800 rpm.

9. Electric Motor

- a. The motor shall be 1 HP, minimum, 1725 rpm, 240 volt, 60 hz, single phase, capacitor start, ball bearing, squirrel cage induction type with a low starting current not to exceed 30 amperes and a high starting torque of 8.4 foot pounds.
- b. The motor shall have inherent protection against overloads or locked rotor conditions by the use of a UL-listed, automatic reset, integral thermal overload protector incorporated into the motor. Non-capacitor start motors or permanent split capacitor motors shall be prohibited.

10. Seal

- a. The pump core shall be provided with a mechanical shaft seal to prevent leakage between the motor and pump. The seal shall have a stationary ceramic seat and carbon rotating surface with faces precision lapped and held in place with a stainless steel spring.

11. Check valve:

The pump discharge shall be equipped with a factory installed, check valve that is built into the discharge pipe. The valve shall be constructed with an HDPE housing and stainless steel interior components. The valve will provide a full-port passage way when open and shall produce a friction loss of less than 6 inches of water at a maximum rated flow. Working parts shall be made of 300 series stainless steel. The valve operation shall provide maximum seating capability, even at very low back pressure. The check valve will provide a full-ported passageway when open. Working parts will be made of a 300 series stainless steel and fabric reinforced synthetic elastomer. Ball-type check valves shall be prohibited.

12 Controls

- a. All necessary controls shall be located in the top housing of the core unit. The top housing will be attached with stainless steel fasteners. All controls shall be wired.
- b. Non-fouling waste water level detection for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral

air-bell level sensor connected to a pressure switch. The level detection device shall have no moving parts in direct contact with the waste water. High-level sensing will be accomplished in the manner detailed above by a separate air-bell sensor and pressure switch of the same type. Float switches are not acceptable.

- c. To assure reliable operation of the pressure sensitive switches, each core shall be equipped with an equalizer diaphragm that compensates for atmospheric pressure or temperature changes.
- d. The grinder pump will be furnished with a length of 6 conductor 14 gauge, type SJOW cable, pre-wired and watertight to meet UL requirements. This cable shall be installed in a 1 ½ inch PVC conduit that runs from the control cabinet to the grinder pump.
- e. The Contractor and home builder shall coordinate the ordered length of control/power cable between the grinder pump location and the control panel. The control/power cable between the grinder pump disconnect and the pump control panel shall be one piece with no splices. The maximum length shall not exceed 150' unless approved modifications are made by the grinder pump manufacturer.

### 13. Pump Control Panel

- a. The pump control panel shall be Simplex Sentry as manufactured by Environment/One Corp., 2773 Ball town Road, Niskayuna, New York or approved equal. The entire pump control panel as specified shall be listed by Underwriters Laboratories, Inc.
- b. Each sewage grinder pumping unit shall include a NEMA 4x, UL listed pump control panel suitable for mounting on the exterior of a residential dwelling. The NEMA 4x enclosure shall be manufactured of UV-stabilized thermal plastic. The enclosure shall include a hinged, pad-lockable cover secured dead front (protection from exposed wires) and component knock outs.
- c. For each pump core, the control panel shall contain one 15 amp dedicated double pole circuit breaker for the power circuit and one 15 amp dedicated single pole circuit breaker for the alarm circuit. The control panel shall also contain one 15 amp dedicated single pole circuit breaker for a 120 VAC, 15 amp rating, service with integral GFC outlet.

The outlet shall only be accessible by opening the control panel cover. The control panel shall contain at least but not be limited to terminal blocks, integral power bus, push to run feature and a complete alarm circuit.

- d. The visual alarm lamp shall be inside a red fluted lens at least 2 5/8" in diameter and 1 11/16" in height. The visual alarm shall be mounted to the top of the pump control in such a manner as to maintain NEMA 4x rating.
- e. The audio alarm shall be a printed circuit board in conjunction with a 93-dB buzzer with a quick mounting terminal strip mounted in the interior of the enclosure. The audio alarm shall be capable of being deactivated by depressing a push-type switch which is encapsulated in a weather proof silicone boot and mounted on the bottom of the enclosure.

14. Interior Piping

- a. All discharge piping and fittings shall be 300 series stainless steel.

15. Warranty

- a. The grinder pump manufacturer shall provide a parts and labor warranty on the entire sewage grinder pumping unit and accessories, including, but not limited to, control panel, electrical parts, pump core, tank basin and integral accessway, cabling and internal piping, valves and appurtenances for a period of 24 months after pump core is placed into service. All service calls during this 24 month period will be deemed necessary as warranty work unless the repairs are due to non-equipment related failures or damage such as vandalism, damage to vehicular traffic, etc. When the Division of Water and Sewer receives a service call request from the customer, they will report to the site and restore the service as soon as possible. If the failure or damage is of no fault of the Division of Water and Sewer or the customer, the Division will backcharge the Developer or Contractor as per the Public Works Utility Agreement or the Contract Documents. If the core unit is deemed defective, the County will contact the manufacturer/supplier and have it picked up from the North East River Advanced Wastewater Treatment Plant located at 123 Carpenters Point Road for repair or replacement. The repaired or replacement core must be returned to the Sod Run Wastewater Treatment Plant within three working days after the notification. Cecil County shall not be responsible for any labor, freight, transportation, taxes or any other costs associated with service deemed as warranty work.

The Contractor shall supply the Division of Water and Sewer with the 24-hour telephone number of the pump manufacturer/supplier representative who will be responding to warranty service calls.

16. Level Sensor

- a. Non-fouling wastewater level detection for controlling the grinder pump and alarm operation shall be accomplished by use of a detection mechanism specifically designed for use in a sewage grinder pump basin. Level detection shall not require any regular maintenance. The control assembly shall be specifically approved by Underwriters Laboratories. Conventional mercury, mechanical or swing arm floats will not be acceptable. All electrical wires to the level detection shall have electrical quick disconnects. (NEMA 6P).

17. Shut-off Valve

- a. The grinder pump discharge piping shall be equipped with a factory-installed, full port, stainless steel manual ball valve with a minimum rated pressure of 235 psi. The valve shall be equipped with a stainless steel valve wrench terminating within 18-inches of the accessway. Each valve wrench shall be stored within the upper confines of the accessway.

18. Anti-Siphon Capability

- a. The pump shall be constructed with a positively primed flooded suction configuration. As added assurance that the pump cannot lose prime even under negative pressure conditions in the discharge piping system, the design shall provide protection against siphoning. This device will automatically close when the pump is running and open to atmosphere when the pump is off. Use of a small diameter orifices in the discharge piping between the pump and check valve for anti-siphoning purposes is not acceptable. The anti-siphon valve shall be a gravity operated, flapper type valve built into the discharge piping. Moving parts shall be made of 300 stainless steel and fabric reinforced synthetic elastomer.

19. Padlocks

The Contractor shall provide one padlock each for the breaker panel, control panel and grinder pump basin. The padlock shall be a Masterlock with rubberized weatherproof coating and keyed to Cecil County Standard.

**3.0. EXECUTION**

A. Factory Test

1. All components for the sewage grinder pumping unit shall be factory tested and certified. Certified test results shall be available upon request by the Division of

Water and Sewer. The Division of Water and Sewer reserves the right to inspect such testing procedures with representatives of the grinder pump manufacturer at the manufacturer's facilities and at their expense.

All completed stations shall be factory leak tested to assure the integrity of all joints, seams and penetrations. All necessary penetrations such as inlets, discharge fittings and cable connections shall be included in this test along with their respective sealing means (grommets, gaskets, etc.).

B. Delivery

1. All grinder pump tanks, including ball valve quick disconnect and water tight penetrations shall be delivered to the job site 100% completely assembled including testing, ready for installation. Grinder pump tanks shall be individually mounted on wooden pallets.

C. Installation

1. Earth excavation and backfill shall be specified in accordance with the Standard Specifications and/or these Specifications and the drawings are also to be done as a part of the work under this section including any necessary sheeting and bracing. The contractor shall be responsible for control of groundwater to provide a firm, dry subgrade for the structure and shall guard against flotation or other damage resulting from general water or flooding. The grinder pump stations shall not be set into the excavation until the installation procedures are excavation have been approved by the inspector.
2. Remove packing material: Users instruction **MUST** be given to the Inspector. Hardware supplied with the unit, if required, will be used at time of installation. The basin will be supplied within one flexible inlet grommet for simplex pump and two flexible inlet grommets for duplex pumps for connecting the incoming sewer line. Appropriate inlet piping must be used. When moving tank, it should be lifted using all 4 lifting eyes provided at the lower end of the basin. Do not use these eyes if a concrete collar has been attached to the tank. The basin may not be dropped, rolled or laid on its side for any reason.
3. A 6 inch layer (minimum) of washed No. 57 stone shall be used as bedding material under each unit. A concrete antiflotation collar, as detailed on the drawings and details and sized according to the manufacturers instructions, shall be required and shall be pre-cast to the grinder pump basin or poured in place. Each grinder pump basin with its pre-cast antiflotation collar shall have a minimum of three lifting eyes for loading and unloading purposes. The unit shall be leveled and filled with water to the bottom of the inlet to help prevent the unit from shifting while the concrete is being poured. The concrete may not extend any higher than the invert of the inlet piping. The contractor may not construct pre-cast concrete "blocks" which are fastened to the grinder pump

basin by means of bolts. All antifoatation concrete collars must be cast-in place integrally with the pump basin, either above or below ground. If pre-cast below ground, the concrete shall be allowed to cure a minimum of 24-hours prior to backfill.

4. The contractor shall provide and install grinder pump house connection piping as shown on the Drawings.
5. Backfill with wash number 57 stone from top of concrete antifoatation collar to six inches minimum above grinder pump discharge pipe, then backfill in accordance with the Contract Documents. Improper backfilling may result in damaged access ways.
6. Upon completion of backfilling, the contractor shall place the stainless steel valve actuators within each grinder pump basin and re-secure the pump basin lid.
7. It is extremely important that the finished grade shall slope away from the surface of the grinder pump.
8. All restoration will be the responsibility of the contractor. Per unit costs for this item shall be included in the contractors bid price for the individual grinder pump stations. All properties shall be restored to their original condition in all respects including, but not limited to, curb and sidewalk replacement, landscaping, topsoil and seeding, restoration of the traveled ways as directed by the inspector.
9. Any pre-purchased control wire and control panels which are not required to be installed at the time of the grinder installation shall be kept in the supplier's inventory and not stored within the grinder basins.

D. Commissioning Procedures Post – Utility Construction for Developer Projects

For developer projects, the following procedures have been established on installing the plumbing and electrical connections to the grinder pumps as well as start-up and testing. These procedures are primarily aimed at the homebuilder.

1. The grinder pump basin and cleanouts shall be protected from damage during the construction of the home(s). Protection shall consist of a 4 foot high orange safety fence installed at a minimum of 5 feet beyond the grinder pump basin and cleanouts. These facilities have been inspected and approved as part of the operational process. Any damage to these facilities from the homebuilder or his subcontractors shall be repaired or replaced if necessary by a Cecil County approved license utility contractor at the homebuilder's expense.

2. Under an electrical permit, the homebuilder shall have a licensed electrician install the electrical service and control panel in conformance with the standard details. Homebuilder is responsible for acquiring the control panel, controls, alarm system and control/power cable from the pump supplier. These components shall have been pre-purchased by the utility contractor. For duplex grinder pumps, each house will have electrical power and controls that only operate the pump for that house.
3. Under a plumbing connection permit, the homebuilder shall have a licensed plumber install the sewer service between the house and the existing cleanout.
4. The ground around the grinder basin must be graded to the finished grades for inspection at start up. The startup test will be cancelled if the ground is not properly graded. At no times shall the grinder pump basin be within a sump pump area. The site drainage shall freely drain stormwater away from the grinder basin. If this cannot be achieved, the homebuilder shall contact the pump supplier to have an extension piece installed by the pump supplier, at the homebuilder's cost. There must be a minimum of 6 inches from the top of the grinder basin lid and finished grade (including sod). If the 6 inch clearance cannot be met the homebuilder shall have the pump manufacturer install a riser section, at the homeowner's cost.
5. Once the electrical and plumbing work is complete, the homebuilder shall schedule for a pump start-up with a minimum 1 week advance notice. Notification shall be to the pump supplier with (1) the test date and time, (2) property address and (3) homebuilder contact name and phone number. The same notification shall also be to Cecil County Water and Sewer Pump Station Operations Maintenance Superintendent.
6. Just prior to the start up test, the homebuilder shall have a septic hauler with vacuum capabilities on-site to thoroughly clean all stones and debris from the bottom of the pump basin.
7. At the day of the start up, water must be available by the homebuilder to fill the basin as needed to test the pump.
8. The following people must be present at the start up test: Homebuilder, homebuilder's electrician, pump supplier technician and Cecil County Operations Maintenance Superintendent.
9. The pump supplier technician will then test all of the electrical connections and inspect the installation. If all is acceptable to the pump supplier and Cecil County, the pump supplier technician will install the pump core and check its operation. If all operations are successful the pump may be put into service.

10. Upon satisfactory start up the grinder pump, the homebuilder shall provide a copy of the grinder pump notification information to the new homeowner at settlement or sooner.
11. Submit affidavit described in Section 1.0.

E. Commissioning Procedures Post-Utility Construction for Capital Projects

1. Under an electrical permit, the Contractor shall have a licensed electrician install the electrical service, circuit breaker, control panel and all required wiring and conduit in accordance with the Contract Documents. The licensed electrician shall be responsible to contact BGE for coordination of a separate service into the BGE meter.
2. The ground around the grinder basin must be graded to the finished grades with seed and mulch for inspection at start-up. At no time shall the grinder pump basin be within a sump area. The site drainage shall freely drain stormwater away from the grinder basin.
3. Once the electrical work and grading is complete, the Contractor shall schedule for a pump start-up test with a minimum 1 week advance notice. Notification shall be to the pump supplier with (1) the test date and time, (2) property address. The same notification shall be made to the Cecil County project manager, inspector and the Division of Water and Sewer, Maintenance Supervisor or his designated representative. The Contractor, pump supplier, Cecil County project manager, inspector and Cecil County Maintenance Superintendent must all be present at the start-up and test.
4. Just prior to the test, the Contractor shall have a septic hauler with vacuum capabilities on-site to thoroughly clean all stones and debris from the bottom of the pump basin.

At the day of start up, the Contractor shall have clean potable water in tanks available to fill the grinder pump basin. It is prohibited to utilize water from the homeowner.

5. The pump supplier shall provide the services of a qualified factory-trained technician who shall inspect the placement and wiring of each installation and perform tests below:
  - a. Check electrical continuity of all circuits.
  - b. Determine if proper voltage is provided to the unit.
  - c. Check entire site for proper installation.
  - d. Install test pump and open all discharge piping.
  - e. After contractor fills basin with water, verify high level alarm.
  - f. Initiate pump operation to verify automatic controls are functioning

properly.

6. Once the sewage pumping unit is accepted by the factory trained manufacturer's representative, the technician shall complete the start-up completion report. The test-pump shall then be removed from the pump basin. The discharge valves shall be in the closed position. All new pump cores shall be retained in inventory with the local pump supplier until notified that the homeowner is ready for connection to the system.
7. For vacant lots- the Contractor is not responsible to perform procedures 1 through 7 above. At the time of site development, the homebuilder will be required to follow the Commissioning Procedures for developer projects.
8. Submit affidavit described in Section 1.0.

END OF SECTION