ARLINGTON COUNTY, VIRGINIA
OFFICE OF THE PURCHASING AGENT
2100 CLARENDON BOULEVARD, SUITE 500
ARLINGTON, VIRGINIA 22201

CONTRACT AWARD COVERPAGE

TO: SAGRES CONSTRUCTION CORPORATION
3680 WHEELER AVE. SUITE 300
ALEXANDRIA, VIRGINIA 22304

DATE ISSUED:	MAY 10, 2022
CONTRACT NO:	22-DES-ITBPW-618
CONTRACT TITLE:	Construction of the Stormwater Management / BMP at the SE Corner of Old Dominion Dr. & 26th Street N.

THIS IS A NOTICE OF AWARD OF CONTRACT AND NOT AN ORDER. NO WORK IS AUTHORIZED UNTIL THE VENDOR RECEIVES A VALID COUNTY PURCHASE ORDER ENCUMBERING CONTRACT FUNDS.

The contract documents consist of the terms and conditions of AGREEMENT No. 22-DES-ITBPW-618 including any attachments or amendments thereto.

EFFECTIVE DATE: MAY 10, 2022
EXPIRES: JUNE 30, 2023
RENEWALS: NONE
COMMODITY CODE(S): 91359
LIVING WAGE: N

ATTACHMENTS:
AGREEMENT No. 22-DES-ITBPW-618

EMPLOYEES NOT TO BENEFIT:
NO COUNTY EMPLOYEE SHALL RECEIVE ANY SHARE OR BENEFIT OF THIS CONTRACT NOT AVAILABLE TO THE GENERAL PUBLIC.

VENDOR CONTACT: DAN DRAGACEVAC VENDOR TEL. NO.: (703) 924-7220
EMAIL ADDRESS: DAN@SAGRESCONSTRUCTION.COM
COUNTY CONTACT: MANNAN QURESHI (DES AND ENG) COUNTY TEL. NO.: (703) 228-3592
COUNTY CONTACT EMAIL: MQURESHI@ARLINGTONVA.US

PURCHASING DIVISION AUTHORIZATION

Sy Gezachew Title: Procurement Officer Date: May 10, 2022

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ARLINGTON COUNTY, VIRGINIA
OFFICE OF THE PURCHASING AGENT
SUITE 500, 2100 CLARENDON BOULEVARD
ARLINGTON, VA 22201

AGREEMENT NO. 22-DES-ITBPW-618

THIS AGREEMENT is made, on 5/10/2022, between **Sagres Construction Corporation**, 3680 Wheeler Ave., Suite 300, Alexandria, Virginia 22304 ("Contractor") a Virginia corporation authorized to do business in the Commonwealth of Virginia, and the **County Board of Arlington County, Virginia** ("County"). The County and the Contractor, for the consideration hereinafter specified, agree as follows:

1. CONTRACT DOCUMENTS

The Contract Documents consist of:

- Agreement No. 22-DES-ITBPW-618, and all modifications properly incorporated into the Agreement
- Exhibit A – Arlington County Invitation to Bid No. 22-DES-ITB-618, including DES General Conditions, Special Conditions, and Supplementary Specifications, included herein by reference
- Exhibit B – Specifications, Drawings and Construction Notes
- Exhibit C – Virginia Department Of Labor And Industry Wage Determination Decision
- Exhibit D – Price Bid of Contractor
- Exhibit E – Specifications for Manufactured Stormwater Filter Device (02541)
- Exhibit F – Specifications for Underground Stormwater Detention Pipe System (02542)
- Exhibit G – Material Testing Specification Reference
- Exhibit H – List of State and Federal Roads in Arlington County, Virginia
- Exhibit I – RFI Template

Where the terms and provisions of this Agreement vary from the terms and provisions of the other Contract Documents, the terms and provisions of this Agreement will prevail over the other Contract Documents, and the remaining Contract Documents will be complementary to each other. If there are any conflicts, the most stringent terms or provisions will prevail.

The Contract Documents set forth the entire agreement between the County and the Contractor. The County and the Contractor agree that no representative or agent of either party has made any representation or promise with respect to the parties' agreement that is not contained in the Contract Documents. The Contract Documents may be referred to below as the "Contract" or the "Agreement".

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2. SCOPE OF WORK

The Contractor will furnish all labor, materials, and equipment for the construction of the Stormwater Management / BMP at the SE Corner of Old Dominion Dr. & 26th Street N. (the "Project") and all other work shown, described, and required by the Contract Documents (hereinafter "the Work").

The Work shall be performed according to the standards established by the Contract Documents read together as a single specification. It shall be the Contractor's responsibility, at solely the Contractor's cost, to provide sufficient services to fulfill the purposes of the Work. Nothing in the Contract Documents shall be construed to limit the Contractor's responsibility to manage the details and execution of its Work.

3. TIME FOR COMPLETION

Work under this Agreement shall achieve Substantial Completion no later than three hundred sixty-five (365) consecutive calendar days after the commencement date given in a Notice to Proceed provided by the County to the Contractor, subject to any modifications made as provided for in the Contract Documents. This three hundred sixty-five (365) day period shall be the Period of Performance for Substantial Completion. No Work shall be deemed Substantially Complete until it meets the requirements of Substantial Completion set forth in the General Conditions. Final Completion of the Work shall be completed no later than thirty (30) calendar days after the date of acceptance of Substantial Completion by the County Project Officer. Work will not reach Final Completion until it meets the requirements set forth in the General Conditions.

Unless otherwise provided, no claims for early completion are allowed.

4. CONTRACT AMOUNT

The County will pay the Contractor in accordance with the terms of the Progress Payments and Retainage and Payment Terms sections below and at the prices shown in Exhibit D, for the Contractor's completion of the Work as required by the Contract Documents provided the Work is performed to the satisfaction of and is accepted by the Project Officer. The Contractor will complete the Work for the total amount specified in this section ("Contract Amount") unless such amount is modified as provided in this Agreement. The Contract Amount includes all of the Contractor's costs and fees (profit) and is inclusive of all anticipated or known site conditions, anticipated or known materials, labor, and equipment costs, or any other costs which should reasonably have been expected by the Contract Documents.

5. PROGRESS PAYMENTS AND RETAINAGE

The County will make monthly progress payments to the Contractor upon written application by the Contractor, on the basis of a written estimate of the work performed during the preceding calendar month as approved by the Project Officer. However, 5% of each progress payment will be retained by the County until Final Completion and acceptance of all Work covered by the Agreement.

All material and work covered by partial payments will become the property solely of the County at the time the partial payment is made. However, the Contractor will have the sole responsibility, care and custody for all materials and work upon which payments have been made until Substantial Completion. When calculating payment for materials on-site, the County shall not pay for materials which are not scheduled for incorporation into the Work within sixty (60) days from the date of application for payment.

6. PAYMENT TERMS

The Contractor must submit invoices to the County's Project Officer, who will either approve the invoice or require corrections. The County will pay the Contractor 45 days after approval of an invoice for

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completed work which is reasonable and allocable to the Contract. The number of the County Purchase Order pursuant to work has been performed must appear on all invoices.

7. PAYMENT OF SUBCONTRACTORS

The Contractor is obligated to take one of the two following actions within seven days after receipt of payment by the County for work performed by any subcontractor under this Contract:

a. Pay the subcontractor for the proportionate share of the total payment received from the County attributable to the work performed by the subcontractor under this Contract; or

b. Notify the County and the subcontractor, in writing, of the Contractor's intention to withhold all or a part of the subcontractor's payment with the reason for nonpayment.

The Contractor is obligated to pay interest to the subcontractor on all amounts owed by the Contractor to the subcontractor that remain unpaid after seven days following receipt by the Contractor of payment from the County for work performed by the subcontractor under this Contract, except for amounts withheld as allowed in subsection b., above. Unless otherwise provided under the terms of this Contract, interest will accrue at the rate of 1% per month.

The Contractor must include in each of its subcontracts, if any are permitted, a provision requiring each subcontractor to include or otherwise be subject to the same payment and interest requirements with respect to each lower-tier subcontractor.

The Contractor's obligation to pay an interest charge to a subcontractor pursuant to this section may not be construed to be an obligation of the County. A Contract modification may not be made for the purpose of providing reimbursement for such interest charge. A cost reimbursement claim may not include any amount for reimbursement for such interest charge.

8. PREVAILING WAGE CONTRACT REQUIREMENTS

A. Section 4-104 of the Arlington County Purchasing Resolution (regarding “Prevailing Wage) applies to this Contract. All employees of the Contractor and any subcontractors shall be paid wages, salaries, benefits, and other remuneration at or above the craft or trade category prevailing wage rate indicated by Virginia Commissioner of Labor and Industry (DOLI) and as listed in the contract.

In addition to applying the prevailing wage rates to its own employees, the Contractor shall include the provisions of this Article 4-104 in every subcontract so that such provisions will be binding upon each subcontractor. The Contractor agrees to assume the obligation that the wage requirements will be observed in fulfilling the requirements of the Contract. The appropriate enforcement sanctions will be invoked against the Contractor and any such subcontractor in the event of such subcontractor’s failure to comply with any of the provisions of this Article 4-104.

All wage rates to be used are listed in this Contract in Exhibit C. While DOLI maintains a list of wage determinations online for reference purposes, only the wage determinations made in an official Wage Determination Decision, sent by DOLI to Arlington County, can be used to ascertain the exact rates to be paid for this Contract.

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All rates are determined by DOLI and any appeals of specific classification may be made through the Wage Determination Appeal form available at http://www.doli.virginia.gov/wp-content/uploads/2021/04/Appeal-for-Wage-Determination-Clarification.pdf.

B. Upon award of the Contract, the Contractor shall certify, under oath, to the Virginia Commissioner of Labor and Industry and to the County Prevailing Wage Compliance Manager, the pay scale for each craft and trade to be employed for, or to provide labor for, in the Work by the Contractor and any subcontractors. The Contractor's certification shall include all information required by the Code of Virginia § 2.2-4321.3G.

C. The Contractor shall ensure that each individual providing labor as a mechanic, laborer, worker or equivalent shall be accurately classified in confirmation with the Wage Determination.

D. The Contractor shall post the prevailing wage rate for each craft and classification involved as determined by DOLI, including the effective date, in a prominent and easily accessible place at the work site during the time work is being performed. The posting must be in English and any other language that is primarily spoken by the individuals at the work site. Within 10 days of such posting the Contractor shall certify to the County Prevailing Wage Compliance Manager and DOLI its compliance with this subsection at https://www.doli.virginia.gov/wp-content/uploads/2021/04/PW_Posting_Compliance_Form.pdf;

E. The Contractor must fully cooperate with the County Prevailing Wage Compliance Manager to ensure contract compliance requirements ,including but not limited to site visits, wage rate signage, contractor employee interviews, and the submission of certified payroll records.

F. The Contractor must submit to the County Prevailing Wage Compliance Manager and DOLI, within five (5) working days of the end of each month, certification for each craft or trade employed on the project, specifying the total hourly amount paid to employees, including wages and applicable fringe benefits using the Pay Scale Certification Form at https://www.doli.virginia.gov/wp-content/uploads/2021/04/DOLI-Pay-Scale-Certification-for-Public-Works-Projects.pdf. The certification must itemize the amount paid in wages and each applicable benefit and list the names and addresses of any third party fund, plan or program to which benefit payments will be made on behalf of employees.

G. The Contractor shall indemnify and hold harmless the County from any fines, demands, claims, suits, and damages, including attorney's fees, resulting from the Contractor's or any subcontractor's failure to pay the Prevailing Wage.

H. The Contractor and its subcontractors shall keep, maintain, and preserve (i) records relating to the wages paid to and hours worked by each individual performing the work of any mechanic, laborer, or worker; and (ii) a schedule of the occupation or work classification at which each individual performing the work of any mechanic, laborer, or worker on the construction project is employed each work day and week. The Contractor and its subcontractors shall make such records available to the Prevailing Wage Compliance Manager within 10 days of a request or

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per a regular schedule established in the Contract, and shall certify that records reflect the actual hours worked and the amount paid to its workers for whatever time period is requested. The Contractor and its subcontractors must preserve these records for a period of six (6) years after the expiration or earlier termination of the applicable contract.

I. Any Contractor or subcontractor who pays any mechanic, laborer, or worker for services under this Contract less than the Prevailing Wage shall be liable to such individuals for the payment of all wages due, plus interest at an annual rate of eight percent (8%) from the dates wages were due; and shall be disqualified from bidding on public contracts with any public body until the Contractor or subcontractor has made full restitution. A willful violation of Article 4-104 is a Class I misdemeanor.

J. For questions regarding Prevailing Wage, please email prevailingwage@arlingtonva.us.

9. RELEASE AND REQUEST FOR FINAL PAYMENT

In order to receive final payment upon Final Completion of the Project and before Final Acceptance, the Contractor must submit to the Project Officer a signed original notarized copy of the Arlington County Release and Request for Final Payment form per the General Conditions.

10. LIQUIDATED DAMAGES

Time is of the essence under this Contract. The Work must be completed within the Time for Completion. The County and the Contractor agree that damages for failure to achieve Substantial Completion of the Work by the date specified under Time for Completion are not susceptible to exact determination but that $1,758.00 per calendar day is in proportion to the actual loss that the County would suffer from such delay. Therefore, the Contractor will pay the County as liquidated damages $1,758.00 per day for each and every day beyond the time for Substantial Completion that the County determines Substantial Completion has not achieved. The County and the Contractor also agree that damages for failure to achieve Final Completion of the Work by the date specified under Time for Completion are not susceptible to exact determination but that $1,758.00 per calendar day is in proportion to the actual loss the County would suffer from such delay. Therefore, the Contractor will pay the County as liquidated damages $1,758.00 per day for each and every day beyond the time for Final Completion until Final Completion is achieved.

The County will be entitled to deduct liquidated damages against any sums owed by the County to the Contractor under this Contract. The Contractor hereby waives any defense as to the validity of any liquidated damages on grounds that such liquidated damages are void as penalties or are not reasonably related to actual damages.

11. PERFORMANCE OF WORK BY THE CONTRACTOR

The Contractor shall perform on site, and with its own organization, at least eight percent (80%) of the total work in place to be performed under the Contract. Prior to award, the Contractor must demonstrate to the Project Officer's satisfaction that both of these standards will be met during contract performance. Labor and work to be counted when determining whether the Contractor has met the self-performance requirement shall not include any work that the Contractor performs under the supervision of a subcontractor.

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The self-performance percentage may be reduced by an Amendment to the Contract, if during performance of the Work, the Contractor requests a reduction and the Project Officer determines that the reduction would be to the advantage of the County.

12. NON-APPROPRIATION

All payments by the County to the Contractor pursuant to this Contract are subject to the availability of an annual appropriation for this purpose by the County Board of Arlington County, Virginia ("Board"). In the event that the Board does not appropriate funds for the goods or services provided under this Contract, the County will terminate the Contract, without termination charge or other liability to the County, on the last day of the fiscal year or when the previous appropriation has been spent, whichever occurs first.

13. ESTIMATED QUANTITIES/NON-EXCLUSIVITY OF CONTRACTOR

This Contract does not obligate the County to purchase a specific quantity of items or services during Contract Term. Any quantities that are included in the Contract Documents are the present expectations of the County for the period of the Contract; and the County is under no obligation to buy that or any amount as a result of having provided this estimate or of having had any normal or otherwise measurable requirement in the past. The County may require more goods and/or services than the estimated annual quantities, and any such additional quantities will not give rise to any claim for compensation other than at the unit prices and/or rates in the Contract.

The County does not guarantee that the Contractor will be the exclusive provider of the goods or services covered by this Contract. The items or services covered by this Contract may be or become available under other County contract(s), and the County may determine that it is in its best interest to procure the items or services through those contract(s).

14. COUNTY PURCHASE ORDER REQUIREMENT

County purchases are authorized only if the County issues a Purchase Order in advance of the transaction, indicating that the ordering County agency has sufficient funds available to pay for the purchase. If the Contractor provides goods or services without a signed County Purchase Order, it does so at its own risk and expense. The County will not be liable for payment for any purchases made by its employees that are not authorized by the County Purchasing Agent.

15. LIEN

It is expressly agreed that after any payment has been made by the County either to the Contractor for work done, or labor or material supplied under the Contract, the County will have a lien upon all material delivered to the site either by the Contractor, or for the Contractor, which is to be used in the performance of the Contract.

16. VALUE ENGINEERING PROPOSAL (VE)

Unless otherwise provided, the Contractor may submit to the County a written VE for modifying the plans, specifications, or other requirements of the Agreement covering the work (Contract) for the purpose of reducing the total cost of the Contract without reducing the design capacity or quality of the finished product. If the VEP is accepted by the County, the net savings will be equally divided by the County and the Contractor.

Each VEP shall result in a net savings over the Contract cost without impairing essential functions and characteristics of the item(s) or of any other part of the project, including, but not limited to, service life,

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reliability, economy of operation, ease of maintenance, aesthetics, and safety. At least the following information shall be submitted with each VE:

(a) a statement that the proposal is submitted as a VE;

(b) a statement concerning the basis for the VE, benefits to the County, and an itemization of the Contract items and requirements affected by the VE;

(c) a detailed estimate of the cost under the existing Contract and under the VE;

(d) proposed specifications and recommendations as to the manner in which the VE changes are to be accomplished; and

(e) a statement as to the time by which a Contract Amendment adopting the VE must be issued so as to obtain the maximum cost-effectiveness.

The County will process the VE in the same manner as prescribed for any other proposal that would necessitate issuance of an Amendment. The County may accept a VE in whole or part by issuing an Amendment that will identify the VE on which it is based. The County will not be liable to the Contractor for failure to accept or act on any VE submitted pursuant to these requirements or for delays in the work attributable to any VE. Until a VE is put into effect by an Amendment, the Contractor shall remain obligated to the terms and conditions of the existing Agreement. If an executed Amendment has not been issued by the date on which the Contractor's proposal specifies that a decision should be made or such other date as the Contractor may subsequently have specified in writing, the VE shall be deemed rejected.

The Amendment effecting the necessary modification of the Contract will establish the net savings agreed on, provide for adjustment of the contract prices, and indicate the net savings. The Contractor shall absorb all costs incurred in preparing a VE. Reasonably incurred costs for reviewing and administering a VE will be borne by the County. The County may establish any reasonable conditions it deems appropriate for consideration, approval, and implementation of the VE. The Contractor's 50 percent share of the net savings shall constitute full compensation to it, including by way of illustration and not limitation compensation for time, for effecting all changes pursuant to the Amendment.
Unless specifically provided for in the Amendment authorizing the VE, acceptance of the VE and performance of the work thereunder will not change the Contract Term limit.

The County may adopt a VE for general use in contracts administered by the County if it determines that the VE is suitable for application to other contracts. A VE identical with or similar to a previously submitted VE will be eligible for consideration and compensation under these provisions if it has not been previously adopted for general application to other contracts administered by the County. When a VE is adopted for general use, compensation pursuant to these requirements will be applied only to those awarded contracts for which the VE was submitted prior to the date of adoption of the VE.

If a VEP is based on or is similar to a change in the plans, specifications, or special provisions adopted by the County prior to submission of the VE, as determined by the County, the County will not accept the VE.

The County will be the sole judge of the acceptability of a VE. The requirements herein apply to each VE initiated, developed, and identified as such by the Contractor at the time of its submission to the County. However, nothing herein shall be construed as requiring the County to consider or approve a VE, and the

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decision to enter into an Amendment to the contract to accommodate a VE shall be in the County's sole discretion.

Subject to the provisions contained herein, the County, or any other public agency with the County's permission, shall have the right to use all or part of an accepted VE without obligation or compensation of any kind to the Contractor.

If a VE is accepted by the County, any provisions herein that pertain to the adjustment of contract unit prices attributable to alterations of contract quantities will not apply to the items adjusted or deleted as a result of putting the VE into effect by an Amendment.

17. EMPLOYMENT DISCRIMINATION BY CONTRACTOR PROHIBITED

During the performance of its work pursuant to this Contract:

A. The Contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, sexual orientation, gender identity, national origin, age, disability or on any other basis prohibited by state law. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

B. Notices, advertisements and solicitations placed in accordance with federal law, rule or regulation will be deemed sufficient for meeting the requirements of this section.

C. The Contractor will state in all solicitations or advertisements for employees that it places or causes to be placed that such Contractor is an Equal Opportunity Employer.

D. The Contractor will comply with the provisions of the Americans with Disabilities Act of 1990 ("ADA"), which prohibits discrimination against individuals with disabilities in employment and mandates that disabled individuals be provided access to publicly and privately provided services and activities.

E. The Contractor must include the provisions of the foregoing paragraphs in every subcontract or purchase order of more than $10,000.00 relating to this Contract so that the provisions will be binding upon each subcontractor or vendor.

18. EMPLOYMENT OF UNAUTHORIZED ALIENS PROHIBITED

In accordance with §2.2-4311.1 of the Code of Virginia, as amended, the Contractor must not during the performance of this Contract knowingly employ an unauthorized alien, as that term is defined in the federal Immigration Reform and Control Act of 1986.

19. DRUG-FREE WORKPLACE TO BE MAINTAINED BY CONTRACTOR

During the performance of this Contract, the Contractor must: (i) provide a drug-free workplace for its employees; (ii) post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in the Contractor's workplace and specifying the actions that will be taken against employees for violating such prohibition; (iii) state in all solicitations or advertisements for employees placed by or on behalf of the Contractor that the Contractor maintains a drug-free workplace; and (iv) include the provisions of the foregoing clauses in every

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subcontract or purchase order of more than $10,000.00 relating to this Contract so that the provisions will be binding upon each subcontractor or vendor.

For the purposes of this section, "workplace" means the site(s) for the performance of the work required by this Contract.

20. *SEXUAL HARASSMENT POLICY

If the Contractor employs more than five employees, the Contractor shall (i) provide annual training on the Contractor's sexual harassment policy to all supervisors and employees providing services in the Commonwealth, except such supervisors or employees that are required to complete sexual harassment training provided by the Department of Human Resource Management, and (ii) post the Contractor's sexual harassment policy in (a) a conspicuous public place in each building located in the Commonwealth that the Contractor owns or leases for business purposes and (b) the Contractor's employee handbook.

21. COVID-19 VACCINATION POLICY FOR CONTRACTORS

Due to the ongoing COVID-19 pandemic, the County has taken various steps to protect the welfare, health, safety, and comfort of the workforce and public at large. As part of these steps, the County has implemented various requirements with respect to health and safety including policies with respect to social distancing, the use of face-coverings and vaccine mandates. To protect the County's workforce and the public at large, all employees and subcontractors of the Contractor who are assigned to this Contract, should be fully vaccinated against COVID-19. Any contractor employee or subcontractor who is not fully vaccinated should be following a weekly testing protocol as established by the Contractor, unless exempt pursuant to a valid reasonable accommodation under state or federal law.

22. PROJECT STAFF

The County has the right to reasonably reject staff or subcontractors whom the Contractor assigns to the Project. The Contractor must then provide replacement staff or subcontractors satisfactory to the County in a timely manner and at no additional cost to the County. The day-to-day supervision and control of the Contractor's employees and its subcontractors is the sole responsibility of the Contractor.

23. FAILURE TO DELIVER

If the Contractor fails to deliver goods or services in accordance with the Contract terms and conditions, the County, after notice to the Contractor, may procure the goods or services from other sources and hold the Contractor responsible for any resulting additional purchase and administrative costs. The County shall be entitled to offset such costs against any sums owed by the County to the Contractor. However, if public necessity requires the use of nonconforming materials or supplies, they may be accepted at a reduction in price to be determined solely by the County.

24. UNSATISFACTORY WORK

If any of the work done, or material, goods, or equipment provided by the Contractor, is unsatisfactory to the County the Contractor must, upon notice from the County, immediately remove at the Contractor's expense such unsatisfactory work, material, goods, or equipment and replace the same with work, material, goods, or equipment satisfactory to the County. If the Contractor fails to do so after fifteen (15) days the County shall have the right to remove or replace the rejected work, material, goods, or equipment at the expense of the Contractor and offset the expense and administrative costs against any sums owed to the Contractor. This provision applies during the Contract term and during any warranty or guarantee period. At the Project Officer's discretion, rather than correction or replacement of the work, an appropriate adjustment to the Contract Amount may be made.

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25. TERMINATION

The County may terminate this Contract at any time as follows: (1) for cause, if, as determined by the County, the Contractor is in breach or default or has failed to perform the Work satisfactorily; or (2) for the convenience of the County.

Upon receipt of a notice of termination, the Contractor must not place any further orders or subcontracts for materials, services or facilities; must terminate all vendors and subcontracts, except as are necessary for the completion of any portion of the Work that the County did not terminate; and must immediately deliver all documents related to the terminated Work to the County.

Any purchases that the Contractor makes after the notice of termination will be the sole responsibility of the Contractor, unless the County has approved the purchases in writing as necessary for completion of any portion of the Work that the County did not terminate.

If any court of competent jurisdiction finds a termination for cause by the County to be improper, then the termination will be deemed a termination for convenience.

A. TERMINATION FOR CAUSE, INCLUDING BREACH AND DEFAULT; CURE

1. Termination for Unsatisfactory Performance. If the County determines that the Contractor has failed to perform satisfactorily, then the County will give the Contractor written notice of such failure(s) and the opportunity to cure them within 15 days or any other period specified by the County ("Cure Period"). If the Contractor fails to cure within the Cure Period, the County may terminate the Contract for failure to provide satisfactory performance by providing written notice with a termination date. Upon such termination, the Contractor may apply for compensation for Contract services that the County previously accepted ("Termination Costs"), unless payment is otherwise barred by the Contract. The Contractor must submit any request for Termination Costs, with all supporting documentation, to the County Project Officer within 30 days after the expiration of the Cure Period. The County may accept or reject the request for Termination Costs, in whole or in part, and may notify the Contractor of its decision within a reasonable time.

   In the event of termination by the County for failure to perform satisfactorily, the Contractor must continue to provide its services as previously scheduled through the termination date, and the County must continue to pay all fees and charges incurred through the termination date.

2. Termination for Breach or Default. If the County terminates the Contract for default or breach of any Contract provision or condition, then the termination will be immediate after notice of termination to the Contractor (unless the County provides for an opportunity to cure), and the Contractor will not be permitted to seek Termination Costs.

   Upon any termination pursuant to this section, the Contractor will be liable to the County for costs that the County must expend to complete the Work, including costs resulting from any related delays and from unsatisfactory or non-compliant work performed by the Contractor or its subcontractors. The County will deduct such costs from any amount due to the Contractor; or if the County does not owe the Contractor, the Contractor must

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promptly pay the costs within 15 days of a demand by the County. This section does not limit the County's recovery of any other damages to which it is entitled by law.

Except as otherwise directed by the County, the Contractor must stop work on the date of receipt the notice of the termination.

B. TERMINATION FOR THE CONVENIENCE OF THE COUNTY

The County may terminate this Contract in whole or in part whenever the Purchasing Agent determines that termination is in the County's best interest. The County will give the Contractor at least 15 days' notice in writing. The notice must specify the extent to which the Contract is terminated and the effective termination date. The Contractor will be entitled to Termination Costs, as defined above, plus any other reasonable amounts that the parties might negotiate; but no amount will be allowed for anticipatory profits.

Except as otherwise directed by the County, the Contractor must stop work on the date of receipt of the notice of the termination.

26. INDEMNIFICATION

The Contractor covenants for itself, its employees and its subcontractors to save, defend, hold harmless and indemnify the County and all of its elected and appointed officials, officers, current and former employees, agents, departments, agencies, boards and commissions (collectively the "County Indemnitees") from and against any and all claims made by third parties for any and all losses, damages, injuries, fines, penalties, costs (including court costs and attorneys' fees), charges, liability, demands or exposure resulting from, arising out of or in any way connected with the Contractor's acts or omissions, including the acts or omissions of its employees, vendors, delivery drivers and/or subcontractors, in performance or nonperformance of the Contract. This duty to save, defend, hold harmless and indemnify will survive the termination of this Contract. If the Contractor fails or refuses to fulfill its obligations contained in this section, the Contractor must reimburse the County for any and all resulting payments and expenses, including reasonable attorneys' fees. The Contractor must pay such expenses upon demand by the County, and failure to do so may result in the County withholding such amounts from any payments to the Contractor under this Contract.

27. INTELLECTUAL PROPERTY INDEMNIFICATION

The Contractor warrants and guarantees that in providing services under this Contract neither the Contractor nor any subcontractor is infringing on the intellectual property rights (including, but not limited to, copyright, patent, mask and trademark) of third parties.

If the Contractor or any of its employees or subcontractors uses any design, device, work or material that is covered by patent or copyright, it is understood that the Contract Amount includes all royalties, licensing fees, and any other costs arising from such use in connection with the Work under this Contract.

The Contractor covenants for itself, its employees and its subcontractors to save, defend, hold harmless, and indemnify the County Indemnitees, as defined above, from and against any and all claims, losses, damages, injuries, fines, penalties, costs (including court costs and attorneys' fees), charges, liability or exposure for infringement of or on account of any trademark, copyright, patented or unpatented invention, process or article manufactured or used in the performance of this Contract. This duty to save, defend, hold harmless and indemnify will survive the termination of this Contract. If the Contractor fails or refuses to fulfill its obligations contained in this section, the Contractor must reimburse the County for any and all resulting payments and expenses, including reasonable attorneys' fees. The Contractor must

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pay such expenses upon demand by the County, and failure to do so may result in the County withholding such amounts from any payments to the Contractor under this Contract.

28. COPYRIGHT

By this Contract, the Contractor irrevocably transfers, assigns, sets over and conveys to the County all rights, title and interest, including the sole exclusive and complete copyright interest, in any and all copyrightable works created pursuant to this Contract. The Contractor will execute any documents that the County requests to formalize such transfer or assignment.

The rights granted to the County by this section are irrevocable and may not be rescinded or modified, including in connection with or as a result of the termination of or a dispute concerning this Contract.

The Contractor may not use subcontractors or third parties to develop or provide input into any copyrightable materials produced pursuant to this Contract without the County's advance written approval and unless the Contractor includes this Copyright provision in any contract or agreement with such subcontractors or third parties related to this Contract.

29. OWNERSHIP AND RETURN OF RECORDS

This Contract does not confer on the Contractor any ownership rights or rights to use or disclose the County's data or inputs.

All drawings, specifications, blueprints, data, information, findings, memoranda, correspondence, documents or records of any type, whether written, oral or electronic, and all documents generated by the Contractor or its subcontractors as a result of this Contract (collectively "Records") are the exclusive property of the County and must be provided or returned to the County upon completion, termination, or cancellation of this Contract. The Contractor will not use or willingly cause or allow such materials to be used for any purpose other than performance of this Contract without the written consent of the County.

The Records are confidential, and the Contractor will neither release the Records nor share their contents. The Contractor will refer all inquiries regarding the status of any Record to the Project Officer or to his or her designee. At the County's request, the Contractor will deliver all Records, including hard copies of electronic records, to the Project Officer and will destroy all electronic Records.

The Contractor agrees to include the provisions of this section as part of any contract or agreement related to this Contract into which it enters with subcontractors or other third parties.

The provisions of this section will survive any termination or cancellation of this Contract.

30. CONFIDENTIAL INFORMATION

The Contractor and its employees, agents and subcontractors will hold as confidential all County information obtained under this Contract. Confidential information includes, but is not limited to, nonpublic personal information; personal health information (PHI); social security numbers; addresses; dates of birth; other contact information or medical information about a person; and information pertaining to products, operations, systems, customers, prospective customers, techniques, intentions, processes, plans and expertise. The Contractor must take reasonable measures to ensure that all of its employees, agents and subcontractors are informed of and abide by this requirement.

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31. ETHICS IN PUBLIC CONTRACTING

This Contract incorporates by reference Article 9 of the Arlington County Purchasing Resolution, as well as all state and federal laws related to ethics, conflicts of interest or bribery, including the State and Local Government Conflict of Interests Act (Code of Virginia § 2.2-3100 et seq.), the Virginia Governmental Frauds Act (Code of Virginia § 18.2-498.1 et seq.) and Articles 2 and 3 of Chapter 10 of Title 18.2 of the Code of Virginia, as amended (§ 18.2-438 et seq.). The Contractor certifies that its bid was made without collusion or fraud; that it has not offered or received any kickbacks or inducements from any other offeror, supplier, manufacturer or subcontractor; and that it has not conferred on any public employee having official responsibility for this procurement any payment, loan, subscription, advance, deposit of money, services or anything of more than nominal value, present or promised, unless consideration of substantially equal or greater value was exchanged.

32. COUNTY EMPLOYEES

No Arlington County employee may share in any part of this Contract or receive any benefit from the Contract that is not available to the general public.

33. FORCE MAJEURE

Neither party will be held responsible for failure to perform the duties and responsibilities imposed by this Contract if such failure is due to a fire, riot, rebellion, natural disaster, war, act of terrorism or act of God that is beyond the control of the party and that makes performance impossible or illegal, unless otherwise specified in the Contract, provided that the affected party gives notice to the other party as soon as practicable after the force majeure event, including reasonable detail and the expected duration of the event's effect on the party.

34. AUTHORITY TO TRANSACT BUSINESS

The Contractor must, pursuant to Code of Virginia § 2.2-4311.2, be and remain authorized to transact business in the Commonwealth of Virginia during the entire term of this Contract. Otherwise, the Contract is voidable at the sole option of and with no expense to the County.

35. RELATION TO THE COUNTY

The Contractor is an independent contractor, and neither the Contractor nor its employees or subcontractors will be considered employees, servants or agents of the County. The County will not be responsible for any negligence or other wrongdoing by the Contractor or its employees, servants or agents. The County will not withhold payments to the Contractor for any federal or state unemployment taxes, federal or state income taxes or Social Security tax or for any other benefits. The County will not provide to the Contractor any insurance coverage or other benefits, including workers' compensation.

36. ANTITRUST

The Contractor conveys, sells, assigns and transfers to the County all rights, title and interest in and to all causes of action under state or federal antitrust laws that the Contractor may have relating to this Contract.

37. REPORT STANDARDS

The Contractor must submit all written reports required by this Contract for advance review in a format approved by the Project Officer. Reports must be accurate and grammatically correct and should not contain spelling errors. The Contractor will bear the cost of correcting grammatical or spelling errors and inaccurate report data and of other revisions that are required to bring the report(s) into compliance with this section.

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Whenever possible, proposals must comply with the following guidelines:

- printed double-sided on at least 30% recycled-content and/or tree-free paper
- recyclable and/or easily removable covers or binders made from recycled materials (proposals with glued bindings that meet all other requirements are acceptable)
- avoid use of plastic covers or dividers
- avoid unnecessary attachments or documents or superfluous use of paper (e.g. separate title sheets or chapter dividers)

38. AUDIT

The Contractor must retain all books, records and other documents related to this Contract for at least five (5) years, unless otherwise specified in the Contract, or such period of time required by the County's funding partner(s), if any, whichever is greater, after the final payment and must allow the County or its authorized agents to examine the documents during this period and during the Contract Term. The Contractor must provide any requested documents to the County for examination within 15 days of the request, at the Contractor's expense. Should the County's examination reveal any overcharging by the Contractor, the Contractor must, within 30 days of County's request, reimburse the County for the overcharges and for the reasonable costs of the County's examination, including, but not limited to, the services of external audit firm and attorney's fees; or the County may deduct the overcharges and examination costs from any amount that the County owes to the Contractor. If the Contractor wishes to destroy or dispose of any records related to this Contract (including confidential records to which the County does not have ready access) within five (5) years after the final payment, unless otherwise specified in the Contract, or such period of time required by the County's funding partner(s), if any, whichever is greater, the Contractor must give the County at least 30 days' notice and must not dispose of the documents if the County objects.

The Purchasing Agent may require the Contractor to demonstrate that it has the necessary facilities, ability, and financial resources to comply with the Contract and furnish the service, material or goods specified herein in a satisfactory manner at any time during the term of this Contract.

39. ASSIGNMENT

The Contractor may not assign, transfer, convey or otherwise dispose of any award or any of its rights, obligations or interests under this Contract without the prior written consent of the County.

40. AMENDMENTS

This Contract may not be modified except by written amendment executed by persons duly authorized to bind the Contractor and the County.

41. ARLINGTON COUNTY PURCHASING RESOLUTION AND COUNTY POLICIES

Nothing in this Contract waives any provision of the Arlington County Purchasing Resolution, which is incorporated herein by reference, or any applicable County policy.

42. DISPUTE RESOLUTION

All disputes arising under this Agreement or concerning its interpretation, whether involving law or fact and including but not limited to claims for additional work, compensation or time, and all claims for alleged breach of contract must be submitted in writing to the Project Officer as soon as the basis for the claim arises. In accordance with the Arlington County Purchasing Resolution, claims denied by the Project

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Officer may be submitted to the County Manager in writing no later than 60 days after the final payment. The time limit for a final written decision by the County Manager is 30 days. Procedures concerning contractual claims, disputes, administrative appeals and protests are contained in the Arlington County Purchasing Resolution. The Contractor must continue to work as scheduled pending a decision of the Project Officer, County Manager, County Board or a court of law.

43. APPLICABLE LAW, FORUM, VENUE, AND JURISDICTION

This Contract is governed in all respects by the laws of the Commonwealth of Virginia; and the jurisdiction, forum and venue for any litigation concerning the Contract or the Work is in the Circuit Court for Arlington County, Virginia, and in no other court.

44. ARBITRATION

No claim arising under or related to this Contract may be subject to arbitration.

45. NONEXCLUSIVITY OF REMEDIES

All remedies available to the County under this Contract are cumulative, and no remedy will be exclusive of any other at law or in equity.

46. NO WAIVER

The failure to exercise a right provided for in this Contract will not be a subsequent waiver of the same right or of any other right.

47. SEVERABILITY

The sections, paragraphs, clauses, sentences, and phrases of this Contract are severable; and if any section, paragraph, clause, sentence or phrase of this Contract is declared invalid by a court of competent jurisdiction, the rest of the Contract will remain in effect.

48. ATTORNEY'S FEES

In the event that the County prevails in any legal action or proceeding brought by the County to enforce any provision of this Contract, the Contractor will pay the County's reasonable attorney's fees and expenses.

49. SURVIVAL OF TERMS

In addition to any statement that a specific term or paragraph survives the expiration or termination of this Contract, the following sections also survive: INDEMNIFICATION; INTELLECTUAL PROPERTY INDEMNIFICATION; RELATION TO COUNTY; OWNERSHIP AND RETURN OF RECORDS; AUDIT; COPYRIGHT; DISPUTE RESOLUTION; APPLICABLE LAW AND JURISDICTION; ATTORNEY'S FEES, AND CONFIDENTIAL INFORMATION.

50. HEADINGS

The section headings in this Contract are inserted only for convenience and do not affect the substance of the Contract or limit the sections' scope.

51. AMBIGUITIES

The parties and their counsel have participated fully in the drafting of this Agreement; and any rule that ambiguities are to be resolved against the drafting party does not apply. The language in this Agreement is to be interpreted as to its plain meaning and not strictly for or against any party.

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52. NOTICES

Unless otherwise provided in writing, all legal notices and other formal communications required by this Contract are deemed to have been given when either (a) delivered in person; (b) delivered by an agent, such as a delivery service; or (c) deposited in the United States mail, postage prepaid, certified or registered and addressed as follows:

TO THE CONTRACTOR:
Dan Dragacevac
3680 Wheeler Ave., Suite 300
Alexandria, VA 22304
Phone: (703) 924-7220
dan@sagresconstruction.com

TO THE COUNTY:

Mannan Qureshi, Project Officer
Arlington County, Virginia
2100 Clarendon Boulevard, Suite 813
Arlington, Virginia 22201
Phone: (703) 228-3592
Email: mqureshi@arlingtonva.us

AND

Dr. Sharon T. Lewis, LL.M, MPS, VCO, CPPB
Purchasing Agent
Arlington County, Virginia
2100 Clarendon Boulevard, Suite 500
Arlington, Virginia 22201
Phone: (703) 228-3294
Email: slewis1@arlingtonva.us

TO COUNTY MANAGER'S OFFICE (FOR PROJECT CLAIMS):

Mark Schwartz, County Manager
Arlington County, Virginia
2100 Clarendon Boulevard, Suite 318
Arlington, Virginia 22201

53. NON-DISCRIMINATION NOTICE

Arlington County does not discriminate against faith-based organizations.

54. INSURANCE, PAYMENT AND PERFORMANCE BONDS

The Contractor shall maintain the required insurance coverage and payment and performance bonds as set forth in the Invitation to Bid through completion of the Contract, including all warranty and guarantee periods.

55. MATERIAL CHANGES

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The Contractor shall notify Purchasing Agent within seven days of any material changes in its operation that relate to any matter attested regarding certifications on its bid form.

56. COUNTERPARTS

This Agreement may be executed in one or more counterparts and all of such counterparts shall together constitute one and the same instrument. Original signatures transmitted and received via facsimile or other electronic transmission (e.g., PDF or similar format) are true and valid signatures for all purposes hereunder and shall be effective as delivery of a manually executed original counterpart.

WITNESS these signatures:

THE COUNTY BOARD OF ARLINGTON COUNTY, VIRGINIA

AUTHORIZED SIGNATURE: DocuSigned by: Sy Gezachew 27FC198F4A6D475...

NAME: Sy Gezachew

TITLE: PROCUREMENT OFFICER

DATE: 5/10/2022

SAGRES CONSTRUCTION CORPORATION

AUTHORIZED SIGNATURE: DocuSigned by: DEJAN DRAGACEVAC 817420F7C4FC427...

NAME: DEJAN DRAGACEVAC

TITLE: Vice President

DATE: 5/6/2022

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INSURANCE CHECKLIST

CERTIFICATE OF INSURANCE MUST SHOW ALL COVERAGE AND ENDORSEMENTS MARKED "X".

COVERAGES REQUIRED	LIMITS (FIGURES DENOTE MINIMUMS)
X 1. Workers' Compensation	Statutory limits of Virginia
X 2. Employer's Liability	$500,000/accident, $500,000/disease, $500,000/disease policy limit
X 3. Commercial General Liability	$1,000,000 CSL BI/PD each occurrence, $1 Million annual aggregate
X 4. Premises/Operations	$500,000 CSL BI/PD each occurrence, $ 1 Million annual aggregate
X 5. Automobile Liability	$1 Million BI/PD each accident, Uninsured Motorist
X 6. Owned/Hired/Non-Owned Vehicles	$1 Million BI/PD each accident, Uninsured Motorist
X 7. Independent Contractors	$1 Million CSL BI/PD each occurrence, $1 Million annual aggregate
X 8. Products Liability	$1 Million CSL BI/PD each occurrence, $1 Million annual aggregate
X 9. Completed Operations	$1 Million CSL BI/PD each occurrence, $1 Million annual aggregate
X 10. Contractual Liability (Must be shown on Certificate)	$1 Million CSL BI/PD each occurrence, $ 1 Million annual aggregate
X 11. Personal and Advertising Injury Liability	$1 Million each offense, $1 Million annual aggregate
X 12. Umbrella\Excess Liability	$1 Million Bodily Injury, Property Damage and Personal Injury
13. Per Project Aggregate	
14. Professional Liability	
a. Architects and Engineers	$1 Million per occurrence/claim
b. Asbestos Removal Liability	$2 Million per occurrence/claim
c. Medical Malpractice	$1 Million per occurrence/claim
d. Medical Professional Liability	$1 Million per occurrence/claim
15. Miscellaneous E&O/ Professional Liability	$1 Million per occurrence/claim
16. Motor Carrier Act End. (MCS-90)	$1 Million BI/PD each accident, Uninsured Motorist
17. Motor Cargo Insurance	
18. Garage Liability	$1 Million Bodily Injury, Property Damage per occurrence
19. Garagekeepers Liability	$500,000 Comprehensive, $500,000 Collision
20. Inland Marine-Bailee's Insurance	$_____
X 21. Moving and Rigging Floater	Endorsement to CGL
22. Dishonesty Bond	$_____
X 23. Builder's Risk	Provide Coverage in the full amount of contract
24. XCU Coverage	Endorsement to CGL
25. USL&H	Federal Statutory Limits

X 26. Carrier Rating shall be Best's Rating of A-VII or better or its equivalent

X 27. Notice of Cancellation, nonrenewal or material change in coverage shall be provided to County at least thirty (30) days prior to action.

X 28. The County shall be named Additional Insured on all policies except Workers Compensation, Errors and Omissions/Professional Liability and Auto.

X 29. Certificate of Insurance shall show Bid Number and Bid Title.

X 30. Environmental Impairment Liability, including coverage of on-site clean up…… BI/PD $3 Million per occurrence/$6 Million Aggregate

a In addition to environmental impairment liability, if work requires clean up, remediation, and/or removal of bio-solids, bio-hazards waste, and any hazardous or toxic material via transportation request:

__Business Auto Liability ……..$2 Million per occurrence with MCS-90 and CA 9948 (or equivalent endorsements specifically referenced in the certificate of insurance

__31. Cyber insurance …….$2 Million per occurrence/Aggregate

32. OTHER INSURANCE REQUIRED: _____

INSURANCE AGENT'S STATEMENT:

I have reviewed the above requirements with the bidder named below and have advised the bidder of required coverages not provided through this agency.

AGENCY NAME:_____ AUTH. SIGNATURE:_____

BIDDER'S STATEMENT:

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If awarded the Contract, I will comply with all Contract insurance requirements.

BIDDER NAME: Sagres Construction Corp.

AUTH. SIGNATURE: DocuSigned by: DEJAN DRAGALEVIC 817420F7C4FC427...

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Arlington County Department of Environmental Services
DES

Construction Standards and Specifications

2020

ARLINGTON
VIRGINIA

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ARLINGTON COUNTY CONSTRUCTION STANDARDS AND SPECIFICATIONS

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END OF TOC

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SECTION 01000 - GENERAL PROVISIONS AND REQUIREMENTS

PART 1 - GENERAL

1.1 Purpose of Section

This section outlines the general provisions and requirements common to these standard specifications and details. This section includes conditions, definitions and abbreviations applicable throughout the specifications and details. All references in this section shall apply to the entirety of these Specifications unless, and except as, explicitly modified in specific sections.

1.2 Definitions

Wherever used in these Standards and Specifications, the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

1. The term "Agreement" means the completed and signed Form of Contract Agreement.
2. The term “Award Date” means the date of execution of the Agreement by the Purchasing Agent.
3. The term “Business Day” shall refer to any day that the County is open for general business.
4. The term “Calendar Day” means any day of twenty-four hours measured from midnight to the next midnight. Included are weekends and holidays. When the term “Day” is used it shall be assumed to refer to a Calendar Day unless otherwise specified.
5. The term “Change Order” means a written order to the Contractor, signed by the Project Officer and the Contractor, which authorizes a change in the Work, and/or adjustment to the Contract Amount and/or an adjustment to the Time for Completion. A Change Order once signed by all the parties is incorporated into and becomes part of the Contract.
6. The term "Commencement Date" means the date on which the Time for Completion will commence for the Contractor to begin to perform his obligations under the Contract Documents as provided in the Notice to Proceed.
7. The term “Construction Change Directive” means a written order issued by the County directing a change in the Work prior to agreement on adjustment, if any, in the Contract Amount or Contract Time, or both.
8. The term "Contract Documents" means the Agreement and all the documents and Exhibits and/or Attachments identified therein which shall include the Drawings and the Specifications, and all modifications including amendments and subsequent Change Orders thereto properly incorporated in the Contract.
9. The terms "County" and "Contractor" shall mean the respective parties to the Contract. They shall be treated throughout the Contract Documents as though each were of the singular number and masculine gender. Only one Contractor is recognized as a party to this Contract.
10. The term “Critical Path Method or CPM” means a step-by-step project management technique for process planning that defines critical and non- critical tasks with the goal of preventing time-frame problems and process bottlenecks. An activity on the critical path

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cannot be started until its predecessor activity has been completed.is delayed then the entire project is delayed.

11. The term “Delay” means an event or condition that results in a work activity starting or being completed later than originally planned.
12. The term "Drawings" means all drawings pertaining to the Contract, including the Contract Drawings and Construction Notes which show and describe the locations, character, dimensions, and details of the Work to be performed under the contract.
13. The term “Field Order” is a written order to the Contractor, authorized by the Project Officer, which acknowledges a change in the Work that does not adjust the Contract Amount and does not adjust the Time for Completion.
14. The term “Final Acceptance” shall mean the date on which the County issues the final payment for the Work.
15. The term “Final Completion” shall mean the condition when the County agrees that all the Work has been fully completed in accordance with the Contract Documents and is acceptable. The date of the Final Completion of the Work under the Contract is the date on which Final Completion is accomplished.
16. The term “Float” shall represent the amount of time that a task in a project network or sequence can be delayed without causing a delay to: subsequent tasks ("free float") or project completion date ("total float"). Float shall belong to the County and shall be used for the successful completion of the Project within the Time for Completion.
17. The term “Limits of Disturbance (LOD)" shall represent the area within which land disturbing activities take place. Land disturbing activities include all actions that expose bare soil during construction.
18. The term “Limits of Work (LOW)" shall represent the area within which construction activities take place, including but not limited to the Limits of Disturbance area.
19. The term “Notice to Proceed” shall mean a written notice issued by the County to the Contractor stating the Commencement Date. The Notice to Proceed will specify the Time for Completion of the Contract.
20. The term “Project” means the entire proposed construction to be executed as stipulated in the Contract Documents
21. The term "Project Officer" means the County Project Officer assigned by the Director of the County Department responsible for the project, or the Director’s designee. When a designee to act on behalf of the Project Officer is used by the County, the name of the designee and the duties and authority of such designee will be identified in the Contract Documents or in a written notice to the Contractor from the Project Officer responsible for the project. The designee may be a professional architect or engineer or other person employed by the County to perform construction services administration, design services, or project oversight.
22. The term “Punch List” means unfinished items of the construction of the Project, which unfinished items of construction are minor or insubstantial details of construction, mechanical adjustment or decoration remaining to be performed, the non-completion of which would not materially affect use of the Project, and which are capable of being completed within the time specified for Final Completion after Substantial Completion has been achieved.
23. The term “Request for Information” (RFI) means a request originated by the Contractor requesting clarification or additional information from the Project Officer and/or Architect/Engineer concerning information in the construction documents where the Contractor believes there is insufficient information or a conflict in the documents. RFI’s shall be submitted by the Contractor sufficiently in advance of the Work to provide time for assessment and response without delay of the Work. Reponses to RFI’s shall not be construed as authorization for a Change Order.

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24. The term “Schedule of Values” means a listing of the Contractor’s total contract value by Construction Specifications Institute (CSI) divisions, including Division 1, Contractor’s General Conditions.
25. The term “Site” refers to that portion of the property on which the Work is to be performed or which has otherwise been set aside for use by the Contractor.
26. The terms "Special Conditions" mean the written statements modifying or supplementing the Technical Specifications or General Conditions for requirements or conditions peculiar to the Contract.
27. The term "Specifications" means and shall include the Technical Specifications, the Special Conditions and all written agreements and instructions pertaining to the performance of the Work.
28. When used, the term “Stipulated Price Item” means and includes an item of Work, unanticipated or of unknown quantity at the time of issuance of the solicitation for a Bid and determined to be executed, based on the actual field conditions during the progress of Work under the Contract. The Unit Price for the “Stipulated Price Item”, as identified in the “Stipulated Price Items” section of the Bid Form, is predetermined by the County as the current reasonably workable rate for the Item inclusive of all necessary labor, equipment, materials, overheads (provision and installation), and the contractor’s profit.
29. The term "Subcontractor", shall include only those having a direct contract with the Contractor, and it shall include those who furnish material worked to a special design according to the plans and specifications for this Work but shall not include those who merely furnish material not so worked.
30. The term “Substantial Completion” shall mean the condition when the County agrees that the Work, or a specific portion thereof, is sufficiently complete, in accordance with the Contract Documents, so that it can be utilized by the County for the purposes for which it was intended. The date of Substantial Completion of the Work under the Contract is the milestone date on which Substantial Completion condition is accomplished.
31. The term "Technical Specifications" means that part of the Contract Documents that describe the quality of materials, method of installation, standard of workmanship, and the administrative and procedural requirements for the performance of the Work under the contract.
32. The term “Time for Completion” shall mean the time period set forth in the Agreement.
33. The term "Work" shall mean the services performed under this Contract including, but not limited to, furnishing labor, and furnishing and installing materials and equipment required to complete the Project specified in the Contract Documents.

1.3 Abbreviations

The following is a list of abbreviations used within the technical specifications. The appropriate designation shall refer to the latest edition or update published by that organization:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AISC	American Institute of Steel Construction

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ANSI	American National Standard Institute
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWS	American Welding Society
AWWA	American Water Works Association
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
OSHA	Occupational Safety and Health Administration
SSPC	Steel Structures Painting Council
VDOT	Virginia Department of Transportation
WRI	Wire Reinforcement Institute

1.4 Technical Terms

Materials or work described in words which, so applied, have a well-known technical or trade meaning shall be construed to refer to the technical or trade meaning.

1.5 Standards, Substitutions

A. Any material specified by reference to the number, symbol or title of a specific standard, such as a Commercial Standard, a Federal Specification, a Trade Association Standard, or other similar standard, shall comply with the requirements in the latest revision of the standards or specification and any amendment or supplement, except as limited to type, class or grade, or as modified in such reference. The standard referred to, except as modified in the Specifications, shall have full force and effect as though printed in the Specifications.

B. Reference in the Specifications or on the Drawings to any article, device, product, material, fixture, form or type of construction by name, make or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as eliminating from competition other products of equal or better quality by other approved manufacturers. Otherwise, applications for acceptance of substitutions for the specified items will be considered only upon request of the Contractor, not of individuals, trades or suppliers, and only for a specific purpose; no blanket acceptance will be granted. No acceptance of a substitution shall be valid unless it is in written form and signed by the Project Officer or designee.

C. If any proposed substitution will affect a correlated function, adjacent construction or the work of other contractors, then the necessary changes and modifications to the affected work shall be

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considered as an essential part of the proposed substitution, to be accomplished by the Contractor without additional expense to the County or an extension of the contract time, if and when accepted. Detail drawings and other information necessary to show and explain the proposed modifications shall be submitted with the request for acceptance of the substitution.

1.6 Applicable Specifications

The following specifications are incorporated into these standards and specifications by reference. Where the provisions of the referenced specifications conflict with this document, this document shall govern.

A. Arlington County Traffic Signal & Streetlight Specifications

B. "Manual on Uniform Traffic Control Devices for Streets and Highways" U.S. Department of Transportation, Federal Highway Administration.

C. The Arlington County Code

D. VDOT Road and Bridge Specifications

1.7 Use of Virginia Department of Transportation Specifications

Virginia Department of Transportation, Road and Bridge Specifications, latest edition, technical specifications only, shall apply and become a part of these specifications whenever these specifications do not adequately cover the work to be done. When VDOT Specifications are applied, the Measurement and Payment sections of those Specifications shall not apply, and Measurement and Payment shall be performed in accordance with the Arlington County Contract. In the event there is a conflict between these specifications and VDOT Specifications these specifications shall govern.

1.8 Infeasibility of Specifications

In the event that the Contractor determines that any aspects of the Specifications are infeasible, the Contractor is obligated to immediately notify the Project Officer of such infeasibility. If the Project Officer agrees that any aspect of the Specifications is in fact rendered infeasible, such determination shall in no way invalidate or otherwise revoke the remainder of the Specifications.

1.9 Inspection of the Work

The Project Officer or designee and representatives of any public authority having jurisdiction shall, at all times, have access to the Work while in progress. The Contractor shall provide suitable facilities for such access and for proper observation of the Work and shall conduct all special tests required by the Specifications, the Project Officer or designee's instructions, and any laws, ordinances or the regulations of any public authority applicable to the work. Nothing in this section shall abrogate or otherwise limits or relieves the Contractor's independent duty to inspect the Work.

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1.10 Site Investigation and Conditions Affecting the Work

A. The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and locations of the work of the Contract, and that it has investigated and satisfied itself as to the general and local conditions and factors which can affect the Work or its cost, including but not limited to:
   1. conditions bearing upon transportation, disposal, handling, and storage of materials;
   2. the availability of labor, water, electric power, and roads;
   3. uncertainties of weather, river stages, tides, or similar physical conditions at the site;
   4. the information and conditions of the ground; and
   5. the character of equipment and facilities needed before and during work performance.

B. The Contractor, by executing the Contract, represents that it has reviewed and understands the Contract Documents and has notified the County of and obtained clarification of any discrepancies which have become apparent during the bidding period. During the Contract, the Contractor must promptly notify the County in writing of any apparent errors, inconsistencies, omissions, ambiguities, construction impracticalities or code violations discovered as a result of the Contractor's review of the Contract Documents including any differences between actual and indicated dimensions, locations and descriptions, and must give the County timely notice in writing of same and of any corrections, clarifications, additional Drawings or Specifications, or other information required to define the Work in greater detail or to permit the proper progress of the Work. The Contractor must provide similar notice with respect to any variance between its review of the Site and physical data and Site conditions observed. If the Contractor performs any Work involving an apparent error, inconsistency, ambiguity, construction impracticality, omission or code violation in the Contract Documents of which the Contractor is aware, or which could reasonably have been discovered, without prompt written notice to the County and request for correction, clarification or additional information, as appropriate, the Contractor does so at its own risk and expense and all related claims are specifically waived.

C. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the County, as well as from the Drawings and Specifications made a part of this Contract. Unless otherwise specified, all existing structures, materials and obstructions that interfere with the new construction shall be removed and disposed of as part of this Contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the Work without additional expense to the County.

D. The locations of existing utilities, including underground utilities, which may affect the Work, are indicated on the Drawings or in the Specifications insofar as their existence and location were known at the time of preparation of the drawings. However, nothing in these Drawings or Specifications shall be construed as a guarantee that such utilities are in the location indicated or that they actually exist, or that other utilities are not within the area of the operations. The Contractor shall make all necessary investigations to determine the existence and locations of such utilities. Should uncharted or incorrectly charted utilities be encountered during performance of the Work, notify the Project Officer or designee immediately for instructions. The Contractor will be held responsible for any damage to and maintenance and protection of existing utilities and structures, of both public and private ownership. However, if it is determined that such existing utility lines or structures require relocation or reconstruction or any other work beyond normal protection, then such additional work will be ordered under the

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terms of the clause entitled “Changes in Work.” At all times, cooperate with the County and utility companies to keep utility services and facilities in operation.

E. The County assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the County. The County assumes no responsibility for any understanding reached or representation made concerning conditions which can affect the Work by any of its officers or agents before the execution of this Contract, unless that understanding or representation is expressly stated in this Contract.

1.11 Work Site Conditions

A. The Contractor shall frequently remove and properly dispose of all refuse, rubbish, scrap materials, and debris from the site resulting from the Contractor's operations during the performance of this contract. The Contractor shall ensure the work site presents a neat and orderly appearance at all times. The Contractor shall isolate any and all dumpsters, trash cans and recycling bins provided for the Project from public use until Final Acceptance.

B. Unless otherwise stated, the Contract Amount and any unit prices shall include all costs and fees for removal and disposal of all waste and debris, whether disposed of at a County site or at any other location.

C. The Contractor shall remove all surplus material, false work, temporary structures including foundations thereof, and debris resulting from the Contractor's operations at work completion and before Final Acceptance. The County shall reserve the right to remove the surplus material, false work, temporary structures including foundations and debris. The County will restore the site to a neat, orderly condition if the Contractor fails to do so. The County shall be entitled to offset such cost against any sums owed by the County to the Contractor under this Contract.

1.12 Public Convenience

A. The Contractor shall at all times so conduct its Work as to ensure the least possible obstruction to traffic (vehicular, bicycle and pedestrian) and inconvenience to the general public, County employees, and the residents in the vicinity of the Work. Traffic shall be maintained in accordance with the approved MOT plan. No road, street or sidewalk shall be closed to the public except with the permission of the Project Officer or designee and or proper governmental authority. Fire hydrants on or adjacent to the Work shall be kept accessible to firefighting equipment at all times. Temporary provisions shall be made by the Contractor and included in the cost of the Work to ensure the use of sidewalks, trails, and transit facilities compliant with all applicable ADA and other regulations, as well as the proper functioning of all gutters, drainage inlets, drainage ditches, and irrigation ditches, which shall not be obstructed except as approved by the Project Officer or designee.

1.13 Maintenance and Control of Traffic

A. This work shall consist of maintaining and protecting workers, vehicular and pedestrian traffic through areas of construction within the limits of the project and over the approved traffic detours. All work shall be in accordance with the latest Arlington County Construction Standards and Specifications, Virginia Department of Transportation (VDOT) Road and Bridge

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Specifications, the Manual on Uniform Traffic Control Devices (MUTCD), and the Virginia Work Area Protection Manual (WAPM), the standard drawings, and the Contract, as directed by the Project Officer.

B. Work Zone Traffic Control Certification
   1. The Contractor shall have at least one (1) employee who is certified by VDOT in Basic Work Zone Traffic Control; and who shall be responsible for the placement, maintenance and removal of work zone traffic control devices within the project limits in compliance with the permit requirements and conditions, the approved plan, specifications, the Virginia Work Protection Manual and the Manual of Uniform Traffic Control Devices. An Employee certified by VDOT in the Intermediate Work Zone Traffic control shall be on-site to provide supervision during work zone adjustments or changes to traffic control due to field conditions. This employee shall provide evidence of this certification upon request from Arlington County personnel.

C. Material shall conform to the requirements of the applicable VDOT specification.
   1. Signalization, barricades, channelizing devices, safety devices, and pavement markings shall conform to the requirements of Division VII of the latest VDOT specifications and the MUTCD.
   2. Temporary pavement markers shall conform to the requirements of VDOT Section 235, Retroreflectors.
   3. Construction pavement markings shall conform to the requirements of VDOT Section 231 (Paint), and Section 246 (Pavement Marking)
   4. Signs for traffic control during construction, maintenance, permits, utility, and incident management activities shall conform to the requirements of VDOT Section 512.02.
      Rollup Work Zone signs shall have standard MUTCD legends orange/black complete with 5/16” vertical rib and 3/16” horizontal rib. Fastened together with two-piece tubular rivet per attached specification or equal.
      a. Shall be supported with two 3/8” thick fiberglass ribs for secure attachment, and avoid sign deflection when used with compact stands. Each of the 5 pockets per sign should be tacked and double-stitched directly to the back of the sign for durability.
      b. Sign legends shall be printed on outer edge for ready identification when sign has been rolled for storage and transport
   5. Portable changeable message signs shall meet the requirements of Section 512.03 subsection q of the VDOT Road and Bridge Specifications.

1.14 Protection of Work and Property

A. The Contractor shall continuously maintain and protect all of its Work from damage and shall protect the County's property from damage or loss arising in connection with this Contract until Substantial Completion. After Substantial Completion, the maintenance or protection of any incomplete or remedial Work identified on the punch list that requires maintenance or protection in order to allow for the final completion and acceptance of such Work shall be the responsibility of the Contractor until Final Completion. The Contractor shall make good any such damage or loss, except such as may be caused by agents or employees of the County. Failure to adequately protect the Work shall not be grounds for additional compensation for any maintenance and/or repairs to such Work.

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B. The Contractor shall not place upon the Work, or any part thereof, any loads which are not consistent with the design strength of that portion of the Work.

C. The Contractor shall be responsible for the preservation of all public and private property, trees, monuments, etc., along and adjacent to the street and/or right-of-way, and shall use every precaution to prevent damage to pipes, conduits and other underground structures, curbs, pavements, etc., except those to be removed or abandoned in place and shall protect carefully from disturbance or damage all monuments and property marks until an authorized agent has witnessed or otherwise referenced their location and shall not remove them until directed. Any damage which occurs by reason of the operations under this Contract, whether shown or not on the approved construction plans, shall be completely repaired or replaced to the County's satisfaction by the Contractor at the Contractor's expense.

D. Prior to commencing construction activity at the Site, the Contractor shall videotape the Site and an additional fifty (50) feet outside the perimeter of the Site. Contractor shall submit a copy of high resolution digital recording on a DVD or flash drive to the County. The recording shall be stable, continuous, and contain all items within the limits of Work. Submission of the DVD to the County shall be a condition precedent to any obligation of the County to consider an Application for Payment. The DVD shall be the property of the County, and the County shall be permitted to reproduce such DVD's and use the same for any purpose without limitation or claim of ownership or compensation from any party. Contractor shall incorporate the cost of the preconstruction survey in the bid amount or the unit prices of the bid items, as applicable. No additional payment will be made by the County.

E. The Contractor shall shore, brace, underpin, secure, and protect, as may be necessary, all foundations and other parts of existing structures adjacent to, adjoining, and in the vicinity of the site that may be affected in any way by excavations or other operations connected with the work required under this Contract. The Contractor shall be responsible for giving any and all required notices to owners or occupants of any adjoining or adjacent property or other relevant parties before commencement of any work. Contractor shall provide all engineering (signed and sealed) for items listed in this section per the Specifications. The Contractor shall indemnify and hold the County harmless from any damages on account of settlements or loss of all damages for which the County may become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.

F. In an emergency affecting the safety of life or of the Work, or of adjoining property, the Contractor, without special instruction or authorization from the Project Officer or designee, or the County, is hereby permitted to act, at the Contractor's discretion, to prevent such threatened loss or injury, and the Contractor shall so act without appeal, if so instructed or authorized.

G. The Contractor shall have a qualified and experienced person who can clearly communicate technical matters regarding the subject project. This person shall be available via phone to respond to emergency situations on the project 24 hours a day.

Safety and Accident Prevention

A. The Contractor shall comply with, and ensure that the Contractor's employees and subcontractors comply with, all current applicable local, state and federal policies, regulations and standards relating to safety and health, including, by way of illustration and not limitation, the U.S. Department of Labor's Occupational Safety and Hazard Administration (OSHA)

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Construction Industry Regulations, the standards of the Virginia Occupational Safety and Health program of the Department of Labor and Industry for General Industry and for the Construction Industry, the Federal Environmental Protection Agency Standards and the applicable standards of the Virginia Department of Environmental Quality.

B. The Contractor shall provide, or cause to be provided, all technical expertise, qualified personnel, equipment, tools and material to safely accomplish the Work specified to be performed by the Contractor and subcontractor(s).

C. The Contractor shall identify to the County Project Officer at least one on-site person who is the Contractor's competent, qualified, and authorized safety officer on the worksite and who is, by training or experience, familiar with and trained in policies, regulations and standards applicable to the work being performed. The competent, qualified and authorized person must be capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees, shall be capable of ensuring that applicable safety regulations are complied with, and shall have the authority and responsibility to take prompt corrective measures, which may include removal of the Contractor's personnel from the work site.

D. The Contractor shall provide to the County, within 7 days of issuance of the Notice to Proceed, a copy of the Contractor's written safety policies and safety procedures applicable to the scope of work. Failure to provide this information within may result in cancellation of the Contract.

E. The Contractor shall exercise proper precaution at all times for the protection of persons and property and shall be responsible for all injury to persons and damage to property either on or off the site, which occur as a result of the Contractor's prosecution of the Work.

F. The Contractor shall take or cause to be taken such additional safety and health measures as the County may determine to be reasonably necessary. Machinery, equipment, and all hazards shall be guarded in accordance with the safety provisions of the current version of "Manual of Accident Prevention" published by the Associated General Contractors of America, Inc., to the extent that such provisions are not in conflict with applicable local laws. The Contractor is directed to the "Rules and Regulations Governing Construction, Demolition and All Excavation" and adopted by the Safety Codes Commission of Virginia, 1966, or latest edition, covering requirements for shoring, bracing, and sheet piling of trench excavations.

1.16 Permission to Work on Highways and Across Utilities

A. When construction crosses highways, railroads, streets, waterways, or utilities under the jurisdiction of State, County, City, or other public agency, public utility, or private entity, the Contractor shall secure written permission where necessary from the proper authority before executing such new construction. A copy of such written permission must be filed with the County before any work is started. The Contractor shall be required to furnish a release from the proper authority before Final Acceptance of the Work.

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1.17 Adjacent Work

A. In case of a dispute arising between two or more separate contractors engaged on adjacent work as to the respective rights of each under their respective contracts, the Project Officer shall determine the rights of the parties

1.18 Connecting Work

A. The Contractor shall do all cutting, patching, or digging of the Contractor's work that may be required to make its several parts come together properly and fit it to receive or be received by work of other contractors as shown upon or reasonably implied by the Drawings and Specifications for the completed Project and shall make good after them as the Project Officer or designee may direct. This work will be performed in a workmanlike manner utilizing proper care and equipment to achieve proper line and grade. The Contractor shall not endanger any work by cutting, patching, or digging, or otherwise, and shall not cut or alter the work of any other contract except with the prior written consent of the Project Officer or designee.

1.19 Environmental Protection

A. The Contractor shall implement measures to prevent releases of pollution to the environment and unauthorized discharges to the County's storm drain system or surface waters. The Contractor shall ensure the pollution prevention measures outlined in Section 01500 Temporary Sediment and Erosion Control are implemented throughout the duration of the work.

B. When the Project includes an approved SWPPP, the Contractor shall strictly abide by this plan which includes: a Pollution Prevention (P2) Plan, an Erosion and Sediment Control (E&S) Plan, and a Stormwater Management Plan. If the Contractor proposes to deviate from this approved plan, it shall be the Contractor's responsibility to coordinate and obtain approval from the County Project Officer prior to implementing any changes.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT AND PAYMENT

4.1 SWPPP

A. No separate payment shall be made by the County for SWPPP implementation, with the exception of E&S items as specified on the E&S plans or listed as pay items. The Contractor shall not be entitled to any additional payment for changes to the SWPPP which are the result of the Contractor's work schedule or resource allocation, weather delays, or other factors not controlled by the County.

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4.2 Maintenance and Control Of Traffic

A. Payment for MOT shall be based on the bid form. Payment for maintenance of traffic is full compensation for providing the proper pedestrian, bike lanes, and vehicular traffic controls during all stages of construction and includes furnishing, preparing, fabricating, installing, maintaining, removing, relocating, repairing, or replacing pedestrian, bike lanes, and vehicular traffic control devices and signs as necessary, and all other materials, labor, hardware, equipment, tools, supplies, and incidentals. Contractor shall be responsible for acquiring VDOT permit for any revision during construction and/or as required by the project contract to the approved traffic control plan.

B. Payment for maintenance of traffic for each site shall be made as partial payments. The first installment of 50 per cent of the total cost for maintenance of traffic shall be made on the first progress estimate following partial mobilization and initiation of construction work for the particular site. The remaining 50% of the cost shall be paid on each subsequent estimate based on the percent of work completed at the site all the way through Final Acceptance of work. The Project Officer shall have the authority to decide on the appropriate payment for each subsequent estimate.

END OF SECTION 01000

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SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 Summary

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Coordination drawings.
   3. RFIs.
   4. Digital project management procedures.
   5. Project meetings.

1.3 Related Work Specified Elsewhere:

A. Section 01320- Construction Progress Documentation

B. Section 01330- Submittal Procedures

C. Section 01400- Quality Requirements

D. Section 01720- Project As-Built Drawings

1.4 Informational Submittals

A. Subcontract List: Within 15 calendar days after execution of the contract by the County the Contractor shall provide to the Project Officer a written summary identifying all individuals or other entities proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

   1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
   2. Number and title of related Specification Section(s) covered by subcontract.
   3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 calendar days after execution of the contract by the County the Contractor shall provide to the Project Officer a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their

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duties and responsibilities; list addresses and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list where required by the Project Officer in web-based Project software directory. Keep list current at all times.

1.5 General Coordination Procedures

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. The Contractor shall cooperate with and coordinate work required to be performed by the County’s independent subcontractors.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Project closeout activities.
7. Startup and adjustment of systems.

1.6 Request For Information (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. The Project Officer will return without response those RFIs submitted to Project Officer by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

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1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. RFI number, numbered sequentially.
6. RFI subject.
7. Specification Section number and title and related paragraphs, as appropriate.
8. Drawing number and detail references, as appropriate.
9. Field dimensions and conditions, as appropriate.
10. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
11. Contractor's signature.
12. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: RFIs shall be generated using a form with the content as indicated above that is acceptable to the Project Officer.

1. Attachments shall be electronic files in PDF format.

D. Project Officer's Action: Project Officer shall review each RFI, determine action required, and respond. Allow seven working days for Project Officer's response for each RFI. RFIs received by Project Officer after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of project Officer's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Project Officer's action may include a request for additional information, in which case Project Officer's time for response will date from time of receipt by Project Officer of additional information.
3. Project Officer 's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to the Contract General Conditions.
    a. In accordance with the Contract conditions, if the Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum he shall notify the Project Officer in writing within 3 days of receipt of the RFI response. The Contractor thereafter must provide to the Project Officer a full cost proposal within 14 days detailing the amount of additional compensation claimed, together with the basis therefore and documentation supporting the claimed amount.

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E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log submitted at each coordination bi-weekly coordination meeting. Use software log that is part of web-based Project software log with not less than the following:

1. Project name.
2. Name and address of Contractor.
3. RFI number including RFIs that were returned without action or withdrawn.
4. RFI description.
5. Date the RFI was submitted.
6. Date Project Officer's response was received.
7. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

F. On receipt of Project Officer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Project Officer within seven days if Contractor disagrees with response.

1.7 Digital Project Management Procedures

A. Use of County's Digital Data Files: Digital data files of County's limited CAD drawings will be provided by Project Officer for Contractor's use during construction.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
2. County makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Digital Drawing Software Program: Contract Drawings are available in AutoCAD format.

4. A Web-based Project software selected by the County shall be utilized at the discretion of the Project Officer.

B. PDF Document Preparation: Where PDFs are required to be submitted to Project Officer,. prepare as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT AND PAYMENT

4.1 Project management and coordination required by the contract documents is incidental to the work and therefore no separate payment will be made.

END OF SECTION 01310

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SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's Construction Schedule.
2. Construction schedule updating reports.
3. Daily construction reports.
4. Material location reports.
5. Site condition reports.
6. Unusual event reports.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time belongs to County.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

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3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file, where indicated.
2. PDF file.

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working digital copy of schedule, using software approved by the Project Officer, and labeled to comply with requirements for submittals.

C. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
3. Total Float Report: List of activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.

D. Construction Schedule Updating Reports: Submit with Applications for Payment.

E. Daily Construction Reports: Submit at monthly intervals.

F. Material Location Reports: Submit at monthly intervals.

G. Site Condition Reports: Submit at time of discovery of differing conditions.

H. Unusual Event Reports: Submit at time of unusual event.

1.5 QUALITY ASSURANCE

A. Scheduling Qualifications: The Contractor shall have an experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Project Officer's request.

B. The Contractor shall:

1. Review software limitations and content and format for reports.

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2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing work stages area separations interim milestones and partial County occupancy.
4. Review delivery dates for County-furnished products.
5. Review schedule for work of County's separate contracts.
6. Review submittal requirements and procedures.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and County startup procedures, including commissioning activities.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.7 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. The Contractor shall submit a comprehensive, fully developed Construction Schedule within 10 business days after the Contract Award Date , or prior to the pre-construction meeting, whichever occurs first.

B. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

1. Use Software package acceptable to the Project Officer for current Windows operating system.
2. Contractor shall employ skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
3. Meetings: Scheduler shall attend all meetings related to Project progress, alleged delays, and time impact.

C. Time Frame: Extend schedule from date established for the Notice of Award to date of final completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

D. Activities: Treat each main element of the Work as a separate activity. Comply with the following:

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1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by the Project Officer.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 01330 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
5. Commissioning Time: Include no fewer than 15 days for commissioning.
6. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Project Officer's administrative procedures necessary for certification of Substantial Completion.
7. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

E. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work by County: Include a separate activity for each portion of the Work performed by the County.
3. Products Ordered in Advance: Include a separate activity for each product. Include delivery date. Delivery dates indicated stipulate the earliest possible delivery date.
4. County-Furnished Products: Include a separate activity for each product. Include delivery date. Delivery dates indicated stipulate the earliest possible delivery date.
5. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use-of-premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

6. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

    a. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Mockups.
    e. Fabrication.
    f. Sample testing.
    g. Deliveries.
    h. Installation.
    i. Tests and inspections.
    j. Adjusting.

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k. Curing.

F. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion.

G. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and the Contract Time.

H. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting. An updated schedule must accompany each application for payment.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

I. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

J. Distribution: Distribute copies of approved schedule to Project Officer, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.8 GANTT-CHART SCHEDULES

A. Gantt-Chart Schedule: The Project Officer, at his sole discretion may elect to have the Contractor utilize a Gantt-Chart schedule on projects of lower complexity.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

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1.9 CPM SCHEDULE REQUIREMENTS

A. CPM Schedule: Prepare Construction Schedule using a time-scaled CPM network analysis diagram for the Work.

1. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates.
2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use "one calendar day " as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.

B. CPM Schedule Preparation

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

a. Preparation and processing of submittals.
b. Mobilization and demobilization.
c. Purchase of materials.
d. Delivery.
e. Fabrication.
f. Utility interruptions.
g. Installation.
h. Work by County that may affect or be affected by Contractor's activities.
i. Testing and inspection.
j. Commissioning.
k. Punch list and final completion.
l. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path.

a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

C. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.

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D. Initial Issue of Schedule: Prepare initial schedule from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.

E. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

1.10 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Testing and inspection.
8. Accidents.
9. Meetings and significant decisions.
10. Unusual events.
11. Stoppages, delays, shortages, and losses.
12. Meter readings and similar recordings.
13. Emergency procedures.
14. Orders and requests of authorities having jurisdiction.
15. Change Orders received and implemented.
16. Construction Change Directives received and implemented.
17. Services connected and disconnected.
18. Equipment or system tests and startups.
19. Partial completions and occupancies.
20. Substantial Completions authorized.

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B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

D. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Project Officer in advance when these events are known or predictable.

1. Submit unusual event reports directly to Project Officer within one day of an occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT AND PAYMENT

4.1 Construction Progress Documentation is considered a subsidiary obligation of the contract, and therefore no separate payment shall be made for this work.

END OF SECTION 01320

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SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require project Officer’s responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Project Officer's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. test

1.4 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Project Officer and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.

2. Initial Submittal: Submit within fifteen (15) calendar days after receipt of the Notice to Proceed.

3. Format: Arrange the following information in a tabular format:

a. Scheduled date for first submittal.

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b. Specification Section number and title.
c. Submittal Category: Action; informational.
d. Name of subcontractor.
e. Description of the Work covered.
f. Scheduled date for Project Officer's final release or approval.
g. Scheduled dates for purchasing.
h. Scheduled date of fabrication.
i. Scheduled dates for installation.
j. Activity or event number.

1.5 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Project Officer.
4. Name of Contractor.
5. Name of firm or entity that prepared submittal.
6. Names of subcontractor, manufacturer, and supplier.
7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
8. Category and type of submittal.
9. Submittal purpose and description.
10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
11. Drawing number and detail references, as appropriate.
12. Indication of full or partial submittal.
13. Location(s) where product is to be installed, as appropriate.
14. Other necessary identification.
15. Remarks.
16. Signature of transmitter.

B. Options: Identify options requiring selection by Project Officer.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Project Officer on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Paper Submittals:

1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Project Officer.
3. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Project Officer will return two copies.

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4. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Project Officer will not return copies.
5. Transmittal for Submittals: Each submittal shall be accompanied by a letter of transmittal, listing the contents of the submission and identifying each item by reference to specification section or drawing.

E. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

F. Submittals for Web-Based Project Software: Prepare submittals as PDF files, or other format indicated by Project software website.

1.6 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Email: Prepare submittals as PDF package and transmit to Project Officer by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Project Officer.

    a. Project Officer will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.

2. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
3. Paper: Prepare submittals in paper form and deliver to Project Officer.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Project Officer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Project Officer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

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1. Initial Review: Allow 14 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Project Officer will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 14 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Project Officer is indicated, allow 21 days for initial review of each submittal.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Project Officer.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Project Officer.

1.7 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Manufacturer's catalog cuts.
b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams that show factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

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5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.

B. Substitutions
   1. The Project Officer shall consider formal requests for substitution of products in place of those specified up to fifteen Business Days before the start of work.
   2. All proposals for substitutions shall be submitted in writing by the General Contractor or permit holder and not by individual trades or material suppliers.
   3. Include in the following information in any Substitution request:
      a. Complete data substantiating compliance of proposed substitution with Contract Documents.
      b. Product identification, including manufacturer's name, address and literature outlining the product description, performance, test data and reference standards.
      c. Samples, if applicable.
      d. Name and address of similar projects on which product was used and date of installation.
      e. Itemized comparison of proposed substitution with product or method specified including any changes in construction schedule, relation to separate contracts, and accurate cost data on proposed substitution in comparison with product or method specified.
   4. If any proposed Substitution shall affect any portion of the Project, adjacent construction, work of other Contractors or Subcontractors, or use or functionality of the finished Project, then the necessary changes to or affected functionality of the Project shall be considered as an essential part of the proposed Substitution. All such changes or accommodations necessary to restore and/or provide the intended functionality of the Project shall be clearly documented by the Contractor as part of the Submittal.
   5. The County shall bear no additional expense as a result of any Substitution.
   6. The Project Officer shall review proposed substitutions and make his recommendations in writing within ten working days. The Contractor shall abide by the Project Officer's recommendations when proposed substitute materials or items of equipment are not accepted for installation and shall furnish the specified material or item of equipment in such case.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale.

   1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

      a. Identification of products.
      b. Schedules.
      c. Compliance with specified standards.
      d. Notation of coordination requirements.
      e. Notation of dimensions established by field measurement.
      f. Relationship and attachment to adjoining construction clearly indicated.
      g. Seal and signature of professional engineer if specified.

   2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 24 by 3 inches.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.

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1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:

    a. Project name and submittal number.
    b. Generic description of Sample.
    c. Product name and name of manufacturer.
    d. Sample source.
    e. Number and title of applicable Specification Section.
    f. Specification paragraph number and generic name of each item.

3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, and identification information for record.
4. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
5. Paper Transmittal: Include paper transmittal including complete submittal information indicated.
6. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

    a. Number of Samples: Submit three sets of Samples. Project Officer will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.

        1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
        2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

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1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.

F. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of engineers and owners, and other information specified.

G. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

H. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

I. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before

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installation of product, for compliance with performance requirements in the Contract Documents.

5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.
    f. Test procedures and results.
    g. Limitations of use.

1.8 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

    1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Project Officer.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

    1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.9 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Project Officer.

B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp or by indication in web-based Project software. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

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1. Project Officer will not review submittals received from Contractor that do not have Contractor's review and approval.

1.10 PROJECT OFFICER'S REVIEW

A. Action Submittals: Project Officer will review each submittal, indicate corrections or revisions required, and return it.

1. PDF Submittals: Project Officer will indicate, via markup on each submittal, the appropriate action.

2. Paper Submittals: Project Officer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

3. Submittals by Web-Based Project Software: Project Officer will indicate, on Project software website, the appropriate action.

B. Informational Submittals: Project Officer will review each submittal and will not return it or will return it if it does not comply with requirements. Project Officer will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Project Officer.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Project Officer will return without review submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents will be returned by Project Officer without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT AND PAYMENT (Not Used)

END OF SECTION 01330

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SECTION 01400 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and quality-control services required by the County or by authorities having jurisdiction are not limited by provisions of this Section.
4. Specific test and inspection requirements are not specified in this Section.

C. All materials testing shall follow the Arlington County Materials Testing Specification Reference. This document specifies the method and frequency of testing for Arlington County projects.

1.3 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

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1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

D. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

E. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.

F. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

G. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

H. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by the Project Officer.

I. Commissioning Process: The commissioning process is a quality process which is intended to monitor the construction process, including but not limited to, submittal conformance with the contract documents, construction installation and associated testing and system startup, prove-out and seasonal performance monitoring.

1.4 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Project Officer.

1.5 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements are specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Project Officer for direction before proceeding.

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B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Project Officer for a decision before proceeding.

1.6 ACTION SUBMITTALS

A. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.7 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

E. Reports: Prepare and submit certified written reports and documents as specified.

1.8 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Contract Award, and not less than five days prior to preconstruction conference. Submit in format acceptable to Project Officer. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's Construction Schedule.

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B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager shall not have other Project responsibilities.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections including Subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
3. County-performed tests and inspections indicated in the Contract Documents.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Project Officer has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.9 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.

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12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspection.

1.10 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An Nationally Recognized Testing Laboratories (NRTL), an National Voluntary Laboratory Accreditation Program (NVLAP), or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

H. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by Project Officer.
3. Notify Project Officer seven days in advance of dates and times when mockups will be constructed.

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4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed to perform same tasks during the construction at Project.
5. Demonstrate the proposed range of aesthetic effects and workmanship.
6. Obtain Project Officer's approval of mockups before starting corresponding work, fabrication, or construction.

    a. Allow seven days for initial review and each re-review of each mockup.

7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
8. Demolish and remove mockups when directed unless otherwise indicated.

1.11 QUALITY CONTROL

A. Contractor Responsibilities: Tests and inspections not explicitly assigned to the County are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Engage a qualified testing agency to perform quality-control services.

    a. Contractor shall not employ same entity engaged by County, unless agreed to in writing by Project Officer.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

B. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

C. Testing Agency Responsibilities: Cooperate with Project Officer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Project Officer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

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5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform duties of Contractor.

D. Associated Contractor Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspection equipment at Project site.

E. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

F. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Project Officer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.12 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Engage a qualified testing agency to conduct special tests and inspections required by Project Officer or by authorities having jurisdiction.

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Project Officer promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Project Officer and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspection of corrected work.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Project Officer’s reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Testing

A. Unless otherwise specified, testing of materials, supplies, equipment, and work to comply with the Contract requirements shall be considered incidental to the work, and the Contractor shall not be entitled to further payment. The Project Officer may direct additional testing in excess of the Contract requirements at the County’s expense, unless such testing reveals non-compliant work, in which case the Contractor shall bear the cost of the testing.

END OF SECTION 01400

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SECTION 01500 - EROSION AND SEDIMENT CONTROL AND POLLUTION PREVENTION

PART 1 - GENERAL

1.1 Description of Work

A. This work shall consist of implementation of erosion and sediment control and pollution prevention measures throughout the duration of the work to prevent unauthorized non-stormwater discharges or pollution releases to the storm drain system or surface waters.

B. Where work is governed by an approved Stormwater Pollution Prevention Plan (SWPPP), the Erosion and Sediment Control and Pollution Prevention components of the SWPPP shall apply.

C. Erosion and sediment control measures shall include, but are not limited to, the use of berms, dikes, dams, sediment basins, fiber mats, silt fences, straw bales, washed gravel or crushed stone, mulch, grasses, slope drains, temporary seeding, and other methods. Erosion and sediment control measures shall be applied to erodible material exposed by any activity associated with the construction, and consistent with federal, state and local regulations.

D. All non-stormwater discharges to the County's storm drain system, which includes the curb and gutter as well as the underground pipe network, or any open watercourse must comply with the conditions of the County's Virginia Stormwater Management Program, Municipal Separate Storm Sewer System (MS4) Permit. Examples of unauthorized non-stormwater discharges include but are not limited to, wash water, slurry runoff from saw cutting, discharges associated with vehicle, equipment, and/or material washing, concrete wash water, process water, waste water, leaks from portable lavatories, equipment, vehicles and/or waste receptacles. Only clear, uncontaminated stormwater discharges and/or permitted non-stormwater discharges (as specified in a Virginia Pollutant Discharge Elimination System (VPDES permit)) are allowed to be discharged to the storm drain system or surface waters. Contaminants, including but not limited to, volatile organic compounds, petroleum products, metals, PCBs, pesticides, and herbicides, shall not be discharged to the County's storm drain system.

1.1 Related Work Specified Elsewhere

A. Section 02100- Clearing and Grubbing

B. Section 02200- Earthwork

C. Section 311300- Tree Protection and Root Pruning

1.2 Applicable Standards and Specifications

A. Erosion and Sediment Control (Chapter 57 of the Arlington County Code)

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B. Utilities (Chapter 26 of the Arlington County Code)

C. Stormwater Management (Chapter 60 of the Arlington County Code)

D. Chesapeake Bay Preservation Ordinance (Chapter 61 of the Arlington County Code)

E. Trees and Shrubs (Chapter 67 of the Arlington County Code)

F. Virginia State Water Control Board Regulations

G. Virginia Erosion and Sediment Control Handbook

H. Arlington County Stormwater Management Ordinance Guidance Manual

I. Arlington County Pre-Storm Checklist

J. Arlington County Tree Protection and Planting Standards

1.3 Submittals

Prior to the start of any work that does not require a Land Disturbing Activity (LDA) and SWPPP, the Contractor shall prepare and submit a plan for implementing erosion and sediment control and pollution prevention measures. The plan shall include, but is not limited to, the operations of clearing and grubbing, stripping of topsoil, grading, stabilizing cleared areas, dewatering, spill prevention and cleanup, and the construction of structures at watercourses.

Any activity that disturbs greater than or equal to 2500 square feet requires a Stormwater Pollution Prevention Plan per the requirements of Arlington County Code Chapter 60. This plan contains the following elements:

- Erosion and Sediment (E&S) Control Plan
- Pollution Prevention Plan (P2 Plan)
- Stormwater Management Plan (SWMP)
- Virginia Stormwater Management Program (VSMP) Requirements where applicable

Construction work shall not commence until the schedule of work and the methods of operations have been reviewed and approved by the Engineer / Project Officer.

Erosion and sediment controls shall be coordinated with the construction of permanent stormwater management facilities, drainage facilities and other contract work to the extent practicable to assure economical, effective, and continuous erosion and sediment control, and to prevent any damage, clogging, or other negative impacts upon the work or other property.

Where work is governed by an approved SWPPP, the Contractor shall be responsible for all SWPPP self-inspection and documentation requirements, which includes but is not limited to the following:

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- A SWPPP box is installed and maintained at project site.
- Permit(s) and applicable documentation are posted near the SWPPP box.
- All sections of the SWPPP are kept complete and up to date throughout the duration of the project. (For example, notation of when erosion and sediment controls (ESC) are installed and information about the types of pollution prevention measures used.)
- Any modifications to controls are documented in the SWPPP, which includes the ESC plan.
- Self-inspections are conducted every four business days or as required.
- Completed and signed inspection reports are kept at the project site.
- Items identified during inspections requiring correction action are properly documented and addressed.
- The ESC Pre-storm checklist provided in the plan / SWPPP is used and followed accordingly.

1.4 Permits

The Contractor is responsible for complying with all applicable State, Federal, and Local permits which are required for construction, including, but not limited to:

- Virginia Water Protection Permits issued by the Virginia DEQ
- General Nationwide Permits issued by the US Army Corps of Engineers
- Land Disturbing Activity (LDA) permits (Virginia Stormwater Management Program (VSMP) authority permits) issued by Arlington County
- General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Construction Activity issued by Virginia DEQ.
- A separate VPDES permit, issued by DEQ may be required for certain non-stormwater discharges such as contaminated groundwater.

Unless otherwise specified as the responsibility of the Contractor in the ITB or contract documents, the County shall obtain all applicable permits prior to awarding the contract. Permits shall then be transferred to the Contractor. When applicable, the Contractor shall be responsible for submitting a Notice of Termination for any General VPDES permit issued by the DEQ once project completion is approved all supporting documents are received by the County.

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PART 2 - PRODUCTS

Materials shall be at the Contractor's option with the approval of the Engineer/Project Officer in accordance with Arlington County Code, Erosion and Sediment Control Ordinance (Chapter 57).

PART 3 - EXECUTION

3.1 Installation and Maintenance of Erosion and Sediment Controls

Where work is governed by an approved SWPPP, the contractor shall follow the plan and Erosion and Sediment Control Pre-Storm Checklist, which includes but is not limited to the conditions below. Where the work is not governed by an approved SWPPP, the contractor shall meet the conditions below as well as those specified in the Erosion and Sediment Control Pre-Storm Checklist.

A. The Contractor, prior to starting work, shall install controls to prevent pollutants, waste materials, sediment, or non-stormwater discharges from entering the storm drain system. The Contractor shall implement and maintain controls as specified in the Virginia Erosion and Sediment Control Handbook and/or approved Stormwater Pollution Prevention Plan. Controls, practices, and/or devices must be monitored and maintained at all times to ensure proper operation condition. Controls shall not create any flooding or safety hazards.

B. No grading operations shall be allowed until erosion and sediment controls have been installed in accordance with the approved plan conforming to the requirements of Virginia Erosion and Sediment Control regulations and Arlington County Erosion and Sediment Control Ordinance.

C. The Contractor shall keep stockpiled materials covered and perimeter controls shall be employed to minimize exposure to wind, precipitation, and runoff.

D. The Contractor shall implement and maintain dewatering methods as specified in Arlington County Construction Standards and Specifications, VA Erosion and Sediment Control Handbook, and/or approved Stormwater Pollution Prevention Plan. Controls, practices, and/or devices used for dewatering operations must be monitored and maintained at all times to ensure proper operation.

E. The Contractor shall conduct dewatering operations in a manner to prevent sediment or other pollutants from discharging to the County's storm drain system or any surface water. Dewatering operations shall not create any erosion or flooding. Dewatering discharges that contain chemicals, hydrocarbons, or sewage shall not be discharged to the storm drain system. Any discharge from dewatering operations shall be properly filtered prior to being discharged. A dewatering plan with sufficient detail to ensure the proposed dewatering shall comply with applicable regulations must be included as part of the erosion and sediment control plan.

F. The Contractor is responsible for the installation and maintenance of any additional erosion and sediment control (ESC) measures necessary to prevent erosion and sedimentation as determined by the County, including but not limited to the actions listed in the County's Erosion and Sediment Control Pre-Storm Checklist (perimeter controls, slope stabilization, and covering stockpiles). Erosion and sediment controls shall be modified as needed to ensure clear water is discharged from the site. The County reserves the right to order the implementation of other

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erosion and sediment controls not specifically described herein to correct an erosion or pollution discharge condition.

G. Control measures shall be properly maintained in accordance with state and local regulations. Immediately after every rainstorm, all control measures shall be inspected, and any deficiencies corrected by the Contractor.

H. Erosion and sediment controls shall be removed when the area has been stabilized and approval has been granted by the construction inspector.

I. No further work shall be allowed until erosion and sediment controls for the applicable phase have been installed in accordance with the approved plan conforming to the requirements of Virginia Erosion and Sediment Control regulations and Arlington County Erosion and Sediment Control Ordinance.

J. No erosion control measures shall be installed that would inhibit the overland relief path of storm water flow. The contractor shall be responsible during the length of the project that an adequate overland relief flow path is maintained.

3.2 Pollution Prevention Measures

Where work is governed by an approved SWPPP, the contractor shall follow the plan, which includes but is not limited to the conditions below. Where the work is not governed by an approved SWPPP, the contractor shall meet the conditions below.

A. The Contractor shall employ good housekeeping at work sites at all times. The Contractor shall collect, remove and legally dispose of all refuse, trash, litter, waste materials, and/or debris generated at the work site as frequently as necessary to prevent pollution releases from the site. Liquid waste must be properly contained prior to being placed into a waste receptacle to prevent leaking. The County, in its sole discretion, may require the Contractor to provide disposal tickets or other information sufficiently demonstrating legal disposal.

B. The Contractor shall contain, capture, collect and legally dispose of any unauthorized non-stormwater discharge(s), including but not limited to, saw cut slurry from saw cutting operations, concrete / asphalt wash water, waste water, and / or wash water from equipment, material, and/or vehicle washing.

C. A vacuum system shall be used to collect liquid waste / slurry generated from saw cutting operations to prevent a discharge to a storm drain or surface water. Collected slurry must be disposed of at an approved waste receiving facility (e.g. landfill, soil safe, waste water treatment plant, commercial dump pad).

D. Methods used for capturing / collecting unauthorized non-stormwater discharges must be on site and operational prior to starting any work that shall generate a non-stormwater discharge.

E. The Contractor shall have designated wash out areas or containers for materials, including but not limited to concrete, asphalt, paint, grout, mortar, stucco, form release oil, curing compounds, and /or sealers.

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F. Construction materials shall be properly stored and secured to ensure no pollutants are released into the environment.

G. The Contractor shall ensure waste receptacles and portable lavatories are not damaged and/or leaking.

H. The Contractor shall ensure spill clean-up materials (including but not limited to absorbent materials, spill pads, rags, booms, bags for waste disposal) and tools (including but not limited to shovels, brooms, containers, vacuums) are kept on the work site and accessible at all times. Spills and leaks shall be cleaned up as soon as discovered and wastes properly disposed of at an approved waste receiving facility. Spills shall not be washed into a street, storm drain, or surface waters.

I. The Contractor shall ensure that the County's procedures for disposing of chlorinated water are followed (DES Construction Standards and Specifications, Section 02550 3.4 L Discharge of Chlorinated Water).

J. The Contractor shall not dump or dispose of anything in a storm drain, street, or stream that is not authorized under the County's VSMP MS4 permit or violates County Code Chapter 26-5 B and/or C.

3.3 Extent of Grading Operations

A. The Contractor shall limit the surface area of earth material exposed by grubbing, stripping of topsoil and excavation to that which is necessary to perform the next operation within a given area.

B. Unless specifically authorized by the Project Officer, the grubbing of root mat and stumps shall be confined to the area over which excavation is to be actively conducted within 30 days following the grubbing operations.

C. The stripping of topsoil shall be confined to the area over which excavation is to be actively prosecuted within 15 days following the stripping operations; and excavation and embankment construction shall be confined to the minimum area necessary to accommodate the Contractor's equipment and work force engaged in the earth moving work.

D. No disturbed area, including stockpiles, shall remain denuded longer than 7 days without temporary seeding or application of other stabilization practices approved by the Project Officer.

3.4 Tree Protection

A. Tree protection shall be in accordance with Arlington County's Specifications Section 311300 Tree Protection and Root Pruning.

B. The Contractor shall protect all existing trees within a Tree Protection Zone.

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PART 4 - MEASUREMENT AND PAYMENT

4.1 Payment for erosion and sediment control and pollution prevention for each site shall be made as partial payments. The first installment of 50 per cent of the total cost for erosion and sediment control and pollution prevention shall be made on the first progress estimate following full installation of erosion and sediment control and pollution prevention measures. The remaining 50% of the cost shall be paid on each subsequent estimate based on the percent of work completed at the site all the way through Final Acceptance of work. The Project Officer shall have the authority to decide on the appropriate payment for each subsequent estimate.

4.2 No additional payment will be made for temporary erosion control required to correct conditions created due to the Contractor's negligence, carelessness or failure to install permanent controls in accordance with the approved plan, or methods or sequence of such work.

4.3 No additional payment will be made for limiting the area of construction operations as directed by the Project Officer. The cost of shaping the top of earthwork, constructing temporary earth berms, slope drains, straw bales, etc., considered being a subsidiary obligation to the Contract and therefore, there will be no payment made for this work.

4.4 In the event the Contractor repeatedly fails to satisfactorily control erosion and siltation, the Owner reserves the right to employ outside assistance or to use its own forces to provide the corrective measures indicated; the cost of such work, plus engineering costs, will be deducted from monies due to the Contractor for other Work.

END OF SECTION 01500

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SECTION 01550 - MOBILIZATION

PART 1 - GENERAL

1.1 This work shall consist of performing preparatory preliminary operations, including moving personnel and equipment to the project site; paying bonds and insurance premiums; and establishing other facilities necessary to allow work to begin on a substantial phase of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT AND PAYMENT

4.1 Payment for mobilization shall be based on the bid form. This price shall also include demobilization.

4.2 Payment for mobilization will be made in two equal installments. The first installment of 50% of the unit total cost price for mobilization will be made on the first progress estimate following partial mobilization and initiation of construction work. The second installment will be made on the next progress estimate following completion of substantial mobilization.

4.3 If, due only to conditions created by the County or by unforeseen utility conflicts no work can be performed and the contractor is directed by the county Project Officer to cease work on an assigned project then the county will issue a 'Cease-Work Order'. Under these conditions the contractor shall be entitled to request (in writing) a re-mobilization fee upon resuming work on the project.

A. Payment for re-mobilization will be a multiplier of only the work not yet completed to be added to the cost of only the remaining work. The contractor shall not be entitled to any re-mobilization fees that are the result of the contractor's work schedule or resource allocation, weather delays, or other factors not controlled by the county.

B. Cost of re-mobilization shall be per the bid form for the remaining task order value at the time of remobilization. There will be no escalation for re-mobilization percentage multiplier for the for the initial contract term and the extensions thereafter.

END OF SECTION 01550

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SECTION 01720 - PROJECT AS-BUILT DRAWINGS

PART 1 - GENERAL

1.1 Purpose of this Section

A. This section outlines the requirements for keeping As-Built Drawings during execution of the project work and for providing the final As-Built Drawings at completion of the project work as well as the requirements for other project documentation in accordance with the General Conditions and in accordance with these specifications.

1.2 Related Work Specified Elsewhere

A. Section 02500 – Gravity Sewers

B. Section 02505 – Storm Sewers

C. Section 02510 - Sanitary Sewers

D. Section 02515 – Televised Inspection of Sewers

E. Section 02540 – Bioretention Facilities

F. Section 02550 – Water Mains and Appurtenances

G. Section 02580 – Electrical Underground Ducts

H. Section 02581 - Communication Underground Ducts

I. Arlington County Lighting Specification

1.3 As-Built Drawings

A. As-Built Drawings depict the as-constructed conditions of a project. As-Built Drawings reflect all changes made in the Contract Documents during the construction process, and show the exact dimension, geometry, and location of all elements of the Work completed under the contract.

B. The Contractor shall maintain one complete set of drawings specifically for the purpose of recording changes during the construction of the project. During the course of construction, this set of Drawings shall be updated daily by the end of each working day.

C. As-Built Drawings shall be neat, accurate and complete. The As-Built Drawings shall be available for periodic inspection by the Project Officer.

D. As-Built Drawings shall include the following, as a minimum:

1. All sheets in the set of Drawing set, regardless of whether they contain as-built corrections or not, shall be made part of the As-Built Drawings.

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2. Details not shown on original Contract Drawings that were amended elsewhere in the Contract Documents.
3. Surveyed locations (horizontal and vertical) of all utilities uncovered during the course of the work.
4. Notation / red line mark up of any changes from the proposed design in grade and location of proposed facilities, utilities, and appurtenances.
5. Any changes, additions or deletions made by Change order or Addenda.
6. Surveyed final coordinates of all structures built or modified under this Contract.
7. Additional As-Built Drawing requirements as specified in the Related Work Sections.

E. At the time of Substantial Completion, As-Built Drawings must be accompanied by a certification from an Engineer or Surveyor licensed in the Commonwealth of Virginia.

F. A Licensed Engineer or Surveyor, under direction of the Contractor, shall certify the final As-Built drawings as accurate and complete. The Certification shall be in the form of a signed and sealed letter from a licensed Engineer or Surveyor listing and certifying that the completed improvements are built according to the Contract Documents.

1.4 Additional Project Documentation

A. The Contractor shall provide any additional documentation, as required by the Contract Documents, to the satisfaction of the Project Officer.

1.5 Submission Requirements

A. A copy of the red line As-Built drawings showing work completed shall be submitted monthly to the County prior to the issuance of each monthly progress payment.

B. For storm and sanitary sewer installations the contractor shall provide As-Built Drawings that are in accordance with Section 02500 of these specifications.

C. For water facility installations the contractor shall provide As-Built Drawings that are in accordance with Section 02550 of these specifications.

D. For Bioretention Facilities installations the contractor shall provide As-Built Drawings and documentation in accordance with Section 02540 of these specifications

E. For electrical underground ducts and facilities the contractor shall provide As-Built Drawings that are in accordance with Section 02580 of these specifications.

F. For communication underground ducts and facilities the contractor shall provide As-Built Drawings that are in accordance with Section 02581 of these specifications.

G. For streetlight and their facilities the contractor shall provide As-Built Drawings that are in accordance with Arlington County Lighting Specification.

H. The Contractor shall submit the final As-Built Drawings (in digital, .PDF and .DWG, formats and 2 full size hardcopy sets) to the Project Officer upon substantial completion of the Project.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT AND PAYMENT

4.1 Project As-Built Drawings are considered a subsidiary obligation of the contract, and therefore no payment shall be made for this work. Final payment will not be released until the project closeout is complete, including the County's receipt and approval of the certified As-Built Drawings.

END OF SECTION 01720

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SECTION 02100 - CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 Description of Work

A. Provide all labor, material and equipment to perform all clearing and grubbing as called for on the approved plans and as specified herein, or as necessary to prosecute the Work.

1.2 Related Work Specified Elsewhere

A. 01500 –Erosion and Sediment Control and Pollution Prevention

B. 02200- Earthwork

C. 311300- Tree Protection and Root Pruning

1.3 Applicable Standards and Specifications

A. Underground Utility Protection Ordinance (Chapter 55 of the Arlington County Code)

B. Erosion and Sediment Control Ordinance (Chapter 57 of the Arlington County Code)

C. Trash, Recycling, and Care of Premises (Chapter 10 of the Arlington County Code)

D. American Association of Nurserymen (A.A.N.)

E. International Society of Arboriculture (I.S.A.) National Arborist Association (N.A.N.)

1.4 Protection of Vegetation

A. Protect existing trees and shrubs outside the limits of clearing and grubbing and existing trees designated to be saved inside the limits of clearing and grubbing by methods approved by the Urban Forester (DPR) and outlined in Specification 311300 Tree Protection and Root Pruning.

1.5 Protection of Property

A. Protect property pipes, stones and monuments from damage. The Contractor shall be responsible for replacing disturbed markers by a registered surveyor at no expense to the County as approved by the Project Officer.

B. Protect street, roads, historical objects, adjacent property, vegetation and other works to remain throughout the contract.

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C. The location of existing utilities has been indicated on the drawings based on the best information available. The completeness or accuracy of the information is not guaranteed. Contractor shall notify "Miss Utility" in accordance with the provisions stipulated in the Underground Utility Protection Ordinance (Chapter 55), of the Arlington County Code.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 Clearing

A. The area of clearing (limits of disturbance) shall be maintained within the limits shown on the approved plans. The Contractor shall ensure the specifications in the County's Tree Protection and Planting Standards are followed throughout the duration of the work. Clearing shall include removal of trees as designated on the construction drawings. Trees and other vegetation that shall not be removed shall be properly protected to avoid damage and limit adverse impacts. Contractor shall refer to Specification 311300, 'Tree Protection and Root Pruning".

3.2 Grubbing

A. The area of grubbing shall be maintained within the limits of disturbance shown on the approved plans. Remove stumps and matted roots to a depth of 24 inches below existing ground surface. Refill excavations made by removal of stumps or roots as specified for backfill in Section 02200.

3.3 Trimming of Tree Branches and Roots

A. Trees may be trimmed to remove branches or roots which interfere with construction when so approved by the Project Officer and as authorized by the County Urban Forester. Contractor shall refer to Specification 311300, "Tree Protection and Root Pruning".

3.4 Salvage

A. Unless otherwise indicated on the plans, remove only those trees which directly interfere with the construction of the project. Trees designated by the Project Officer to be salvaged shall be either mechanically dug with a tree spade or hand dug, balled and burlapped with root ball sizes as specified by the American Association of Nurserymen.

B. Material, which is to be salvaged, as a result of clearing operations, shall include live plants suitable for replanting. Shrubbery is to be transplanted as trees using A.A.N. Standards. If required, temporarily replant the shrub and at the completion of construction replace according to A.A.N. Standards.

C. Place any desirable topsoil in well-drained stockpiles, not to exceed 7 feet in height, and protect per Section 01500.

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3.5 Disposal

A. Dispose of trees and shrubs in accordance with the Trash, Recycling, and Care of Premises Ordinance of the Arlington County Code. When approved by the Project Officer, material may be dumped within the Contract area where directed. Trees can be retained as snags as approved by the Project Officer and authorized by the County Urban Forester.

B. Do not burn materials on the site. The County Fire Marshal may consider granting a waiver from open burning restrictions in cases where the State Air Pollution Control Board has granted a waiver to the Contractor or permit holder. The responsibility for obtaining all waivers shall be the Contractor's or permit holders.

C. Remove material from the site as it accumulates. Do not allow waste material to accumulate for more than 48 hours.

PART 4 - MEASUREMENT AND PAYMENT

4.1 No separate measurement of quantities shall be made for this work. Clearing and grubbing is considered a subsidiary obligation of the contract and, therefore, no separate payment shall be made for this work.

4.2 The removal of any designated tree smaller than 6" DBH shall be consider clearing and incidental to the WORK. Therefore, no separate payment shall be made for the removal of any tree smaller than 6" DBH.

END OF SECTION 02100

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SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.1 Description of Work

A. Provide all labor, material and equipment to perform all excavation, transportation, handling, disposal, placement, shaping, compaction, and other tasks pertaining to earthwork for the structures, pipelines, roadways, and other work as called for on the approved plans and as specified herein.

1.2 Related Work Specified Elsewhere

A. Section 01400 – Quality Requirements

B. Section 01500 – Temporary Erosion & Sediment Control

C. Section 02100 - Clearing and Grubbing

D. Section 02202 - Rock Excavation

E. Section 02400 - Protection of Excavation

F. Section 02650 - Restoration of Roadway

G. Section 03100 – Concrete Formwork Reinforcement and Materials

H. Section 329100- Planting Preparation

1.3 Applicable Standards and Specifications

A. American Association of State Highway and Transportation Officials (AASHTO)

B. American Society for Testing and Materials (ASTM)

C. Occupational Safety and Health Act, State & Federal (OSHA)

D. Underground Utility Protection Ordinance (Chapter 55 of the Arlington County Code)

E. Erosion and Sediment Control Ordinance (Chapter 57 of the Arlington County Code)

F. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

G. Arlington County, VA Materials Specification Testing Reference

H. Arlington County Planning & Field Guide for Erosion & Sediment Control

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I. Arlington County Planning & Field Guide for Pollution Prevention (P2)

1.4 Underground Utilities

A. The location of existing utilities has been indicated on the drawings based on the best information available. The completeness or accuracy of the information is not guaranteed. Contractor shall notify "Miss Utility" in accordance with the provisions stipulated in the Underground Utility Protection Ordinance (Chapter 55), of the Arlington County Code.

1.5 Overhead Utilities

A. The Contractor shall identify and protect all existing overhead utility poles and facilities in the vicinity of the Work. The Contractor shall be solely responsible for all necessary notification and coordination with the utility owner(s). There shall be no payment made for necessary bracing, sheeting, shoring, or other work required to protect and maintain existing utility poles or overhead utilities.

1.6 Existing Foundations

A. When foundations are located such that excavation may endanger or interfere with an existing structure or utility, the Contractor shall take all measures necessary to protect the existing utilities or structures. There shall be no payment made for these measures.

1.7 Stability of Excavations

A. The Contractor shall be solely responsible for the stability of excavations and for meeting all State and Federal OSHA requirements. Provide all protection of excavation, and/or other support required to retain the stability of excavations in compliance with the requirements of Section 02400 of these specifications.

1.8 Care and Restoration of Pavement and Property

A. Excavation in any roadway, street, or paved surface shall conform to Section 02650 of these Specifications.

B. Property inside the Limits of Disturbance shall be preserved, restored, or replaced per the Contract Documents .

C. Pavement and other property outside of the defined Limits of Disturbance shall be preserved in the condition existent prior to construction. Damage or other impacts upon pavement or property outside the Limits of Disturbance shall be restored immediately at the Contractor's expense.

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1.9 Construction Tolerance

A. Compact, shape, slope, and dress to yield the grades and slopes indicated on the approved plans. All grades and slopes shall be precisely as shown in the approved plans.

1.10 Saw Cutting

A. When excavations are to be made in paved surfaces, the Contractor shall sawcut or use of a similar tool so as to provide a clean, uniform edge with a minimum of disturbance to remaining pavement.

B. A vacuum system shall be used to collect liquid waste / slurry generated from saw cutting activities. Collected slurry must be hauled off and disposed of at a proper waste receiving facility (e.g. landfill, soil safe, waste water treatment plant, commercial dump pad).

PART 2 - PRODUCTS

2.1 Backfill

A. Material installed below the top three feet consisting of suitable fill material, available from regular excavation or borrow excavation, of a quality consistent with Contract requirements and conforming to Section 303 of the VDOT Road and Bridge Specifications.

B. Class I backfill material for drainage structures shall be crusher run aggregate size No. 25 or 26, aggregate base material size 21A or 21B, or flowable fill conforming to VDOT Road and Bridge Specification Sections 205, 208 or 249 respectively.

C. Select Material Type shall conform to VDOT Section 207 – Select Material.

D. Backfill and Select Material, shall be approved in writing by the Project Officer in advance of delivery and placement. All testing must be in compliance with the Arlington County, VA Materials Specification Testing Reference and Section 01400 of these Specifications.

2.2 Inspection of Materials

A. The Project Officer shall determine if soils meet the contract requirements based upon testing provided by the Contractor and any other relevant information. All testing must be in compliance with the Arlington County, VA Materials Specification Testing Reference and Section 01400 of these Specifications The Project Officer’s decision shall be final.

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PART 3 - EXECUTION

3.1 Location & Protection of Existing Structures & Utilities

A. Locate all utility pipes, conduits and facilities well ahead of the excavation process. Plainly mark all such locations and comply with the Underground Utility Protection Ordinance (Chapter 55), of the Arlington County Code.

B. Where the Contractor has identified or anticipates existing utilities, structures, or artifacts, excavate using hand tools or other labor-intensive activity as necessary to protect the facilities. No extra compensation or time shall be allowed for this activity

C. In case of damage caused by the Work, notify the owner or appropriate agency or party and affect repair in a manner resulting in a condition at least equal to the condition prior to construction. No extra compensation or time shall be allowed for repair of damages.

3.2 Trench Excavation

A. Carry out the excavation, dewatering, sheeting, and bracing in such manner as to eliminate any possibility of undermining or disturbing the foundations of any existing structure, utility, facility, or any work previously completed.

B. Excavate pipe trenches to the necessary depth as shown on the drawings, holding the width below top of pipe as shown in the Standard Details.

C. The Contractor shall comply with all OSHA and/or other applicable Federal, State and local regulations for excavation.

D. Excavate trenches to provide a uniform and continuous bearing and support for the pipe and appurtenant structures on solid and undisturbed ground and at the specified grade at every point.

E. Correct any part of the trench bottom excavated below the specified grade with approved materials and compact as required by drawings and specifications. Shape the bottom of all pipeline trenches to fit the lower part of the pipe exterior for a width of a least 60% of the pipe breadth. Shape the excavation and/or bedding for pipe bells, joints, and fittings. Care shall be taken that stones and lumps shall not become nested.

F. Should an unacceptable bedding for the proposed pipe or structure be encountered, notify the Project Officer. The Project Officer may direct additional excavation below the bottom of the proposed pipe or structure and may direct the contractor to provide an alternate bedding or foundation. Additional excavation due to the fault or negligence of the Contractor or performed without prior approval from the Project Officer shall beat the expense of the Contractor.

G. No excavation shall remain open within the roadway or sidewalk without the approval of the County except when the excavation can be safely bridged with the use of steel plates or other materials acceptable to the County. When areas of excavation do remain open with the use of steel plates, warning signs shall be posted.

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H. Steel plates may not be used within the VDOT Right-Of-Way from November 1st through April 1st. If steel plates are used during the allowable time period of April 2nd through October 31st, then their use shall comply with the most current VDOT Standards and Specifications.

3.3 Protection of Excavation

A. Provide sheeting, shoring, bracing, or other protection systems in accordance with Section 02400 of these specifications.

3.4 Storage, Handling, and Disposal of Excavated Materials

A. Carefully remove loam and topsoil to be incorporated in the finished work and store separate from the other excavated material. Failure to isolate loam and topsoil from the other excavations shall require that said soils not be used as topsoil.

B. Excavation shall include the disposal of material deemed unsuitable by the Project Officer for reuse in the Work. The Contractor shall stockpile, treat, and/or otherwise manipulate suitable materials which may be incorporated into the project at a later date or different location. The Contractor is responsible for protecting any stockpiled material from contamination by unsuitable material and from degradation by any other means. Failure by the Contractor to adequately handle and protect excavated material shall result in the Contractor being directed to use Select Material or other approved material at no expense to the County. Unless otherwise specified, the Contractor shall be solely responsible for securing the necessary area for stockpiling, treating, protecting, and related activities.

C. Do not mix pavement with other excavated material. Dispose of excavated pavement away from the work site immediately. All costs associated with removing, handling, transporting, disposing, etc. of existing pavement, curb and gutter, sidewalks, driveway aprons, etc. is considered to be incidental to excavation and no additional compensation shall be considered for such activities.

D. The County shall take preference over others in claiming excavated material. The Contractor shall consult the Project Officer before disposing of such materials.

3.5 Dewatering

A. At all times during construction the Contractor shall keep all excavations dry and promptly remove all water entering trenches and other excavations until the structures, pipes, and appurtenances to be built therein have been completed and backfilled. Dispose of all water pumped or drained from the work without impact to the Work, traffic, or injury to public or private property, and in compliance with all Local, State, and Federal regulations.

B. The Contractor shall implement and maintain dewatering methods as specified in Arlington County Construction Standards and Specifications, VA Erosion and Sediment Control Handbook, Arlington County Planning & Field Guide to Erosion and Sediment Control, Arlington Planning & Field Guide for Pollution Prevention (P2) and/or approved Stormwater Pollution Prevention Plan. Controls, practices, and/or devices used for dewatering operations must be monitored and maintained at all times to ensure proper operation condition.

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C. The Contractor shall conduct dewatering operations in a manner to prevent sediment or other pollutants from discharging to the County's storm drain system, which includes the curb and gutter, or any surface water. Dewatering operations shall not create any erosion or flooding. Dewatering discharges that contain chemicals, hydrocarbons, or sewage shall not be discharged to the storm drain system. A dewatering plan with sufficient detail to ensure the proposed dewatering shall comply with applicable regulations must be included as part of the erosion and sediment control plan.

3.6 Backfilling – General

A. If the Project Officer determines that sufficient approved material from excavation on the job-site is not available for backfill, the Contractor shall secure select material from areas outside the job-site to complete the backfill. All select material shall consist of approved material and shall be obtained from approved sources outside the project limits. All backfill materials shall contain sufficient moisture to meet the density and compaction defined in the testing section of this specification.

B. Backfill materials shall be free of construction debris.

C. Except in proposed landscape areas, or where otherwise specified, each layer of material shall be compacted to a dry density not less than 95 percent of the maximum determined by the Modified Proctor Compaction Test. Upon completion of backfilling in any area under the contract, the Owner may make tests to determine the degree of compaction of the backfill material. If the results of test indicate densities less than specified, the Contractor shall, at his own expense, remedy the condition as directed.

D. Backfill all excavations as rapidly as practicable after the completion of each section of the work. Complete all backfilling to the dimensions and levels shown on the drawings.

E. The placement of material around structures shall be carried out symmetrically around the structure in horizontal lifts not to exceed six inches of loose material. The Contractor shall protect and be responsible for any damages to adjacent structures or utilities.

F. Start backfilling around concrete structures only after the concrete has reached sufficient strength to withstand the pressure exerted by the material and compacting equipment and after carrying out and satisfactorily completing the tests specified in Section 03100 of these specifications,.

G. At points which cannot be reached by mobile mechanical equipment, use suitable power-driven tampers to achieve the same degree of compaction.

H. No material shall be placed or compacted when it is wet or frozen or when the sub grade or previously placed material is wet or frozen.

3.7 Backfill for Pipelines

A. The sub grade shall be properly shaped before any material is placed and compacted. Care shall be taken that stones and lumps shall not become nested.

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B. Place approved backfill material in six-inch layers to a point at least two feet above the top of pipe. Thoroughly compact each layer for the full trench width and under, around, and over the pipe, using hand-operated mechanical tampers exerting a pressure of not less than 250-foot pounds per square foot of tamping force. The contractor shall be responsible for pipe damage as a result of excessive tamping force.

C. Remainder of trench, more than two feet above top of pipe , may be backfilled by machinery in one-foot layers, thoroughly compacted.

3.8 Final Grading

A. Final grading shall not permit ponding of water.

3.9 Tests and Testing

A. All testing must be in compliance with the Arlington County, VA Materials Specification Testing Reference and Section 01400 of these specifications.

B. The optimum moisture content and the maximum density of each type of material approved as backfill and Select Material shall be determined by “Standard Test Methods for Moisture Density Relations of Soils and Oil- Aggregate Mixtures Using 5.5-lb. Rammer and 12-inch Drop (ASTM D698) or (AASHTO T-99)”.

C. The field moisture content of materials being compacted shall be determined by “Laboratory Determination of Moisture Content of Soil,” (ASTM D2216). The field density of compacted material shall be determined by either “Standard Test Method for Density of Soil in Place by Sand Cone Method,” (ASTM D1556) or- “Standard Test Method for Density of Soil in Place by the Rubber Balloon Method,” (ASTM D2167).

D. Perform field density and field moisture content tests on each lift of material to the satisfaction of the Project Officer in order to ensure that the contract requirements are complied with.

E. State when and where the tests are to be made so that the Project Officer may observe the testing. Submit certified reports verifying test results. The Project Officer may order more testing should he feel the above procedures to give inadequate information, or if he feels the results of such testing to be questionable.

3.10 Maintenance of Backfilled Excavations

A. The Contractor shall maintain the backfilled area in proper condition for a period of one year after final acceptance of the project. All defects shall be promptly corrected. If the Contractor fails to do so within a reasonable time after the receipt of written notice from the Project Officer, the County may correct any non-compliant condition at the Contractor’s expense.

B. The Contractor shall be responsible for any injury or damage that may result from improper maintenance of trenches at any time before the end of the aforementioned guarantee period.

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3.11 Fill or Embankments

A. Fill or embankment above existing grade shall consist of the placing, shaping, and compaction of material as indicated in the Contract Documents and approved by the Project Officer.

B. Concrete foundations, slabs, rocks, boulders, and similar material removed during excavation may be utilized in embankments when said material shall be located five feet or more below the proposed subgrade surface. When such materials are used, they shall be fractured into pieces such that no dimension exceeds 18 inches in any dimension or plane. The Contractor shall take care to ensure that no voids develop and shall be held responsible for any surface settlement resulting there from.

C. The embankment material shall be uniformly compacted throughout in lifts of no more than 12 inches, except in the case of rock, where lifts of up to 2 feet may be used. Except as otherwise allowed in the paragraph above, the embankment material shall conform to the requirements of this specification. Each layer shall be compacted at optimum moisture content and the embankment shall have the required maximum density of ninety five percent (95%) as compared to the density of the same material when tested in accordance with AASHTO T99.

D. Do not place embankment upon frozen ground or areas covered with snow or ice or saturated soils.

E. The area upon which embankments are to be placed shall be denuded of vegetation per Section 02100.

F. Rock, broken concrete, or other solid material shall not be placed in embankment areas where piling is to be placed or driven.

G. Compact the ground upon which the embankment shall be constructed to a depth of 8 inches prior to placing any fill material.

H. Embankments to be constructed over swampy areas may be deposited by end dumping the original course. This course may exceed 8-inches" but shall be the minimum depth required to support the equipment and shall be determined by the Project Officer. The use of compaction equipment shall not be required on the original course.

3.12 Over-Excavation

A. During construction if the need arises for additional excavation not included in the Contract Documents, the Contractor shall request in writing the need for additional excavation. The Contractor must request approval from the County Project Officer prior to performing the work.

B. Failure by the Contractor to obtain written approval from the County Project Officer prior to performing any additional excavation will be performed at the Contractor's expense and there will be no cost to the County.

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3.13 Test Pits

A. The contract unit price for test pits (with restoration included within the unit price) shall apply only in the following cases, upon approval of the County Project Officer:
   1. Utilities, which are not shown on the plans provided to the Contractor for construction under this contract, but are marked by the utility designator prior to construction.
   2. Utilities, where noted on the plan documents to be performed during construction, or directed by the Project Officer.

B. Protecting existing utilities is the Contractor's responsibility.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Excavation

A. Excavation, including backfill, shall be considered incidental to other work. Therefore, no separate payment shall be made for Excavation.

B. If over-excavation is approved by the County Project Officer, payments will be at the stipulated price and will be based on actual site measurements taken by Arlington County personnel using the contract unit prices.

4.2 Fill

A. When explicitly included as a separate pay item on the Bid Form, Fill shall be measured by the cubic yard in place as illustrated on the approved plans, or as approved by the Project Officer, and shall include all materials, equipment, and labor to construct the fills or embankments as illustrated on the construction drawings. Payment shall include all clearing and grubbing, preparation, acquisition, transporting, storing, and handling of material, placement, shaping, compaction, and all other activities necessary to comply with these Specifications.

4.3 Select Material

A. When sufficient onsite (in place) material meets the Contract requirements for Select Material, and the Project Officer approves it for use, no payment will be made to the Contractor for Select Material.

B. When sufficient onsite material is amended, and subsequently meets the Contract requirements for Select Material and is approved by the Project Officer, payment will be made in accordance with the method of measurement for the amending material used to supplement the Select Material.

C. When insufficient material is found onsite, as verified by the Project Officer, payment may be made for imported material with the written consent of the Project Officer. Payment shall include acquisition of materials, transport, preparation, handling, storage, ground preparation, excavation, placement, compaction, testing, and all other activities necessary to comply with the Contract requirements.

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D. When imported material is specified and explicitly included as a separate pay item on the Bid Form, Select Material shall be measured in cubic yards in place. Payment shall include acquisition of materials, transport, preparation, handling, storage, ground preparation, excavation, placement, compaction, testing, and all other activities necessary to comply with the Contract requirements.

4.4 Protection of Existing Utilities, Structures, and Property

A. Protection of existing utilities (above and below ground), structures, and other property is considered a subsidiary obligation of the Work. There shall be no compensation or other consideration for the protection, repair, replacement, or restoration of any such facilities. In the event of unknown and unidentified underground utilities or other underground structures that must be protected to complete the Work, the Contractor shall immediately notify the Project Officer. The Contractor shall identify appropriate methods to protect the unidentified facilities and shall obtain written approval from the Project Officer prior to undertaking any action.

4.5 Saw Cutting

A. The cost for saw cutting shall be incidental to other items in the Contract; therefore, there shall be no separate payment for saw cutting.

4.6 Test Pits

A. Unless otherwise authorized by the Project Officer, test pits shall be incidental to the work and no separate payment shall be made for that purpose.

END OF SECTION 02200

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SECTION 02202 - ROCK EXCAVATION

PART 1 - GENERAL

1.1 Description of Work

A. Provide all labor, materials, tools and equipment as required to excavate and dispose of rock as specified herein.

1.2 Related Work Specified Elsewhere

A. Section 02200 - Earthwork

1.3 Applicable Standards and Specifications

A. Underground Utility Protection Ordinance (Chapter 55 of the Arlington County Code)

B. Fire Prevention Code (Chapter 8.1 of the Arlington County Code)

C. Virginia Department of Transportation (VDOT) Road and Bridge Specifications

1.4 Submittals

A. The Contractor shall submit a blasting plan to the Project Officer for review and acceptance. The blasting plan shall detail the blasting techniques to be used during excavation operations requiring the use of explosives.

B. The Contractor shall keep and submit to the Project Officer an accurate record of each blast. The record shall show the general location of the blast, the depth and number of drill holes, the kind and quantity of explosive used, and other data required for a complete record.

1.5 Definition:

A. Rock excavation is defined as the excavation of all hard, compacted, or cemented materials that require blasting or the use of heavy ripping and excavating equipment larger than required for common excavation. The excavation and removal of isolated boulders or rock fragments larger than 1 cubic yard encountered in materials otherwise conforming to the definition of common excavation shall be classified as rock excavation. The presence of isolated boulders or rock fragments larger than 1 cubic yard is not in itself sufficient cause to change the classification of the surrounding material.

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1.6 Permits and Regulations

A. Obtain all permits required for the transportation, handling, storage and use of explosives and drilling equipment. Blasting permits shall be obtained from the Arlington County Fire Marshal.

B. Observe the Fire Prevention Code and the Underground Utility Protection Ordinance of Arlington County, the VDOT Road & Bridge Specifications, as well as state and federal laws and ordinances relating to explosives.

C. Explosives shall be purchased, transported, stored, used and disposed of by a Virginia State Certified Blaster in possession of a current criminal history record check and a commercial driver's license with hazardous material endorsement and a valid medical examiner's certificate.

PART 2 - PRODUCTS

2.1 Explosives shall be commercial grade. Explosives, equipment and appurtenant items are the Contractor's option.

PART 3 - EXECUTION

3.1 General

A. Excavate rock to the lines and grades indicated on the construction standards. Excavate to 6 inches below pipe or precast structure bottom and to the bottom of poured-in-place concrete structures.

3.2 Explosives

A. When the use of explosives is necessary, exercise the utmost care not to endanger life or property. The Contractor shall be responsible for damage resulting from the use of explosives. .

B. The Contractor shall notify each property and utility owner having a building, structure, or other installation above or below ground in proximity to the site of the work of the intention to use explosives. Notice shall be given sufficiently in advance of the start of blasting operations to enable the owners to take steps to protect their property.

C. To prevent damage to newly constructed concrete, the Contractor shall schedule blasting operations in the proximity of proposed concrete structures so that work will be completed prior to placement of concrete.

3.3 Blasting

A. Notify the Project Officer at least 48 hours in advance of blasting operations.

B. Conduct all operations involving explosives using experienced personnel only.

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C. Blast only with such quantities and strengths of explosives and in such manner as shall break the rock approximately to the intended lines and grades.

D. Avoid excessive cracking of the rock upon or against which any structure shall be built. Prevent damage to existing pipes or other structures and property above or below ground.

E. Cover areas to be blasted with mats, logs or other material to stop flying matter during explosions. Give sufficient warning to all persons in the vicinity of the work before a charge is exploded. Employ flagmen to stop or direct traffic as required.

3.4 Excess Rock Excavation

A. If rock is excavated beyond the limits of excavation indicated on the standard and is not authorized in writing by the Project Officer, the excess excavation, whether resulting from over breakage or other causes, shall be defined as excess rock excavation and backfilled, by and at the expense of the Contractor, as specified below:
   1. In pipe trenches, excess excavation below the elevation of the bottom of the pipe bedding, cradle or encasement shall be filled with material of the same type, placed and compacted in the same manner, as specified for the bedding, cradle, or encasement.

B. In excavations for structures, excess rock excavation beneath foundations shall be filled with Class A3 concrete. Other excess rock excavations shall be filled with select material as specified in Section 02200 with the approval of the Project Officer.

C. In excavations for roadways, excess rock excavation shall be filled with material as specified for the sub grade.

3.5 Shattered Rock

A. If rock below normal depth is shattered due to drilling or blasting operations and such shattered rock is unfit for foundations, the shattered rock shall be removed, and the excavation shall be backfilled as described above in excess rock excavation. All such removal and backfilling shall be classified as excess rock excavation and shall be at no additional expense to the County.

PART 4 - MEASUREMENT AND PAYMENT

4.1 The measurement for rock excavation for structures and pipelines shall be the vertical depth up to 6 inches below pipe and precast structures and to the bottom of cast-in place structures. The pay width for rock shall be as shown in Detail M3.0, Pipe and Bedding Detail for Trench Conditions. The pay width and depth shall be fixed regardless of the actual dimensions of rock

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excavation. Payment shall be made for the cubic yards excavated and shall include the pipe or precast structure bedding due to over excavation.

4.2 The measurement for rock excavation for roadways shall be to the bottom of the sub grade and to the lines and grades as shown on the approved plans. Payment shall be made for the cubic yards excavated.

4.3 Any additional testing required, including seismograph, other than that shown on approved plans shall be done at no cost to the County.

END OF SECTION 02202

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SECTION 02210 - RIPRAP

PART 1 - GENERAL

1.1 Description of Work

A. Provide all labor, material, equipment and incidentals to furnish and place the riprap as called for on the approved plans and as specified herein.

1.2 Related Work Specified Elsewhere

A. Section 02200 Earthwork

B. Section 03100 - Concrete Formwork, Reinforcement and Materials

C. Section 04100 - Mortar and Grout

1.3 Applicable Specifications

A. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

1.4 Definitions

A. Derrick Stone – Stone with special shape or size resulting from the method of production.[1]

B. Mean High Water (MHW) - is a Tidal Datum representing the average of all the daily tidal high water heights observed over a period of several years.

PART 2 - PRODUCTS

2.1 General

A. Stone for riprap and bedding shall be as specified in VDOT Section 204 and shall be sound, durable and free from seams, cracks and other structural defects or imperfections tending to destroy its resistance to weathering.

[1] *Engineering and design*. (1990). Dept. of the Army, U.S. Army Corps of Engineers

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B. Riprap bedding shall be reasonably well graded crush stone within the following limits:

Sieve Size	Total Percent Passing
3-inch	100
1-1/2-inch	75-95
3/4-inch	50-85
No. 4	25-55
No. 16	10-25
No. 50	2-10

C. Grade A, B, or C sand may be used in mortared or grouted riprap

2.2 Dry Riprap

A. Dry riprap, Class I, shall meet VDOT Section 414.02(a).

B. Dry riprap, Class II, shall meet VDOT Section 414.02(a).

C. Dry riprap, Class III, shall meet VDOT Section 414.02(a).

2.3 Mortared Riprap

A. Stone for this purpose shall, as far as practicable, be selected as to size and shape in order to secure fairly large, flat-surfaced stone which shall produce a nearly true and even surface with a minimum of voids. Place the stone upon a slope not steeper than the natural angle of repose of the fill material. Fifty percent of the mass shall be broad flat stones, 2 cubic feet or more in volume, laid with the flat surface uppermost and parallel to the slope.

B. Mortar mix shall conform to the requirements of Section 04100.

2.4 Grouted Riprap

A. Grout for grouted riprap shall consist of one part of Portland cement and three parts of sand, thoroughly mixed with water to produce grout having a thick, creamy consistency. The stones shall be of the same sizes and placed in the same manner as specified for dry riprap, Class 1.

2.5 Stone Riprap

A. Stone riprap for pier and abutment protection shall range in size up to derrick stone and shall be graded from coarse to fine in such a manner as to provide a minimum of voids.

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2.6 Concrete Slab Riprap

A. The concrete slabs for riprap shall consist of Class A concrete, cast-in-place 6 inches thick, unless otherwise noted on the approved plans. The slabs shall be of two types: plain or reinforced concrete. If reinforcement is required, it shall be furnished as shown on the approved plans.

2.7 Dumped Riprap

A. Type (1) Core Riprap: Core riprap shall be reasonably well graded. It shall be composed of compact, angular pieces of derrick stone weighing no less than 500 pounds and no more than 4,000 pounds each, averaging 2,000 pounds, except that approximately ten percent by weight may consist of pieces weighing from 10 to 250 pounds each. Neither the width nor thickness of any piece of riprap shall be less than one-third of its length.

B. Type (2), Heavy Riprap: Heavy riprap shall be reasonably well graded. It shall be composed of compact, angular pieces of derrick stone weighing no less than three tons and no more than ten tons each, averaging four tons. Neither the width nor thickness on any piece of riprap shall be less than one-third of its length.

2.8 Imbricated Rip Rap

A. Imbricated riprap should be angular and blocky in shape such that they are stackable and should be sufficiently large to resist displacement by both the design storm event and the site-specific lateral earth stresses. Therefore, the length of the longest axis of each stone should be greater of 1/3 the height of the proposed wall and the size necessary to resist the design stream flow. A typical minimum axis length is 24 inches (0.6 meters).

B. Materials for imbricated riprap construction and installation should meet the following requirements:

1. Filters: Synthetic filter fabric may be used based on VDOT Specifications. Whenever possible, however, granular filters with a minimum thickness of 6 inches (15 cm) should be used with a graduation as follows:

Percent Less Than	**U.S. Standard Sieve Size**
100	2 1/2 in (64 mm)
85 - 100	1 in (25 mm)
60 - 100	1/2 in (13 mm)
35 - 70	No. 10
20 - 50	No. 40
3 – 20	No. 200

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PART 3 - EXECUTION

3.1 Riprap Bedding

A. Riprap bedding of the thickness indicated on the plans shall be placed on the embankment to form a backing for the riprap. Where approved by the Project Officer a construction fabric or matting may be substituted for backing, as shown on the approved plans. Spread riprap bedding uniformly on the prepared base, in a satisfactory manner, to the lines indicated on the approved plans or as directed. Placing of material by methods which shall tend to segregate particle sizes within the bedding base during placing of bedding shall be repaired before proceeding with the Work. Compaction of the bedding material shall not be required, but it shall be finished to present a reasonably even surface free from mounds or depressions.

3.2 Dry Riprap

A. Place the stones upon a slope not steeper than the natural angle of repose of the fill material. Lay with joints as close as practicable and lay the courses from the bottom of the bank upward, the larger stones being placed in the lower courses. Fill the open joints with spall.

B. For Class 2 and Class 3 riprap, use stones having one broad flat surface when possible, and lay the flat surface on a horizontal earth bed prepared for it and so placed as to overlap the underlying course, the intent being to secure a lapped or – "shingled" surface which shall shed a maximum amount of water. Fifty percent of the mass shall be of stones having a volume of two cubic feet or more. These stones shall be placed first and roughly arranged in close contact. Then fill the spaces between the larger stones with stone of suitable size so placed as to leave the surface evenly stepped, conforming to the contour required, and capable of shedding water to the maximum degree practically attainable.

3.3 Mortared Riprap

A. Place these stones first and roughly arranged in close contact, the largest stones being placed near the base of the slope. Fill the spaces between larger stones with stones of suitable size, leaving the surface reasonably smooth and tight and conforming to the contour required. In general, lay the stone with a degree of care that shall ensure for plane surfaces a maximum variation from a true plane of not more than 1-1/2 inches in four feet. Warped and curved surfaces shall have the same general degree of accuracy as specified for plane surfaces.

B. As each of the larger stones is placed, surround it by fresh mortar and shove adjacent stones into contact. After the larger stones are in place, fill all the spaces or openings between them with mortar, and place the smaller stones by shoving them into position, forcing excess mortar to the surface, ensuring that each stone is carefully and firmly bedded laterally.

C. After the stones have been placed and mortared as described, all excess mortar forced up shall be spread uniformly to completely fill the surface voids. Point all surface joints roughly with flush joints or with shallow, smooth-raked joints.

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3.4 Grouted Riprap

A. Care is to be taken during placing to keep earth or sand from filling the spaces between the stones. After the stones are in place, completely fill the spaces between them with grout from bottom to top and sweep the surface with a stiff broom. Do not grout riprap in freezing weather.

B. In hot, dry weather, protect the grouted riprap from the sun and keep moist for at least three days after grouting by the use of saturated burlap.

3.5 Stone Riprap for Foundations

A. Deposit in an approved manner at locations shown on the approved plans or where designated by the Project Officer.

3.6 Concrete Slab Riprap

A. Except as modified herein, construction of the slabs shall conform to specification for Concrete Formwork, Reinforcement and Materials - Section 03100.

B. The concrete shall be of such consistency that it can be placed without the use of top forms.

C. Dig a trench of the dimensions shown on the approved plans at the toe of the slope and dress the slope to the lines and grades specified.

D. Place the riprap in blocks of dimensions as shown on the plans, alternate blocks being poured and the remaining panels filled in later. Unless otherwise shown, the blocks shall be laid in horizontal courses and successive courses shall break joints with preceding ones. The joint details shall be as shown on the approved plans, but if not shown, the horizontal joints shall be normal to the slope and all joints shall be close joints without filler.

3.7 Dumped Riprap

A. Immediately prior to placing riprap bedding in any area, the prepared base shall be inspected by the Project Officer and no material shall be placed thereon until that area has been approved.

B. Place dumped riprap on the embankment as soon as practicable after the riprap bedding has been finished and inspected. Place stone for dumped riprap on the bedding material in such a manner as to produce a reasonably well graded mass of rock with a practicable percentage of voids and construct to the lines and grades shown on the approved plans, or as directed. Riprap shall be to its full course thickness in one operation and in such a manner as to avoid displacing the underlying material. Do not place dumped riprap in layers. The larger stones shall be reasonably well distributed. The finished riprap shall be free from pockets of small stones and clusters of larger stones. Hand-placing to a limited extent may be required, but only to an extent necessary to secure the results specified and as required to form reasonably uniform slopes. A tolerance of plus-six inches or minus-four inches from the lines and grades shown on the plans shall be allowed in the finished surface, but the extremes of such tolerance shall not be continuous over an area greater than 200 square feet.

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C. The desired distribution of the various sizes of stones throughout the mass may be obtained, at the option of the Contractor, either by selective loading at the quarry or other source, by controlled dumping of successive loads during final placing or by a combination of these methods. Do not place riprap by dumping into chutes or other similar methods likely to cause segregation of the various sizes. The Contractor shall maintain the riprap protection until accepted and any material displaced by any cause shall be replaced at his expense to the lines and grades shown on the plans.

D. The slopes above Mean High Water (MHW) shall be finished to a reasonably smooth and compact surface within an allowable tolerance of two inches from the surface lines, cross-sections and elevations indicated on the plans. Tolerances for underwater portions shall be six inches. The degree of finish for graded slopes of the embankment shall be that obtainable from either blade grader or scraper operations, as the Contractor may elect.

3.8 Imbricated Riprap

A. Remove unsuitable material and replace with suitable material following Section 02200 when directed by Project Officer. Excavate loose material at toe of embankment until stable foundation is reached. Subgrade should be smooth, firm and free from protruding objects or voids for proper positioning of the first layer of stones.

B. Place graded granular filter or filter fabric on the prepared subgrade.
1. If filter fabric is used place carefully and loosely on prepared slope and secure. Overlap adjacent strips a minimum of 8 inches. If geotextile is torn or damaged, repair or replace.

C. Stack rock layers with staggered joints so each stone rests firmly on two stones in the tier below. Use smaller stones to fill voids. Upon completion of first layer, fill toe trench with Class III rip rap.

D. The height of imbricated revetment is dictated by the size of the stone used. The height shall not exceed 3 times the length of the longest axis and shall not be greater than 10 feet.

E. Place granular backfill concurrently with stone placement. The backfill slope angle should be 2H:1V or flatter, but greater than 0 degrees.

F. After backfill is in place, cover with geotextile per VDOT section 245 and layer topsoil sufficient to support native vegetation cover.

PART 4 - MEASUREMENT AND PAYMENT

4.1 4.1 Riprap Bedding

A. Riprap bedding shall be considered a subsidiary requirement for the placement of dry riprap and dumped riprap. Payment for riprap bedding shall be included in the unit price bid for dry riprap or dumped riprap.

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4.2 Dry Riprap

A. Dry riprap shall be measured in square yards actually placed, by class, and payment shall include the riprap bedding in-place and shall be at the unit price stated in the bid proposal.

4.3 Mortared Riprap

A. Mortared riprap shall be measured in square yards actually placed. Payment shall be at the unit price stated in the bid proposal.

4.4 Grouted Riprap

A. Grouted riprap shall be measured in square yards actually placed. Payment shall be at the unit price stated in the bid proposal.

4.5 Stone Riprap

A. Stone riprap shall be measured in units of volume or weight. Payment shall be at the unit price stated in the bid proposal.

4.6 Concrete Slab Riprap

A. Concrete slab riprap shall be measured in units of square yards actually placed. Payment shall be at the unit price stated in the bid proposal.

4.7 Dumped Riprap

A. Dumped riprap shall be measured in tons as evidenced by railroad bills of lading or truck delivery tickets. Payment shall include the riprap bedding in place shall be at the unit price stated in the bid proposal.

4.8 Imbricated Riprap

A. Imbricated riprap shall be measured in cubic yards actually placed. Payment shall include all material and bedding necessary to install the riprap in place and shall be at the unit price stated in the bid proposal.

4.9 Excavation

A. Demolition, excavation and restoration shall be considered incidental to the Work for the placement of all types of riprap and therefore, no separate payment shall be made for excavation.

END OF SECTION 02210

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SECTION 02400 - PROTECTION OF EXCAVATION

PART 1 - GENERAL

1.1 Description of Work

A. Provide all labor, material, equipment, and incidentals for the protection of excavation during the Work. The protection of excavation system shall provide for the protection of public or private property, and for the safety of personnel as called for on the approved plans, as specified herein, or as required by field conditions and/or regulations.

1.2 Related Work Specified Elsewhere

A. Section 02100 - Clearing and Grubbing

B. Section 02200 – Earthwork

C. Section 02202 – Rock Excavation

D. Section 03100 – Concrete, Formwork, Reinforcement, and Materials

1.3 Applicable Standards and Specifications

A. American Association of State Highways and Transportation Officials (AASHTO)

B. American Society for Testing and Materials (ASTM)

C. Occupational Safety and Health Act (OSHA)

D. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

E. Erosion and Sediment Control Ordinance (Chapter 57 of the Arlington County Code)

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PART 2 - PRODUCTS

2.1 Materials shall be of metal, wood or other material acceptable to the Project Officer. Sheet steel piling shall conform to ASTM A-328. Structural timber and timber piles shall conform to AASHTO M-168.

PART 3 - EXECUTION

3.1 General

A. Be fully responsible for the design and supervision of installation and removal of all sheeting, shoring, bracing, or other systems required to support the excavation. Submit the design and proposed installation procedure to the Project Officer for approval prior to any excavation. Approval by the Project Officer shall not relieve the Contractor of the responsibility for the adequacy of the protection system, and if at any time during the progress of the work it is determined by the Project Officer that such design and installation is inadequate, the Contractor shall at his expense, furnish, install or make such changes in the plan or installation as may be necessary to perform the work in a manner satisfactory to the Project Officer and in conformance with all applicable Local, State, and Federal regulations.

B. The installation of the protection system shall provide for the depth and width of the excavation and the characteristics and water content of the soil. Also, weather conditions, the proximity of other structures, the vibration from construction equipment and/or vehicular traffic and spoil placement or other surcharge loads shall all be taken into account.

C. For trenches 20 feet deep or greater, the Contractor shall submit to the Project Officer for approval, design of the support of excavation system signed and sealed by a professional engineer licensed to practice in the Commonwealth of Virginia as per 29 CFR 1926.652. No excavation requiring such support system may proceed in advance of the Project Officer’s written approval of the support system design.

3.2 Installation

A. Furnish, put in place, and maintain such sheeting, bracing, shoring, or other systems required to support the sides of the excavation and to prevent any movement of earth which could in any way injure persons, endanger adjacent structures and utilities, or delay the work.

B. Whenever possible, drive sheeting ahead of the excavation to avoid loss of material from behind the sheeting. If it is necessary to excavate below the sheeting, care shall be taken to avoid trimming behind the face along which the sheeting shall be driven. Prevent voids outside of the sheeting. If voids are formed, fill immediately with appropriate material and compact.

C. In areas not shown on the approved plans, where it is required to leave sheeting, shoring and bracing in place to prevent injury to proximate structures, utilities and property, or the installation, the approval of the Project Officer, in writing, shall be required for payment. Cut off sheeting and bracing at the elevations approved by the Project Officer.

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3.3 Removal

A. Remove sheeting, shoring, bracing, or other systems during the backfill operations. Provide additional backfill compaction around the area of the pipe or structure to fill voids left behind the sheeting and shoring as it is removed. Avoid the production of loads which shall increase the safe backfill load on the pipe or structure.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Protection of Excavation

A. Timber sheet piling, shoring and bracing, left in place as shown in the Contract Documents, or approved by the Project Officer, in writing, shall be measured in 1,000-feet-board measure (MFBM) for the materials actually left in place. Payment shall be at the unit price stated in the Bid Proposal and shall include all materials, labor, tools, equipment, design and all other work necessary for the installation.

B. Steel sheet piling, left in place as shown in the Contract Documents or approved by the Project Officer, in writing, shall be measured in square feet (SF) for the materials actually left in place. Payment shall be at the unit price stated in the Bid Proposal and shall include all materials, labor, tools, equipment, design and all other work necessary for the installation.

C. Sheeting, shoring, bracing, or other systems removed from the installation shall be considered incidental to the work to which it pertains. Therefore, no separate payment will be made for sheeting, shoring, bracing, or other systems removed from the installation.

D. Design, demolition, excavation and restoration, as may be required by the Contract work, are considered incidental and therefore no separate payment shall be made for design, demolition, excavation or restoration.

END OF SECTION 02400

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SECTION 02500 - GRAVITY SEWERS AND APPURTENANCES

PART 1 - GENERAL

1.1 Description of Work

A. Provide all labor, materials, and equipment to furnish and install gravity sewer pipe, structures, and appurtenances as specified herein and in related specifications.

1.2 Related Work Specified Elsewhere

A. Section 02200 - Earthwork

B. Section 02202 – Rock Excavation

C. Section 02400 - Protection of Excavation

D. Section 02505 – Storm Sewers and Appurtenances

E. Section 02510 - Sanitary Sewers and Appurtenances

F. Section 02515 – Televised Inspection of Sewers

G. Section 02650 – Restoration of Roadways

H. Section 2952 – Trenchless Crossing

I. Section 03100 – Concrete, Formwork, Reinforcement, and Materials

J. Section 03400 - Precast Concrete

K. Section 04200 - Masonry Units

L. Section 05500 – Structural Steel

1.3 Applicable Standards and Specifications

A. American Society for Testing and Materials (ASTM)

B. American National Standards Institute (ANSI)

C. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

D. Arlington County Plumbing Code (Chapter 18 of the Arlington County Code)

E. Arlington County Utilities Code (Chapter 26 of the Arlington County Code)

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F. Erosion and Sediment Control Ordinance (Chapter 57 of the Arlington County Code)

G. Virginia Department of Environmental Quality Erosion and Sediment Control Handbook

H. Virginia Department of Health (VDH) and State Water Control Board Sewerage Regulations (VR 355-17-000) [Section 62.1-44.19(8) of the Virginia Code].

1.4 Submittals

A. Submit full descriptions and details of all pipe, valves, hydrants, and other appurtenances proposed for the project Per Section 01330 Submittal Procedures.

1.5 Quality Assurance

A. The Contractor shall be responsible for providing evidence that all materials used in the work meet all applicable standards and certifications. Such evidence shall comply with the requirements of Section 01400 Quality Requirements.

B. The Contractor shall provide ample space and other accommodations to enable the Project Officer to inspect all pipe, structures, and other materials upon delivery to the site and prior to utilizing the pipe, structures and materials in the Work. The Contractor shall ensure that materials are stockpiled or otherwise stored such that the Project Officer has access to all aspects and components.

C. The Contractor shall conduct a television inspection of all installed sewer installations in accordance with Section 02515 Televised Inspection of Sewers prior to final acceptance.

1.6 Easements

A. Sewers shall be installed within the ROW whenever possible.

B. Where the following clearances cannot be maintained within the ROW, permanent easements shall be secured to allow for the clearances required to facilitate maintenance and operations.
   1. 10 feet each side of the centerline (20 feet total) for sewers 15 inches and smaller and less than 10 feet in depth.
   2. 10 feet from the outside edge of the pipe for sewers greater than 15 inches or deeper than 10 feet in depth.

PART 2 - PRODUCTS

2.1 Reinforced Concrete Pipe (RCP)

A. RCP shall conform to ASTM C-76, Class III or greater. Asbestos containing pipe or appurtenances shall not be accepted.

B. RCP pipe shall be in lengths of at least 8 feet and shall be manufactured with bell and spigot ends with rubber gasket joints conforming to ASTM C443.

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2.2 Polyvinyl Chloride Pipe (PVC)

A. PVC pipe and fittings 15" and less shall comply with ASTM D3034.

B. PVC pipe and fittings larger than 15" shall comply with ASTM F679, T-1.

C. PVC pipe shall be in lengths of at least 12 feet and be manufactured with integrated bell gasket joints. Joints shall comply with ASTM D3212 and gaskets shall comply with ASTM F477.

D. PVC pipe shall be less than 6 months old at the time of installation.

2.3 Polypropylene Pipe (PPP)

A. PPP shall conform to ASTM F2881 and AASHTO M330

B. Joint performance shall meet or exceed ASTM D3212

2.4 Polypropylene Pipe HP (High Performance Pipes)

A. In addition to A and B in 2.3 above, HP pipes shall have a smooth interior and annular exterior corrugations. Manning's "n" value for use in design shall be 0.012

B. Pipe shall be joined using bell & spigot joint meetings the requirements of ASTM F2881 or AASHTO M330

C. Gaskets shall meet the requirements of ASTM F477 Fittings shall conform to ASTM F2881 or AASHTO M330. Bell and spigot connections shall utilize a welded or integral bell and valley or inline gaskets meeting the watertight joint performance requirements of ASTM D3212.

2.5 Precast Concrete Manholes

A. Precast manhole bases, risers, and cones shall conform to the requirements of ASTM C-478. Cones shall be eccentric. Manholes shall have a minimum internal diameter of 48 inches.

B. All sections shall be of male and female end type with a preformed groove provided in the male end for a round rubber gasket ring complying with ASTM C361 or C443. The gasket assembly alone shall provide adequate sealing to meet internal and/or external pressure requirements.

C. Precast manhole sections shall be clearly marked with the following information as applicable: ASTM designation, standard detail or drawing number, station location and designation, date of manufacture and name of manufacturer.

D. Concrete used in precast manholes or structures shall be VDOT Class A4.

E. Precast manholes shall be manufactured by Americast, Smith-Midland Corporation, Old Castle Infrastructure or approved equivalent.

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2.6 Concrete

A. Concrete used in manhole or structure construction shall be VDOT Class A3 and conform to the requirements of Section 03100 – Concrete, Formwork, Reinforcement, and Materials.

2.7 Brick

A. Brick used in manhole bench and collar construction shall conform to the requirements of Section 04200 - Masonry Units.

2.8 Mortar

A. Mortar used in manhole construction shall be one part of Portland cement conforming to ASTM C150, Type II, and two parts of sand conforming to ASTM C144, with enough water added to produce mortar of the proper consistency for the type of joint.

2.9 Manhole Frames and Covers

A. Manhole frames and covers shall be constructed of gray or ductile iron conforming to ASTM A48 and A536.

B. Frames and covers shall have machined bearing surfaces to prevent rocking and rattling under traffic.

C. Manhole covers shall be as shown on the Construction Standards and as indicated on the Contract Drawings. Frames and covers shall be manufactured by Dewey Brothers Inc., or equivalent.

2.10 Manhole Steps

A. Manhole steps shall be a composite of a No. 3 grade 60 deformed steel bar encased in a copolymer polypropylene plastic of the “press-fit” design or rubber.

B. Steps shall be PSI-PF as manufactured by M.A. Industries or Wedge-Lok as manufactured by Delta Pipe Products, or approved equivalent.

2.11 Manhole Neck Adjustments

A. Adjustments to manhole necks shall be limited to 2 inches of concrete.

B. Concrete adjustment rings shall be used for adjustments in excess of 2 inches, but not to exceed 12 inches. Non-shrink grout shall be used between adjustment rings.

2.12 Quick-Setting Grout

A. Quick-setting non-shrink grout shall conform to the requirements of VDOT Road and Bridge Specification, Section 218.

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2.13 Miscellaneous Metals

A. Structural steel, grating and miscellaneous metal shall conform to the requirements of Section 05500 - Structural Steel and Miscellaneous Metal.

2.14 Bedding

A. Bedding for pipe shall be compacted granular bedding crushed stone, VDOT Size #57, Specification 203.

PART 3 - EXECUTION

3.1 General

A. No sewer facilities shall be constructed without approved plans, shop drawings, and construction cut sheets.

B. Sewer size, material, direction, and grade shall remain constant between manholes or structures.

C. Bring any conflicts during the installation of piping to the attention of the Project Officer.

D. If any active sewers must be removed from service for any period of time, the Contractor shall submit to the Project Officer for approval per Section 01330, Submittal Procedures, a plan for diverting flow or otherwise maintaining service and capacity of the existing pipe(s) while out of service.

E. In the event of a water or sewer emergency, the Contractor shall immediately notify the County's Water Control Center at 703-228-5555 and the Project Officer.

3.2 Depth and Cover of Pipe

A. PVC sewer shall not be installed with less than 3 feet of cover from the top of pipe to finished grade.

B. PVC pipe installed with less than 14 feet of cover shall be SDR 35 (pipe stiffness of 46 psi) or stronger. PVC installed with 14 or more feet of cover shall be SDR 26 (pipe stiffness of 115 psi) or stronger. PVC shall not be installed at depths greater than 20 feet without special design analysis.

C. RCP sewer shall not be installed with less than 18 inches of cover from the top of the pipe to finished grade. Refer to the table below for minimum Class requirements based upon height of cover from the top of the pipe to finished grade and pipe diameter:

	12”	**15”**	**18”**	**24”**	**30”**	**36”**	**42”**	**48”**	**60”**	**72”**	**84”**
2’	IV	III	III	III	III	III	III	III	III	III	III
3’	III	III	III	III	III	III	III	III	III	III	III

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4'	III	III	III	III	III	III	III	III	III	III	III
5'	III	III	III	III	III	III	III	III	III	III	III
6'	III	III	III	III	III	III	III	III	III	III	III
7'	III	III	III	III	III	III	III	III	III	III	III
8'	IV	III	III	III	III	III	III	III	III	III	III
9'	IV	IV	III	III	III	III	III	III	III	III	III
10'	IV	IV	IV	III	III	III	III	III	III	III	III
11'	IV	IV	IV	III	III	III	III	III	III	III	III
12'	IV	IV	IV	IV	III	III	III	III	III	III	III
13'	IV	IV	IV	IV	IV	III	III	III	III	III	III
14'	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV
15'	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV
16'	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV
17'	V	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV
18'	V	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV
19'	V	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV
20'	V	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV

D. PPP and PPP HP sewer shall not be installed with less than 2 feet of cover from the top of the pipe to finished grade

E. PPP shall not be installed at depths greater than 20' without special design analysis

3.3 Laying Pipe

A. Install PVC pipe in accordance with ASTM D2321. Install RCP pipe in accordance with ASTM C1479.

B. Use the proper tools for the safe handling and laying of pipe. Unload pipe by hand, skidways or hoists in such a manner so that material is not dropped or damaged. Distribute pipe at site of installation near area where it is to be laid. Protect machined ends of pipe from damage and keep pipe free from dirt and debris.

C. Lay pipe to a true uniform line and grade from elevations indicated on the drawings with continuous bearing of barrel and bells on cradle or bedding material. Excavate bedding material at bells to ensure continuous and direct bearing of all portions of the pipe and bell on bedding materials.

D. Utilize adequate bedding material to provide a continuous and firm bearing profile for the pipe. Pay particular attention to sufficient compaction of the bedding and haunches area below the pipe springline.

E. Lay pipe upgrade whenever possible and with the bell end pointing in the direction of work progress.

F. Use full manufactured lengths of pipe whenever possible. Do not use short lengths of pipe with couplings unless approved by the Project Officer.

G. Plug or grout lift holes left in the pipe prior to backfilling operations.

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H. As the work progresses, clear the interior of the pipe of all dirt and superfluous materials of every description.

I. Keep trenches and excavations free of water during construction and until final inspection. Do not lay pipe in water or in a frozen bedding condition. Prevent flotation and re-lay pipe that has floated.

J. Install PPP and PPP HP in accordance with ASTM D2321

3.4 Manholes, Catch Basins, and Other Structures

A. All structures shall be constructed to be watertight under the anticipated loads and site conditions.

B. Structures shall be centered along the axis of the pipes intersecting the structure, unless otherwise specified. Structures shall not be placed overtop of any other utilities.

C. Precast manholes and catch basins shall be placed on a 6-inch minimum gravel bedding extending 6 inches all around outside of the structured footprint and resting on undisturbed earth. Cast-in-place concrete bases may be poured directly onto undisturbed soil that has been compacted to a minimum of 95% density compaction and determined to be adequate subgrade by the Project Officer.

D. Manholes in fill areas shall have a foundation extending a minimum depth of 18 inches into undisturbed earth.

E. Cast-in-place concrete for structures shall be placed monolithically, or as shown on the plans. Concrete may be allowed to drop freely up to five feet in height; where greater drops are required, a tremie or other device approved by the Project Officer shall be used.

F. Construct flow channels in the bottom of structures. Cast in place channels shall be a minimum of 4 inches thick 3000 psi concrete. Provide a positive means of bonding the channel to the manhole base of the structure. Flow channels shall provide a smooth transition from inlet pipe(s) to outlet pipe(s) to minimize turbulence. Benches shall be sloped towards the channel to prevent the accumulation of debris.

G. The minimum invert drop from inlet to outlet of a manhole shall be 0.10 foot.

H. Steps shall be provided in any structure greater than 4’ in depth. Steps shall be installed in accordance with Standard Drawing M-2.0.

I. The crown of inlet pipes shall not be lower than the crown of outlet pipes.

J. Special design may be required for pipe sizes greater then 36 inches.

K. Cut all pipes flush with the inside walls of the structures. Sanitary structures shall use a flexible rubber gasket designed specifically for the materials and the anticipated service conditions to ensure a watertight and flexible joint.

L. Adjust frame and cover to match finished grade using concrete adjusting ring(s).

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M. For repair of existing manholes, joints for brickwork and precast concrete block work shall be completely filled and shall be smooth and free from surplus mortar on the inside of the manhole. Brick shall be laid radially with every sixth course laid as a stretcher course. Brick and concrete block manholes shall be plastered with mortar over the entire outside surface of the walls.

3.5 Abandonment of Sewers

A. Structures to be abandoned in place shall be excavated and removed to a minimum depth of 2' below finished grade. The remainder of the structure shall be filled with flowable fill, 21A aggregate, or sand. #57 aggregate may be used if all openings of the structure are completely covered with filter fabric to prevent migration of adjacent fines.

B. Sewers to be abandoned in place shall be capped at all open ends and completely filled with flowable fill.

3.6 As Built Plans

A. Prior to Final Release & Payment, the Contractor shall submit one set of As-Built drawings per Section 01720 of these specifications and meeting industry standards for clarity, detail, and precision. As-Builts shall include a certification from a Licensed Surveyor or Licensed Engineer that the plans as drawn indicate actual construction.

B. The As-Builts shall include, at a minimum Surveyed:
1. Invert Elevations
2. Manhole top elevations
3. Percent of grade between manholes
4. Horizontal distance between manholes
5. Any material changes
6. Location of connection to existing system measured from nearest structure
7. Location of pipe connections, including service lines, measured from nearest manhole
8. Actual location, depth or elevation, and type and size of all utility crossing.

3.7 Bypass Pumping, Temporary Flow Diversion and Dewatering

A. The Contractor shall utilize temporary pumps to divert storm, and sanitary sewer flows during construction as required. All equipment used for these purposes shall comply with the requirements of the Arlington County Noise Ordinance. The Contractor shall be responsible for the installation, operation, and removal of the temporary pumps. The Contractor shall be responsible for utilizing pumps sufficient to bypass the normal flow and dewater the work area.

B. The Contractor shall furnish, install, operate and maintain all sumps, pumps, casings, wellpoints, dewatering device, portable dams/barriers and other equipment needed to perform the temporary flow diversion and dewatering of the construction site as needed for proper execution of the construction Work.

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C. The Contractor shall furnish to the County in writing, a plan for diverting flows and removal of water from the work area before beginning the construction work. Acceptance of this plan will not relieve the Contractor of responsibility for completing the work as specified.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Sewer

A. Sewer pipe for the various materials, classes, and sizes shown on the plans shall be measured in linear feet along the center line of the pipe and shall be measured from inside wall of structure to inside wall of structures. Payment shall include the furnishing of all pipe and fittings, all necessary tests, excavation, removal and disposal of existing pipes, removal and disposal of unsuitable or surplus material, placement of bedding and backfill as shown in Standard M-3.0, restoration of roadways as shown in Standard M-6.1, all other restoration, and all other work required to providing a complete sewer installation in compliance with the Construction Documents.

4.2 Manholes

A. Manholes for the various internal diameters shall be measured by each up to 8 vertical feet from the top of the manhole cover thereafter the measurement shall be in vertical feet to the invert of the outlet pipe. Payment shall include demolition, excavation, backfill, bedding, foundation, base and components, channels, sleeves, frame and cover, intermediate landings, steps, all restoration and all other work necessary for a complete installation incompliance with the Construction Documents.

4.3 Adjust Existing Manholes to New Grade

4.4 Existing manhole frames, covers, valve boxes and other appurtenances shall be adjusted to the final grade or replaced, as necessary. The cost for this shall be considered incidental to work and shall be incorporated into the cost for relevant items. Connections to existing and proposed storm structures are considered incidental and no separate payment will be made. Excavation Below Proposed Grade and Additional Bedding

A. Should an unacceptable bedding for the proposed pipe or structure be encountered, the Contactor shall notify the Project Officer. The Project Officer may direct additional excavation below the bottom of the proposed pipe or structure and may direct the contractor to provide an alternate bedding or foundation. Excavation, additional bedding and associated work shall be considered over excavation and shall be measured and paid in accordance with Section 02200. Additional excavation and subsequent fill with acceptable bedding due to the fault or negligence of the Contractor or performed without prior approval from the Project Officer shall be at the expense of the Contractor.

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4.5 PVC Pipe and Perforated PVC Pipe

A. PVC pipe and Perforated PVC Pipe for the various materials, classes, and sizes shown on the plans shall be incidental to the primary work. Work shall include the furnishing of all pipe and fittings, valve box with cap, all necessary tests, excavation, removal and disposal of existing pipes, removal and disposal of unsuitable or surplus material, placement of bedding and backfill as shown in Standard M-3.0, restoration of roadways as shown in Standard M-6.1, all other restoration , core drilling, #57 gravel, filter fabric, top soil, sod, and all work required to provide complete installation in accordance with the Contract Documents.

4.6 PVC Cleanout

A. PVC Cleanout for the various materials, classes, and sizes shown on the plans shall be incidental to the primary work. Work shall include the furnishing of all pipe and fittings, valve box with cap, all necessary tests, excavation, removal and disposal of existing pipes, removal and disposal of unsuitable or surplus material, placement of bedding and backfill as shown in Standard M-3.0, restoration, #57 gravel, filter fabric, and all work required to provide a complete PVC Cleanout installation in compliance with the Contract Documents.

4.7 Sump Pump Core and Cleanout Connection

A. Sump Pump Core and Cleanout Connection for the various materials, classes, and sizes shown on the plans shall be incidental to the primary work. Work shall include the furnishing of all pipe and fittings, valve box with cap, all necessary tests, excavation, removal and disposal of existing pipes, removal and disposal of unsuitable or surplus material, placement of bedding and backfill as shown in Standard M-3.0, restoration of roadways as shown in Standard M-6.1, all other restoration, radial core drilling, #57 gravel, filter fabric, top soil, sod, proposed connections to storm structures and storm pipes, and all other work required to provide a complete Sump Pump Core and Cleanout Connection installation in compliance with the Contract Documents.

4.8 Bypass Pumping, Temporary Flow Diversion and Dewatering

A. The cost for bypass pumping shall be incidental to other items in the Contract; therefore, there will be no separate payment for bypass pumping.

END OF SECTION 02500

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SECTION 02505 - STORM SEWERS AND APPURTENANCES

PART 1 - GENERAL

1.1 Description of Work

A. Provide all plant, labor, supervision, materials and equipment to furnish and lay all storm sewer pipe and appurtenances to the lines and depths called for on the approved plans and as specified in Section 02500 Gravity Sewers and Appurtenances.

1.2 Related Work Specified Elsewhere

A. Section 02200 - Earthwork

B. Section 02500 – Gravity Sewers and Appurtenances

C. Section 02510 - Sanitary Sewers

D. Section 02515 – Televised Inspection of Sewers

E. Section 02650 – Restoration of Roadways

F. Section 02952 – Trenchless Crossing

G. Section 03400 - Precast Concrete

H. Section 04200 - Masonry Units

I. Section 05500 – Structural Steel

1.3 Applicable Standards and Specifications

A. American Society for Testing and Materials (ASTM)

B. American National Standards Institute (ANSI)

C. Virginia Department of Transportation, Road and Bridge Standards and Specifications (VDOT)

D. Arlington County Plumbing Code (Chapter 18 of the Arlington County Code)

E. Erosion and Sediment Control Ordinance (Chapter 57 of the Arlington County Code)

F. Virginia Department of Environmental Quality Erosion and Sediment Control Handbook

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1.4 Submittals

A. Submit full descriptions and details of structures, and other appurtenances proposed for the project Per Section 01330 Submittals.

PART 2 - PRODUCTS

2.1 Storm sewers pipes shall be RCP as specified in Section 02500 Gravity Sewers. Other materials may be approved on a case by case basis.

2.2 Precast Concrete Blocks

A. Precast concrete blocks shall conform to ASTM C-139.

PART 3 - EXECUTION

3.1 General

A. Maintain a minimum 5-feet horizontal distance between storm sewer and all other utilities.

B. The minimum vertical clearance between storm sewer and other utilities shall be 1.0 foot, unless provisions to prevent damage to the underlying utility are detailed for approval by the Project Officer.

3.2 Catch Basins and Structures

A. Joints for masonry structures shall be completely filled and shall be smooth and free of surplus mortar on the inside of the structure.

B. Structures shall be pargeted on the inside using Portland cement mortar 1/2” thick.

C. Concrete blocks shall be 12” in length. For structures less than 6’ in depth, 6” thick concrete blocks may be used. For depths from 6’ to 12’, 8” thick blocks shall be used. For depths greater than 12’, 12” thick blocks shall be used.

D. When possible on storm drainage inlets, manhole covers shall be positioned over the outgoing pipe.

E. Whenever grate inlets are used, they shall be bicycle friendly such that the inlet openings run perpendicular to any anticipated traffic flow.

F. Inverts are to be paved to the shape of the pipe and to the spring line except where inlet and outlet pipes make an angle with each other in which case paving shall be to the crown of the outlet pipe. Then from the spring line or the invert, whichever is the case, the paving is to be extended upward at a 45 degree angle to meet the structure wall. Refer to Standard Detail D-2.1.

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G. Angle iron and frame and cover shall be painted with black asphaltic paint.

H. A construction joint shall be provided in the gutter at the outside edges of each catch basin. The gutter between the outside edges of a catch basin shall be considered part of the catch basin and this work shall be included in the payment for catch basins.

I. Place three 3-inch drain pipe weep holes under the gutter and in other locations as required by the Contract Drawings. All drain pipes shall be placed within two feet below the top of curb.

3.3 Design Requirements

A. Storm sewers shall be designed as described in the VDOT Drainage manual, with the exceptions defined below:
   1. The 10-year storm shall be the basis of design except for conditions in which severe threat to property or life would result from system failure, in which case the 100year storm should be the design basis.
   2. Storm sewer inlets on residential streets shall be located to prevent stormwater from overtopping the curb during the design storm. The design shall account for a 1" freeboard between the top of curb and gutter flow depth. Gutter flow spread shall not be permitted to overtop the crown of the roadway. On streets other than residential, storm sewer inlets shall be placed in accordance with the requirements of the VDOT Drainage Manual.

3.4 Valley Gutters

A. Concrete valley gutters may be utilized where placement of drainage inlets would not be feasible due to lack of drainage infrastructure and/or conflicts with other infrastructure.

B. Valley gutters should be used only on residential streets. For streets with greater than 1500 vehicles per day, valley gutters shall only cross stop controlled legs of an intersection.

C. Valley gutters shall be constructed of Class A3 concrete, 9" thick, placed on a 6" base of crushed aggregate, with welded wire fabric as shown in VDOT Road and Bridge Standard PR-2, and per detail R-2.9.

D. Valley gutters shall be capable of carrying the design storm runoff entirely within the concrete conveyance area.

3.5 Private Connections

A. Storm Sewer Connections are privately owned and maintained from the storm sewer main up to and including the property served. Pipe and fitting for storm sewer service connections shall conform to the requirements of the Arlington County Plumbing Code and Plumbing Code adopted by the State of Virginia.

B. Connections to existing storm sewer mains shall be at manholes or inlets. The connection shall be made by core-drilling the structure and using a manhole adaptor appropriate for the pipe and structure materials. Connections at brick or masonry structures shall be made by carefully

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chiseling or removing single bricks or blocks such that the clearance between the connection pipe and any portion of the manhole is minimized.

C. Connections directly to pipes shall not be allowed without specific approval by the DES Engineering Bureau and issuance of appropriate permits. Where specifically permitted by DES, connections to existing pipes shall be made using saddles or fittings designed specifically for use on the pipe material which it is proposed to be used upon. When manholes or inlets are not accessible for connections, a hole can be core-drilled into the main line and the use of a three-piece service connection that consists of a PVC hub, a compression rubber sleeve, and a stainless steel band can be used in conformance with ASTM F2946. When anchors are set into concrete pipes, expansion anchors shall not be permitted. Such fittings or saddles shall eliminate any encroachment of the incoming pipe into the flow line of the existing pipe when flowing full. Saddles shall provide flexural relief for the incoming line without transmitting any stress onto the storm sewer pipe. All field connections must be approved by the Project Officer.

D. No mechanical discharge of groundwater, stormwater, or other collected water onto the public right of way shall be permitted. Gravity drainage from roofs or area drains through the curb shall be permitted.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Payment shall be as described in Section 02500 Gravity Sewers, except the items listed below.

A. Catch Basins and Yard Inlets
1. Catch basins, and yard inlets, shall be measured as each. Payment shall include demolition, excavation, bedding, backfill, concrete base and invert, walls, top, frame and cover, gutter or apron, steps, finished surface restoration, roadway restoration, and all other work necessary for a complete installation.

B. Catch Basins or Other Structures Converted to Manholes
1. Catch basins, or other structures converted to manholes shall be measured as each. Payment shall include demolition, excavation, backfill, modification work necessary to convert the structure, steps if required by Standards, finished surface restoration, roadway restoration, and all other work necessary for a complete installation.

END OF SECTION 02505

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SECTION 02510 - SANITARY SEWERS AND APPURTENANCES

PART 1 - GENERAL

1.1 Description of Work

A. Provide all plant, labor, supervision, materials and equipment to furnish and lay all sanitary sewer pipe and appurtenances to the lines and depths called for on the approved plans and as specified in Section 02500 Gravity Sewers and Appurtenances.

1.2 Related Work Specified Elsewhere

A. Section 02200 - Earthwork

B. Section 02500 – Gravity Sewers and Appurtenances

C. Section 02515 – Televised Inspection of Sewers

D. Section 02650 – Restoration of Roadways

E. Section 02952 – Trenchless Crossing

F. Section 03400 - Precast Concrete

G. Section 04200 - Masonry Units

H. Section 05500 – Structural Steel

1.3 Applicable Standards and Specifications

A. American National Standards Institute (ANSI)

B. American Society for Testing and Materials (ASTM)

C. American Water Works Association (AWWA)

D. Arlington County Plumbing Code (Chapter 18 of the Arlington County Code)

E. Arlington County Utilities Code (Chapter 26 of the Arlington County Code)

F. Plumbing Code adopted by the State of Virginia

G. Erosion and Sediment Control Ordinance (Chapter 57 of the Arlington County Code)

H. Virginia Department of Environmental Quality Erosion & Sediment Control Handbook

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I. Virginia Department of Health (VDH) and State Water Control Board Sewerage Regulations (VR 355-17-000) [Section 62.1-44.19(8) of the Virginia Code].

1.4 Submittals

A. Submit full descriptions and details of all materials, and appurtenances proposed for the project Per Section 01330 Submittal Procedures

1.5 Quality Assurance

A. Sanitary Sewer Field Tests
   1. Conduct field tests as specified in paragraph Sanitary Sewer Acceptance Tests paragraph in Part 3 of this Section.

B. Force Main Field Tests
   1. Hydrostatic testing of force mains shall conform to the hydrostatic testing specifications of Section 02550 of these specifications, except that the entire force main may be pressure tested at one time.

1.6 Definitions

A. Terminal Sewer – Any sewer which has no other common sewers discharging into it.

PART 2 - PRODUCTS

2.1 Polyvinyl Chloride pipe (PVC)

A. PVC pipe shall be as specified in Section 02500 Gravity Sewers and Appurtenances.

2.2 Concrete Pipe

A. Concrete pipe smaller than 12-inch shall not be used as sanitary sewer pipe. Concrete pipe shall be as specified in Section 02500 Gravity Sewers and Appurtenances.

2.3 Ductile Iron Pipe (DIP)

A. Ductile iron pipe shall conform to AWWA C-151 (ANSI A21.51), minimum class 52, and shall have mechanical or push-on joints utilizing rubber gasket rings conforming to AWWA C-111 (ANSI A21.11). Fittings shall be ductile-iron, mechanical joint conforming to AWWA C-110 (ANSI A21.10) with double cement lining. Force mains shall be minimum class 52 ductile iron pipe.

B. Pipe lining shall be corrosion resistant to sewer gas. Lining material shall be an amine cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment. A test report verifying the following properties shall be submitted per Section 01330 of these specifications:

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1. A permeability rating of 0.00 when tested according to Method A of ASTM E-96, Procedure A with a test duration of 30 days.
2. The following test must be run on coupons from factory lined ductile iron pipe:
   - ASTM B-117 Salt Spray (scribed panel) – Results to equal 0.0 undercutting after two years.
   - ASTM G-95 Cathodic Disbondment 1.5 volts @ 77 °F. Results to equal no more than 0.5 mm undercutting after 30 days.
   - Immersion testing rated using ASTM D-714.
     – 20% Sulfuric acid – No effect after two years.
     – 140 °F 25% Sodium Hydroxide – No effect after two years.
     – 160 °F Distilled Water – No effect after two years.
     – 120 °F Tap Water (scribed panel) – 0.0 undercutting after two years with no effect.
   - ASTM G-22 Standard practice for determining resistance of Synthetic Polymeric materials to bacteria. The test should determine the resistance to growth of Acidithiobacillus Bacteria and should be conducted at 30 degrees centigrade for a period of 7 days on a minimum of 4 panels. The growth must be limited only to trace amounts of bacteria.

2.4 Vitrified Clay Pipe

A. Vitrified clay pipe shall not be used as sanitary sewer pipe.

2.5 Asbestos-Cement Pipe

A. Asbestos-cement pipe shall not be used as sanitary sewer pipe.

2.6 Coating for manholes and large diameter concrete pipe

A. Coating will be an adhesive mortar designed to provide an abrasion and corrosion-resistant, protective lining that can withstand biogenic corrosion caused by hydrogen sulfide. Testing of the coating using the ASTM C1138M Test Method for Abrasion Resistance of Concrete shall result in no more than 0.5% weight loss after 12 hours and 0.2% after 72 hours of testing.

2.7 Manhole Covers

A. Manhole covers shall be watertight, and as specified in Section 02500 Gravity Sewers and Appurtenances

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PART 3 - EXECUTION

3.1 Design Basis

A. Per Capita Flow
1. New sanitary sewer systems shall be designed on the basis of an average daily per capita flow as follows:

Table 1- Sanitary Sewer Design Table

Establishment	**Average Daily Usage**
Single Family	225 gallons per day (gpd)/unit
Multi-Family	205 gpd/unit
Apartment	160 gpd/unit
Hotel	80 gpd/room
Manufacturing	0.03 gpd/sq. ft. GFA
Transportation	0.03 gpd/sq. ft. GFA
Trade	0.11 gpd/sq. ft. GFA
Office	0.05 gpd/sq. ft. GFA
Restaurant	0.40 gpd/sq. ft. GFA
Service	0.09gpd/sq. ft. GFA
Intensive Service	0.50 gpd/sq. ft. GFA
Other	0.07 gpd/sq. ft. GFA
School	0.03 gpd/sq. ft. GFA
Church	1000 gpd/church

GFA = Gross Floor Area

B. Peak Flow
1. Sanitary Sewers shall be designed to accommodate Peak Flow as determined by multiplying a Peak Flow Factor by the calculated Average Daily Usage.
2. For Terminal Sewers, or any sewers which collect only Terminal Sewers, the Peak Flow Factor shall be 4.0
3. For all other sewers, the Peak Flow Factor shall be 3.0
4. Force Mains shall be designed to accommodate a Peak Flow Factor of 4.0___

3.2 Sanitary Sewer Design Criteria

A. Sanitary sewers shall be designed and installed in accordance with Arlington County Standard Details and Specifications, the Virginia Department of Health and State Water Control Board Sewerage Regulations, Water Pollution Federation Standards, the Uniform Statewide Building Code of Virginia, and the following design criteria:
1. All data regarding size of building, type of occupancy, number of occupants and estimated peak water demands as applicable for all buildings within the proposed development shall be furnished to DES to substantiate sanitary sewer main sizes. The final size of all sanitary sewer mains and appurtenances shall be determined by DES.

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2. Sanitary sewer mains shall be a minimum 8-inches in diameter and shall be installed in straight alignment and grade between manholes. Minimum sewer slopes should be 0.5%. Minimum slopes for terminal sewer segments and sewers serving less than 10 households or their equivalent should be 1.0%. Slopes less than those mentioned above shall only be considered for approval by DES in extreme cases with justification provided by the Licensed Professional Engineer. Absolute minimum allowable slopes for various sized pipes shall conform to Virginia Department of Health Sewerage Regulation VR 355-17-106.05(c) for non-settled sewage. Maximum sewer slopes shall be 15%. Slopes shall be determined between centers of manholes.
3. Sanitary sewers shall be installed at depths sufficient to serve existing and proposed basements. Minimum cover over sewers shall be 6 feet in streets and areas subject to vehicular traffic and shall be 4 feet in other areas.
4. Stream and estuary crossings shall have a 3-foot minimum cover if possible and sewer pipe shall be ductile iron encased in concrete from manhole to manhole. The pipe and joints shall be tested in place and shall exhibit zero infiltration. Sewers located adjacent to streams shall be located outside of the stream bed whenever possible and should be sufficiently removed there from to provide for possible future channel widening.
5. Gravity sewer size shall remain constant between manholes. Where a smaller sewer enters a larger one, the relative elevations of the inverts of the sewers shall be arranged to maintain approximately the same energy gradient.
6. When pipe velocities greater than 15 feet per second are expected, special provisions shall be made to protect pipes and structures against internal erosion due to high velocity and corrosive gases. The pipe shall conform to applicable ASTM, AWWA, ANSI, or other appropriate standards or specifications which provide protection against internal erosion.
7. Sanitary sewers shall be installed within street right of way and shall follow the street centerline wherever possible. The sewer shall extend a minimum of 10 feet along the property frontage of the last house being served. Sewers shall not be located longitudinally under walks. Sewers may be installed within recorded easements as specified in Section 02500 Gravity Sewers and Appurtenances when locations in public right of way are not possible.
8. The minimum clear horizontal separation between sanitary sewer mains or sewer manholes and water mains shall be 10 feet. When local conditions prevent a minimum separation of 10 feet, a closer separation may be allowed provided that:
    a. The top of the sanitary sewer main shall be a minimum of 18 inches below the bottom of the water main. The sewer main and water main shall be kept in separate trenches. Where minimum vertical separation cannot be obtained, the sanitary sewer shall be constructed of ductile iron pipe and pressure tested in place without leakage prior to backfilling.
9. Sewer mains crossing under water mains shall be laid to provide a minimum vertical separation of 18 inches between the top of the sewer and bottom of the water main. If local conditions prevent this, the water main shall be relocated to provide the separation directed by the Project Officer, or the sewer shall be constructed of ductile iron pipe, pressure tested in place without leakage before backfilling, and with no joint of the sewer closer than 8 feet of the water main.
10. Sanitary sewer mains crossing over water mains shall maintain a minimum vertical separation of 18 inches between the top of the water main and the bottom of the sewer. The sanitary sewer shall be constructed of ductile iron pipe, pressure tested in place without leakage before backfilling. Provide adequate structural support for the sewer to prevent joint deflection or settlement on or breakage of the water main (refer to Standard Drawing M-7.0).

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11. The minimum clear horizontal separation between sanitary sewer and utilities other than water main shall be 5 feet.
12. The minimum vertical clearance between sanitary sewer and utilities other than water main shall be 1.0 foot, unless provisions to prevent damage to the underlying utility are detailed for approval by DES.
13. Individual building or house sewer services 5 inches and smaller shall be connected to the sanitary sewer main in accordance with the Arlington County Plumbing Code. Sanitary sewer services 6 inches and larger and sewer services serving more than one building, townhouse or similar structure shall be connected to a manhole on the sanitary sewer main as directed by DES. Existing manholes receiving new sewer services must be approved by DES and shall be reconstructed or replaced as directed by DES to meet current Standards. No sanitary sewer service taps shall be made in trunk sewers 15 inches and larger without special approval from DES.
14. Ventilation of gravity sewer systems shall be provided where continuous watertight sections (including manholes with watertight covers) greater than 1,000 feet in length are incurred [conforms to Virginia Department of Health Sewerage Regulation VR 355-17106.07(G)].
15. Sanitary sewer lines constructed in fill areas shall be continuous ductile iron (CL50) run from manhole to manhole. Fill material beneath the pipe shall be select material compacted to 95 percent density at optimum moisture (ASTM Proctor Test). Refer to Section 02500 for manholes in fill areas.

3.3 Manholes

A. Manholes shall be a maximum 16 feet deep and shall be installed at all changes in sewer size, material, alignment or grade and at terminal end of sewer. Manholes deeper than 16 feet shall only be considered for approval by DES in extreme cases with justification provided by the Project Officer.

B. Maximum spacing of manholes shall be 350 feet.

C. Crown of inlet sewer shall not be lower than crown of outlet sewer.

D. Drop connections should be avoided and will be allowed only upon approval by DES when normal connections are not practical. Drop connections shall provide a minimum drop in a manhole of two feet measured from the invert of the incoming pipe to the manhole invert. Inside drop connections shall be in 5 foot inside diameter manholes and shall be used under special circumstances such as high water table, utility conflicts and excessive depths.

3.4 Sewer Service Connections

A. Sewer service connections to the sanitary sewer main shall be made only by a licensed plumber and in accordance with the Plumbing Code adopted by the State of Virginia and the Arlington County Plumbing Code. No sewer service connections shall be made within 2 feet of any joint in the sanitary main or within 5 feet along the pipe leading from a terminal manhole. The minimum allowable distance between sewer service connections at the sewer main shall be 3 feet. No house service lateral shall be connected to an existing manhole without the special approval of DES.

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3.5 Sanitary Sewer Acceptance Tests

A. General: Acceptance tests shall not be made until all sanitary sewer pipes, manholes and required building spurs have been installed, and the pipe trenches are backfilled to the finished grade and compacted. Prior to backfilling sanitary sewer sections, the Contractor may perform preliminary tests at his own discretion without the presence of the Project Officer. The Contractor shall schedule the final acceptance tests with the Project Officer at least 48 hours in advance. Final acceptance tests shall be performed in the presence of the Project Officer or his duly authorized representative. All material, equipment and labor required shall be provided by the Contractor. Sewer pipes shall be tested from manhole to manhole or from manhole to terminus. Sections passing the acceptance tests shall continue to be maintained by the Contractor until a satisfactory final inspection of the entire sewer system is completed.

B. Low Pressure Air Tests: Sanitary sewer sections of one diameter only and above the ground water table shall be tested using low air pressures after completion of backfill and before hookup of house connections. Temporarily cap and securely brace all laterals for the test. Inspect sewers and manholes prior to testing and remove all soil and debris by thoroughly flushing the lines. Dispose of soil and debris without using the existing sewer system. Provide and securely brace test plugs at each manhole. After all personnel are removed from manholes, add air slowly to the portion of the pipe being tested until internal air pressure is held at a test pressure of 4.0 pounds per square inch (psi) for a minimum of two minutes. Pressure gauges used in the air test procedure shall be calibrated in divisions of 0.10 psi.

If, in the Project Officer's opinion, there is any indication of leakage at the test plug, relieve the internal pressure before taking steps to eliminate the leak. After the two-minute holding period at 4.0 psi, disconnect hose and compressor from the pipe section being tested. If pressure decreases to 3.5 psi, observe and record the time required for the pressure to drop 1.0 psi from 3.5 to 2.5 psi. Pipes failing to maintain minimum acceptable holding times in accordance with the most current version of ASTM-C828 shall not be accepted.

C. Mandrel Testing: All PVC sewer lines shall require Mandrel testing in addition to air test acceptance to determine if they are within the allowable deflection tolerance. The Contractor shall perform the deflection test by utilizing an approved go/no go multi-arm mandrel which meets ASTM D-3034 dimensions for 7.5 percent deflection limit.

D. Manhole Testing: Manholes shall be tested using one of the methods listed below. Manholes may be tested for leakage at the same time that gravity sewer lines are being tested for leakage. Manhole inverts shall be completed before testing is performed.

1. Vacuum testing shall include vacuum pump, certified vacuum gauge with a range of 0 to 30-inch mercury (Hg.), sealing element with manhole support brace and air pressure to monitor the inflatable sealing ring. Evacuate the manhole to 10 inches Hg. for the specified test period using the chart provided. If the vacuum drops less than one-inch mercury within the test time the manhole is considered acceptable.
2. When exfiltration testing is used, the allowable leakage shall not exceed one-half gallon per hour. This equates to 0.25 or ¼-inch per four-hour test period. The inflatable plugs, or stoppers shall be positioned in the lines far enough from the manhole to ensure testing of those portions of the lines not air tested. The manhole shall then be filled with water to the top of the manhole rim. A 24-hour soak shall be allowed prior to testing. After test completion the water shall be pumped from the manholes and disposed of properly.
3. Under no circumstances shall water be allowed to enter the existing sanitary sewer system. If water drop in manhole exceeds the allowable leakage during the test period the

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Contractor shall make repairs or replacement at no cost to the County and retest as specified above.

E. In addition to passing air test requirements, sanitary sewer sections below the ground water table shall be tested using the following infiltration test procedure. The Contractor shall provide all material, labor and equipment for the infiltration tests.

1. Plug upper section of pipe system after flushing and cleaning section in conformance with paragraph B above. Place a weir in the downstream invert of pipe in a plumb and level position. Read the infiltration after an elapsed time of 30 minutes with the line of sight level to the weir line. Flow rates shall not exceed 100 gal./day/inch of diameter/mile. Readings that exceed 100 gal./day but are below 1,500 gal./day shall be remeasured using a weir with spout approved by the Project Officer.

F. Sewer sections containing a large amount of lateral volume or sewer sections partially submerged, shall be air-tested using the appropriate criteria stipulated in ASTM Designation C-828 to ensure accuracy of the test procedure.

Table 2: Vacuum Test Table- Specified test period for vacuum to Drop less than one-inch mercury

Manhole Depth In Feet	**4-Foot Inside Diameter**	**5-Foot Inside Diameter**	**6-Foot Inside Diameter**
	(seconds)	**(seconds)**	**(seconds)**
8	20	26	33
10	25	33	41
12	30	39	49
14	35	46	57
16	40	52	65
18	45	59	73
20	50	65	81
22	55	72	89
24	59	78	97
26	64	85	105
28	69	91	113
30	74	98	121

Table 3: Air Test Table- Based on Equations from ASTM C828

SPECIFICATION TIME (min:sec) REQUIRED FOR PRESSURE DROP
FROM 3-1/2 to 2-1/2 PSIG WHEN TESTING ONE PIPE DIAMETER ONLY

	PIPE DIAMETER, INCHES								
PIPE LENGTH									
(FEET)	4	6	8	10	12	15	18	21	24
25	0:04	0:10	0:18	0:28	0:40	1:02	1:29	2:01	2:38
50	0:09	0:20	0:35	0:55	1:19	2:04	2:58	4:03	5:17
75	0:13	0:30	0:53	1:23	1:59	3:06	4:27	6:04	7:55

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SPECIFICATION TIME (min:sec) REQUIRED FOR PRESSURE DROP
FROM 3-1/2 to 2-1/2 PSIG WHEN TESTING ONE PIPE DIAMETER ONLY

	PIPE DIAMETER, INCHES								
PIPE LENGTH (FEET)	4	6	8	10	12	15	18	21	24
100	0:18	0:40	1:10	1:50	2:38	4:08	5:56	8:05	10:34
125	0:22	0:50	1:28	2:18	3:18	5:09	7:26	9:55	11:20
150	0:26	0:59	1:46	2:45	3:58	6:11	8:30		
175	0:31	1:09	2:03	3:13	4:37	7:05			
200	0:35	1:19	2:21	3:40	5:17				
225	0:40	1:29	2:38	4:08	5:40				
250	0:44	1:39	2:56	4:35					
275	0:48	1:49	3:14	4:43					
300	0:53	1:59	3:31						
400	1:10	2:38							
450	1:19	2:50							
500	1:28	2:50	3:47	4:42	5:40	7:05	8:30	9:55	11:20

PART 4 - MEASUREMENT AND PAYMENT

4.1 Sewer Service Connections

A. Sewer service connections shall be measured in linear feet along the center line of the service line, from the center line of main sewer to the end of the cap of where tied into the existing service line. Payment for house connections shall include the plumbing permit, demolition, excavation, backfill, restoration of roadways as shown in Standard M-6.1, all other restoration, tapping main sewer, pipe, fittings, and all additional work required to provide a complete and operable house connection.

4.2 Sanitary Sewer Force Mains

A. Measurement and payment shall be as per Section 02500 - Gravity Sewers and Appurtenances, and shall also include thrust blocks, anchorage, and any other restraint required.

4.3 Drop Connections

A. Drop connections for the various sizes and depths shown on the bid proposal shall be measured as each. Payment shall be at the unit price stated in the bid proposal and shall include all materials, labor and other work necessary to provide a complete and operable installation.

END OF SECTION 02510

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SECTION 02515 - TELEVISED INSPECTION OF SEWERS

PART 1 - GENERAL

1.1 Description of Work

A. Provide all labor, materials, equipment to inspect sewer pipes using closed circuit television technology as specified herein.

1.2 Related Work Specified Elsewhere

A. Section 02500 – Gravity Sewers and Appurtenances

B. Section 02505 – Storm Sewers and appurtenances

C. Section 02510 - Sanitary Sewers and Appurtenances

1.3 Applicable Standards and Specifications

A. National Association of Sewer Service Companies (NASSCO)

1.4 Submittals

A. Provide copies of the inspection and electronic reports complying to NASSCO Pipeline Assessment and Certification Program (PACP) standards for all segments of sewer and manholes inspected.

B. The inspection video is either configured for viewing using the latest version of Windows Media Player, or the appropriate viewing software must be submitted on each CD or DVD. Files are configured to have the ability to use all features of the CCTV player including fast forwarding capability.

1.5 Quality Assurance

A. The vendor performing the Television Inspections shall hold a valid NASSCO PACP certification.

PART 2 - PRODUCTS

2.1 Equipment

A. The television camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire

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periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera, television monitor, and other components of the video system shall be capable of producing picture quality to the satisfaction of the Project Officer. The Equipment shall provide a means of accurately measuring distance from manhole or other structure to an accuracy of plus or minus 6 inches.

PART 3 - EXECUTION

3.1 General

A. After cleaning, all sewer sections shall be visually inspected by means of closed-circuit television. The inspection shall be done one segment at a time from structure to structure and the flow in the section being inspected shall be suitably controlled. All CCTV inspections and documentation shall be performed in accordance with NASSCO PACP standards including the specific date and time of inspection.

B. The camera shall be moved through the line in either direction, stopping when necessary to permit proper documentation of the sewer's condition and any connections. In no case shall the television camera be pulled at a speed greater than 25 feet per minute. Obtain a still picture (color jpeg format) of all significant defects observed during inspection. Record segment, location along sewer, clock position, time and defect code for each picture. Obtain still photograph coaxial with each lateral. Perform a 360-degree pan at all pipe joints. During the inspection the following information shall be clearly and continuously displayed on the periphery of the screen, monitor and CCTV recording: starting location ID, ending location ID, distance from manhole or headwall. A global positioning system device shall be used to document the inlet and outlet locations. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If, during the inspection operation, the television camera does not pass through the entire sewer segment between manholes, the Contractor shall set up his equipment so that the inspection can be performed from the opposite manhole. If, again, the camera fails to pass through the entire sewer segment, the inspection shall be considered complete and noted as "Survey Abandoned" with the specific reason.

C. When manually operated winches are used to pull the television camera through the line, telephones or other suitable means of communication shall be set up between the two manholes of the section being inspected to insure good communications between members of the crew.

D. The Contractor shall stop the camera and inspect all entering pipe connections and other features of interest.

3.2 Documentation

A. All documentation shall clearly reference the unique identifier for the pipe segment for each segment of pipe inspected. Contractor to verify pipe size, material and length provided by the County. If discrepancies are found the contractor is to note the differences. If the contractor finds additional structures, contractor to document the type and location of the structure found so it can be added to the system.

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B. Electronic media location records shall be kept by the Contractor and shall clearly show the location, by distance in 1/10 of a foot, from the manhole wall, in relation to an adjacent manhole of each infiltration point observed during inspection. The information called out includes but not limited to: structural condition and deformation of the pipe walls, segment length (from inside walls of adjacent manholes), manhole depth (invert to top of casting to nearest 0.1 ft), blockages or obstruction and associated locations, condition of joints and pipe walls, standing water/sag conditions, infiltration/exfiltration, fluctuations in water level, size location and condition of laterals with the clock position. In addition, other points of significance such as locations of building sewers, unusual conditions, roots, storm sewer connections, cracks, fractures, broken pipe, presence of scale and corrosion, and other discernible features, as defined in the PACP defect codes, shall be recorded on electronic media and a copy of such records shall be supplied to the Owner.

C. Digital photographs of the pipe condition and all defects shall be taken by the Contractor. Photographs shall be located by distance, in increments of 1/10 of a foot, from the adjacent manhole or structure wall.

D. Electronic media recordings shall be in a format and media which is acceptable to the Project Officer.

E. The Contractor shall report any evidence of illicit discharges or illicit connections to the storm drain system to the Department of Environmental Services.

3.3 Pipe Condition Coding

A. Pipe condition coding for pipes subjected to CCTV inspection is done in accordance with National Association of Sewer Service Companies'

B. Table of PACP Defect Grades:

Grade	Description	Estimated Time to Failure
1	EXCELLENT: Minor Defects	Unlikely in the foreseeable future
2	GOOD: Defects that have not begun to deteriorate.	20 years or more
3	FAIR: Moderate defects that will continue to deteriorate.	10 to 20 years
4	POOR: Severe defects that will become grade 5 defects within foreseeable future.	5 to 10 years
5	IMMEDIATE ATTENTION: Defects requiring immediate attention.	Has failed or will likely fail within the next 5 years

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PART 4 - MEASUREMENT AND PAYMENT

4.1 Television Inspection

A. Where specifically included as a payment item, payment shall be lump sum and shall include the labor, materials, equipment, operations, maintenance of traffic, operational modifications to the existing system, and any other work required to perform Television Inspections. If not included as a specific pay item, Television Inspection shall be considered incidental to the installation of any new sewer and no separate payment shall be made for the Television Inspection.

END OF SECTION 02515

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SECTION 02550 - WATER MAINS AND APPURTENANCES

PART 1 - GENERAL

1.1 Description of Work

A. Provide all plant, labor, supervision, materials and equipment to install all water pipe and appurtenances to the lines and depths as called for on the approved plans and as described herein for a complete and operable water distribution system.

1.2 Related Work Specified Elsewhere

A. Section 02200 - Earthwork

B. Section 02202 – Rock Excavation

C. Section 02400 – Protection of Excavation

D. Section 02650 – Restoration of Roadways

E. Section 02952 – Trenchless Crossing

F. Section 03100 – Concrete, Formwork, Reinforcement, and Materials

1.3 Applicable Standards, and Specifications

A. American National Standards Institute (ANSI)

B. American Society for Testing and Materials (ASTM).

C. American Water Works Association (AWWA).

D. National Fire Protection Association (NFPA)

E. Arlington County Fire Protection Code (Chapter 8.1 of the Arlington County Code)

F. Arlington County Plumbing Code (Chapter 18 of the Arlington County Code).

G. Arlington County Utilities Code (Chapter 26 of the Arlington County Code).

H. Plumbing Code adopted by the State of Virginia

I. Erosion and Sediment Control Ordinance (Chapter 57 of the Arlington County Code).

J. Virginia Department of Health (VDH) Waterworks Regulations (12 VAC 5-590)

K. Arlington County Dechlorination Policy Acknowledgement form

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L. Arlington County Dechlorination Plan form

M. Arlington County Dechlorination and Disposal Procedures

1.4 Submittals

A. Submit full descriptions and details of all pipe, valves, hydrants, and other appurtenances proposed for the project Per Section 01330 Submittal Procedures.

1.5 Quality Assurance

A. The manufacturer shall provide facilities or a certified laboratory for conducting load bearing and other tests required by the referenced specifications such as the ASTM.

B. The Contractor shall provide ample space and other accommodations to enable the Project Officer to inspect all pipe, fittings, and joint materials upon delivery to the site and prior to utilizing the pipe, fittings, and joint materials in the Work. The Contractor shall ensure that materials are stockpiled or otherwise stored such that the Project Officer has access to all aspects and components.

1.6 Acceptance

A. No portion of new installation shall be considered for acceptance without a submittal. that includes a minimum of a passing hydrostatic test, passing bacteriological tests, and as-built drawing (Section 3.3).

PART 2 - PRODUCTS

2.1 General

A. All materials shall be suitable for 150 pounds per square inch (psi) working pressure unless otherwise indicated.

B. Pipe of the same size and material shall be furnished by the same manufacturer. Each pipe length and fitting shall be clearly marked with the manufacturer's name, trademark and class of pipe.

C. Materials shall be recently manufactured and unused. Only previously approved manufacturers items may be furnished.

2.2 Pipe

A. Pipe shall be ductile iron conforming to AWWA C151 (ANSI A21.51), class 53 minimum for 6-inch and smaller pipe and class 52 minimum for 8-inch and larger pipe. Pipe shall be single cement lined conforming to AWWA C104 (ANSI A21.4) with a minimum 1.0 mil. thick bituminous coating and shall have mechanical or push-on joints utilizing rubber gasket rings, conforming to AWWA C111 (ANSI A21.11).

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B. Fittings shall be mechanical joint ductile iron conforming to AWWA C110 (ANSI A21.10), with a minimum pressure rating of 250 psi, or ductile iron compact grade conforming to AWWA C-153 (ANSI 21.53) with a minimum pressure rating of 350 psi. Fittings shall be cement lined conforming to AWWA C104 (ANSI A21.4) with a minimum 1.0 mil. thick bituminous coating.

C. Polyethylene encasement with a minimum thickness of 8-mils shall be applied to all underground ductile pipe installations and shall comply with the installation and material requirements of AWWA C-105 and ANSI A21.5. All pipes, fittings, valves, hydrants and branch connections shall be encased as shown on approved plans. All holes and openings of any size shall be repaired in accordance with the manufacturer's recommendations.

2.3 Tie Rods and Accessories for Anchorage and Mechanical Joint Restraints

A. Tie rods, tie bolts and accessories shall be manufactured of corrosion resistant steel, ASTM-A242, Super Star series of Star National Products, Romac Industries, Smith Blair, or approved equivalent.

B. Mechanical joint restraints shall be used with all water main appurtenances as directed or as approved by the Project Officer. 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. Restraining devices shall be manufactured of ductile iron. Torque limiting twist off nuts shall be used to ensure proper installation of the restraining device. The minimum working pressure shall be at least 250 psi. and shall be manufactured by EBAA iron, inc., Romac Industries, Smith Blair, or approved equivalent.

2.4 Gate Valves

A. Gate valves, 4-inch through 12-inch, for buried installation shall be ductile or grey cast iron, resilient wedge type, O-ring sealed, non-rising stem, fitted with a 2-inch operating nut opening left, with mechanical joint and/or flanged ends, as indicated on the drawings. Valves shall conform to AWWA C-509 (grey iron) or C-515 (ductile iron) requirements. Provide buried valves with valve boxes. Provide extension stems extended within two feet of finished grade if required for valve depth. Valves shall be American Flow Control Series 2500-1, Mueller A-22360, U.S. Pipe USPO valve, Kennedy KS, or approved equivalent.

B. Gate valves 14" and larger shall be iron body with fusion epoxy coating conforming to AWWA C 550 bronze mounted, double disc, resilient wedge, O-ring sealed, non-rising stem, fitted with a 2" operating nut opening left, with mechanical joint and/or flanged ends as indicated on the drawings. 14" gate valves may be installed in vaults or buried with valve boxes and extension stems placed within two feet of finished grade if required for valve depth. Gate valves 16" and larger shall be installed in vaults with or without NRS bypass valve as indicated on the drawings. Valves shall conform to AWWA C-500 requirements and shall be Mueller Co. 2360 series or from US Pipe USPO, or American Flow Series, or approved equivalent.

C. Gate valves 3" to 8" for water meter and/or fire line vault or interior installation shall be iron body, bronze mounted, resilient wedge , bolted bonnet, 250 psig maximum working pressure class 125 psi, outside screw and yoke, rising stem with hand wheel, opening left, with flanged ends.

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Valves shall be Mueller Co. 2360 series or from US Pipe USPO, or American Flow Series, or approved equivalent.

D. Gate valves 2" and smaller shall be bronze body, solid disc, union bonnet, class 150 psi minimum, non-rising stem with hand wheel, opening left, with inside threaded ends. Valves shall be Stockham Model B-128 , Crane Model No. 426, or from Mueller Co or US Pipe USPO. or approved equivalent.

2.5 Butterfly Valves, Check Valves and Insert Valves

A. Butterfly, check, and insert valves shall be as directed by the Project Officer on a special project basis.

2.6 Fire Hydrants

A. Fire hydrants shall be dry top, dry barrel compression type, with a valve opening of 5-1/4inches, double 0-ring seals and safety flange, and shall conform to AWWA C502 requirements.

B. Hydrants shall be provided with two 2-1/2 inch hose outlets and one 4-inch pumper outlet with threading conforming to NFPA No. Standard 1963, Standard for Fire Hose Connections, requirements for American National Fire Hose Connection Screw Threads (NH), 6-inch mechanical joint inlet connection, National Standard 1-1/2 inch pentagon operating nut and outlet cap nuts, chains on outlet caps, and harnessed lugs. Hydrants shall open left and counterclockwise. Fire hydrants shall be painted with an exterior type industrial coating enamel. The upper barrel including bonnet and hose nozzle caps shall be painted "National Standard Yellow". Hydrants shall be Mueller Super Centurion 250, Kennedy “Guardian”, Clow “Medallion”, or approved equivalent.

2.7 Valve Boxes

A. Valve boxes shall be of the two-piece, sliding type 5-1/4-inch shaft, cast iron kind. Valve box lid shall read “Water” Valve boxes shall be as manufactured by Bingham and Taylor Company, Capitol Foundry, or Tyler Company and conform to their standard dimensions.

2.8 Copper Pipe

A. Copper pipe shall be seamless water tube, AWWA type K conforming to ASTM designation B88 requirements. Fittings shall be underground copper service flared type.

2.9 Water Meters and Services 2-inch and smaller by Arlington County

A. Water meters, including taps, pipe fittings, meter box and accessories from the water main through the meter, shall normally be furnished and installed by the Arlington County Department of Environmental Services (DES) after payment of the appropriate fee. The connection from the back side of the meter installation to the building shall be installed by the owner’s plumber.

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2.10 Water Meters and Services 2-inch and smaller by Contractor

A. The Department of Environmental Services shall approve all water meter locations. Water meters shall be located in the utility strip or just behind the curb within public right-of-way or recorded easements and a minimum of 5 feet horizontally clear from other utilities, structures, or trees.

B. The Contractor shall assume complete responsibility for the installation, adjustments and any damage that may occur until final acceptance of the project.

C. The Contractor shall furnish all water service materials except the water meter. The water meter is always supplied and installed by Arlington County.

D. New water mains shall pass all acceptance testing procedures before the installation of water service connections.

E. All services shall be installed by wet tap only. Service taps shall be located at the 10:00 and 2:00 position on the water main. Maintain a minimum of 12 inches between taps. Direct taps are allowed for 1-inch connections. Use approved saddles for 1 ½ inch and 2-inch connections.

F. Water service lines shall have a minimum of three feet of cover and shall be approved by the Project Officer, from the main to the meter prior to backfilling. Meter settings for 1-inch to 2-inch services shall be a minimum of 18-inches and a maximum of 24-inches below the meter box cover. Meter box covers shall be painted black with an exterior type of rust resistant enamel.

G. Meter boxes, meter box covers, corporation stops, angle valves, yoke ells, yoke bars and all other appurtenances (except the water meter) necessary for a complete installation shall be provided in accordance with the approved plans, specifications and requirements of DES. Meter box covers shall be furnished by Bingham and Taylor, Capitol Foundry, Ford Meter Box Co., or approved equivalent.

2.11 Water Meters and Services by Contractor 3-inch and Larger

A. The Department of Environmental Services shall approve all water meter and service locations. Water meters shall be within a specified permanently provided clear space located just behind the curb in public right-of-way or just behind the curb in recorded easements.

B. All materials necessary for a complete water service installation (except the water meter) shall be provided and installed by the Contractor in accordance with the approved plans.

C. The Contractor shall assume complete responsibility for the installation, adjustments, and any damage that may occur until final acceptance of the project.

D. New water service piping and appurtenances shall pass all acceptance testing procedures and inspections before the installation of the water meter by Arlington County.

2.12 Air Release Valves

A. Air release valves shall be constructed of cast iron body and cover conforming to ASTM A126.GR.B requirements. The float shall be stainless steel conforming to ASTM A240

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requirements. Air release valves shall be manufactured by Apco, Crispin, Cla-val, Flomatic, or approved equivalent.

2.13 Tapping Sleeves and Valves

A. Tapping sleeves and valves shall conform to the applicable requirements specified herein for installation on the existing type of pipe described below.
   1. Iron Pipe: Tapping sleeves shall be iron or stainless steel. The iron tapping sleeve shall have an iron body, mechanical joint, with gaskets, suitable for installation on the existing iron pipe. The tapping sleeve shall be as manufactured by Mueller Company No. H-615 or approved equal. Tapping valves shall conform to the applicable requirements specified herein for gate valves. All stainless steel tapping sleeves shall be type 304 stainless steel with stainless steel flange and full circumferential seal as manufactured by JCM style 432, Ford style FAST, Smith Blair #663, or approved equivalent.
   2. Concrete Pipe: The tapping sleeve shall be in accordance with AWWA Manual M9. The sleeves shall have a separate gland which permits installation of the sleeve prior to the cutting of the prestress wires. The gland shall have a fusion epoxy coated (per AWWA C-213-79) waterway, and a broad gasket set in a retaining groove of a draw flange to eliminate flexing. The gland shall be equipped with load bearing set screws to protect the cylinder. Sleeves shall be furnished with grouting seals and grout horns to facilitate filling the space between the sleeve and the pipe.

2.14 Service Clamps

A. Service clamps shall have cadmium zinc plated ~~be~~ double steel straps and ductile iron body with corporation stop thread of appropriate size, neoprene gasket cemented in place, and cadmium zinc plated nuts. ~~and straps and shall be the diameter required.~~ Clamps shall be as manufactured by Ford, Mueller, Romac Industries, Smith Blair, JCM Industries or approved equivalent.

2.15 Manhole Frames and Covers

A. Manhole frames and covers shall conform to the requirements of Section 02500 Gravity Sewers, or as specified on the plans. Refer to W-9.7, W-9,8, and W-9.9.

2.16 Manhole Steps

A. Manhole steps shall conform to the requirements of Section 02500 Gravity Sewers

2.17 Concrete

A. Concrete used for concrete thrust blocks and valve collars shall be in conformance with Section 03100 of these Specifications.

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PART 3 - EXECUTION

3.1 Water Main Design Criteria

A. Water mains shall be designed and installed to conform to Arlington County Standards and Specifications, the Virginia Department of Health Waterworks Regulations, American Water Works Association Standards and the following design criteria:

1. If required by DES, detailed design calculations shall be submitted to substantiate line sizes and to demonstrate that the minimum pressure of 20 psi, as stated in 12VAC5-90 of the Virginia Administrative Code, shall be met for average daily demands, peak hourly demands, and maximum daily demand plus fire flow. The final size of all water mains and appurtenances shall be determined by DES.
2. The hydraulic conditions at the points of proposed connection of the existing Arlington County water system shall be defined. DES shall provide the hydraulic conditions at the node closest to the point of connection (i.e., fire flow test results). The designer of the proposed water system shall model the water system network starting from the node of the water system for which Arlington County has supplied the starting hydraulic conditions. Requests for computer modeling or fire flow test information shall be addressed to DES. The request for computer modeling shall include a sketch plan indicating the location of proposed development, size of building, type of occupancy, number of occupants, estimated average daily demand, maximum daily demand, peak hourly demand and fire flow demand based on the Arlington County Fire Prevention Code requirements for all buildings within the proposed development. Required fire flow calculations shall be provided on the cover sheet of the approved plans.
3. Water mains shall be 8-inch diameter minimum (unless otherwise approved by DES) and shall be looped wherever possible. Dead end mains shall not exceed 600 feet without approval from DES and shall have blow-offs or fire hydrants for flushing. No flushing device shall be directly connected to any sewer.
4. Water mains shall be located in street right of way and 7 feet off of face of curb wherever possible. The water main shall extend the full frontage of the property being served unless directed otherwise by DES. Water mains shall not be located longitudinally under walks. Water mains, water meters, fire hydrants and blow offs shall be publicly maintained and as such shall be installed within recorded easements on private property when locations in public right of way are not possible. Such easements, measuring 20 feet in width, shall be recorded prior to final approval and issuance of building permits.
5. Water mains shall have a minimum cover of 4 feet measured from the top of pipe to the proposed finished grade directly above the waterline; however, 3 feet minimum cover may be used for short distances to avoid utility conflicts and excessive depth of water main. Mains shall be laid on continuous grades to avoid sags or crests in the line.
6. The minimum clear horizontal separation between water mains and sewer mains or sewer manholes shall be 10 feet (conforms to VDH Waterworks Regulation 12 VAC 5-590-1150). When local conditions prevent a minimum horizontal separation of 10 feet between water mains and sewer mains or sewer manholes, a closer separation may be allowed provided that:
    a. Sewer manholes shall be of watertight construction and tested in place.
    b. The bottom (invert) of the water main shall be a minimum of 18 inches above the top (crown) of the sewer. The water main and sewer pipes shall be kept in separate trenches. Where minimum vertical separation cannot be obtained, the sewer shall be constructed of ductile iron pipe and pressure tested in place without leakage prior to backfilling.

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7. No water mains shall pass through or come in contact with any part of a sewer manhole.
8. Water mains crossing over sewers shall be laid to provide a minimum vertical separation of 18 inches between the top of the sewer and the bottom of the water main. If local conditions prevent this, the water main shall be relocated to provide the separation directed by the Project Officer, or the sewer shall be constructed of ductile iron pipe pressure tested in place without leakage before backfilling and with no joint of the sewer closer than 8 feet of the water main.
9. Water mains crossing under sanitary sewers shall be protected by the following provisions:
    a. A minimum vertical separation of 18 inches between the top of the water main and the bottom of the sewer.
    b. Sewer shall be constructed of ductile iron pipe, pressure tested in place without leakage before backfilling.
    c. Adequate structural support for the sewer to prevent excessive joint deflection and the settling on and breakage of the water main. Refer to Standard Drawing M-7.0.
    d. One length of the water pipe shall be centered at the point of crossing so that the joints are equidistant and as far as possible from the sewer.
10. Water mains crossing over surface waters shall be adequately supported, protected from freeze damage, accessible for repair or replacement, and above the 100-year flood elevation.
11. Water mains crossing under surface waters shall be protected by the following provisions:
    a. The pipe shall be of special construction, having flexible watertight joints.
    b. Valves shall be provided at both ends of the water crossing so that the section can be isolated for tests or repair; the valves shall be easily accessible and not subject to flooding.
    c. Sample taps shall be available at each end of the crossing at a reasonable distance from each side of the crossing and not subject to flooding.
    d. Permanent taps shall be made for testing and locating leaks.
12. The minimum clear horizontal separation between water main and utilities other than sanitary sewer shall be 5 feet (see 3.1.A.6 for separation between water main and sanitary sewer).
13. The minimum vertical clearance between water main and utilities other than sanitary sewer shall be 1.0 foot, unless provisions to prevent damage to the underlying utility are detailed for approval by DES.
14. The minimum horizontal separation between water main and buildings or other structures shall be provided as follows:
    a. Ten feet for water mains less than 16 inches and 10 feet or less in depth.
    b. Fifteen feet for water mains 16 inches and larger or all mains in excess of 10 feet in depth.
15. Valves shall be provided on all mains at major intersections and on branch mains at minor intersections. Four valves are required at crosses and three at tees unless otherwise approved by DES. Line valve spacing shall be 500 feet maximum for water mains 12 inches and smaller and as determined by DES for mains larger than 12 inches. Valve boxes shall be set and adjusted flush with the roadway surface. Where valves boxes are located in off street areas they shall be set flush in a 2’ x 2’ x 6” concrete pad.
16. Automatic air release valves shall be installed on water mains according to the following provisions (conforming to VDH Waterworks Regulation 12-VAC 5-590-1160):
    a. Air release valves shall be located at "strategic" high points as directed or approved by DES.
    b. Refer to the standard drawings for air release valve settings.
    c. Air release valve and piping shall be two inches unless directed or approved otherwise by DES.

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d. Air release valves shall not be located in areas subject to flooding or high water table. In cases where such locations cannot be avoided, sump pumps and special vent piping shall be required as directed by DES.
e. Tapping saddles shall be used.
f. Chambers containing air release valves shall not be connected directly to any storm drain or sanitary sewer, nor shall air release valves be connected directly to any sewer. Chambers shall be drained to the surface of the ground where they are not subject to flooding by surface water or to absorption pits located above the seasonal groundwater table elevation. Sump pumps may be used where other means are not practical.

17. Water meters shall be located in the utility strip or just behind the curb and a minimum of 5 feet clear of driveways and other vehicular traffic areas. A clear space 5 feet by 5 feet shall be permanently provided for 2 inch and smaller water meters. A clear space 20 feet by 15 feet and 10 feet deep shall be permanently provided behind the curb for 3- and 4-inch water meter vault installations. A clear space 25 feet by 20 feet and 10 feet deep shall be provided for 6-and 8-inch meter vault installations. Water meters sizes greater than 8-inches shall be approved by DES.
18. No water service taps shall be made without special approval from DES in transmission mains 16 inches and larger.
19. Backflow prevention devices shall be installed at each service connection to a consumer's water system when specified by the Arlington County Department of Community Planning, Housing & Development (DCPHD) - Inspection Services Division that a potential health, pollution or system hazard to the waterworks exists. Refer to the Arlington County Cross Connection and Backflow Prevention Control Ordinance for more information.
20. All plans and specifications for construction of proposed water distribution facilities must be approved by DES. No water distribution facility shall be constructed without approved plans, shop drawings and construction cut sheets.
21. All existing segments of water main to be cut and capped shall be strapped or thrust blocked as directed by DES.
22. Blow offs for water mains shall be provided at all “strategic” low points and all terminal points. Fire hydrants may be used in lieu of blow offs as directed by DES. Blow offs shall be installed in meter boxes and located behind the curb line and clear of driveways and other vehicular traffic areas (refer to Standard Drawing W4.0).

3.2 Fire Protection Requirements

A. Waterworks systems shall be designed to deliver a minimum residual pressure of 20 psi with fire flow requirements and maximum daily demands applied to the system. Applicable fire flow shall be selected based on the requirements of Appendix B of the Arlington County Fire Prevention Code. The required fire flow may be reduced by up to 75% for buildings protected throughout with automatic sprinkler systems complying with the requirements of the Virginia Uniform Statewide Building Code, but in no case shall the flow be less than:

1. One and Two-family dwellings - minimum exposure distances of:

less than 10'	1,500 – 2,000 gallons per minute (gpm)
10' - 30'	1,000 – 1,500 gpm
greater than 30'	1,000 gpm

2. Other than One and Two-family dwellings: 1,500 gpm

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B. Fire Hydrants

1. Fire hydrants shall be located behind the curb line in accessible areas. Maximum spacing shall be 500 feet in residential areas and 300 feet in commercial and high-density areas.
2. Building siamese fire line connections shall be located within 75 feet of fire hydrants or as approved by the Arlington County DCPHD - Inspection Services Division.
3. Actual fire hydrant locations are subject to approval by the Arlington County Fire Marshal and DES.
4. Fire hydrants shall not be installed on lines less than 8 inches in diameter or on lines not adequately sized to carry fire flows. Installation of fire hydrants on 6-inch water mains may be approved in special cases as determined by DES.
5. Connect hydrants to the water main with a minimum 6-inch ductile iron branch controlled by an independent gate valve. Hydrants shall stand vertically plumb with the center of the 4-inch pumper nozzle a minimum of 18 inches above the top of curb on streets with curb and gutter or a minimum of 18 inches above the elevation of the edge of the shoulder on streets without curb and gutter. Provide vertical offsets or bends as required to set hydrants at proper grade. The maximum bury depth shall be 6 feet.
6. No plantings or erection of other obstructions shall be made within 5 feet of any fire hydrant.
7. All hydrants, fire line valves and fittings shall be strapped or thrust blocked as approved by DES (refer to Standard Drawing W-7.0).
8. Drainage fill shall be provided to prevent the ponding of water around hydrants.
9. Fire hydrants shall be installed five feet from the point of curvature of curb returns or at the property line between properties in subdivisions or other areas where fire hydrants are installed between intersections.
10. Fire hydrants shall be drained to dry wells provided exclusively for this purpose.
11. Fire hydrants shall not be located in areas subject to high groundwater, flooding, contaminant or pollutant spills, or in areas where surface water ponds. If there exist no alternative location, weep holes on the hydrant shall be plugged and the hydrant shall be marked for seasonal dewatering or the weep hole drainage shall be piped to daylight with the pipe end screened.
12. Fire hydrants shall be placed so that the top operating nut is a minimum of 18 inches and a maximum of 2 feet back from the face of curb unless otherwise directed by the Arlington County Fire Marshal or DES.
13. Fire hydrants shall be installed within recorded easements on private property when locations in public right of way are not possible.

3.3 Minimum Requirement for As-Built Plan

A. Prior to acceptance of water mains and appurtenances, the Contractor shall submit to the Project Officer all As-Builts Drawings as required in Section 01720 of these specifications. Such submittals shall be made prior to Request for Final Payment. As-Builts shall include a certification from a Licensed Surveyor or Licensed Engineer that the plans as drawn indicate actual construction. The As-Built Drawings shall include, but are not limited to, the following:

1. Changes in valve and fire hydrant locations.
2. Horizontal line changes and/or location of water main appurtenances changes.
3. Any changes in water main profiles greater than 6-inches.
4. Actual materials, limits of mechanical joint restraints and location of reaction blocking used on the project.

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5. Water main to meter distances and locations of all water service meters and water service lines.
6. Show actual location, depth or elevation, type and size of all utility crossings.
7. Provide a minimum of two (2) swing ties to all valve boxes and permanent blow offs from fixed permanent objects visible above snow cover such as fire hydrants, utility poles or building corners. Swing ties shall cross as near to ninety degrees as practical for each valve box and blow off located.

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3.4 Construction Standards

A. Laying Pipe

1. Use proper and suitable tools for the safe handling and laying of pipes and fittings. Prevent fitting linings and coatings from being damaged; damaged pipe shall be replaced or repaired to the satisfaction of the Project Officer.
2. Unless indicated otherwise, the depth of trench shall be sufficient to provide a minimum cover over the top of the pipe of 4.0 feet from the existing or proposed ground surface and to avoid interference of the pipeline with other utilities. Install pipe on continuous grades, as indicated on plans, to avoid sags or crests in the line.
3. The cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner, without damage to the pipe, so as to leave a smooth end at right angles to the axis of the pipe. Outside edge of cut pipe shall be beveled and smoothed to avoid damage to the gasket. Avoid damage to the lining. Do not flame cut cast iron pipe with oxyacetylene torch.
4. Thoroughly clean pipes and fittings before they are laid.
5. Carefully lower pipe fittings into trench. Butt ends of pipe against each other in such a manner that there shall be no shoulder or unevenness on the inside of the pipe.
6. Ensure that pipe is well bedded on a solid foundation as shown in the standard details. Correct any defects due to settlement. Excavate bell holes sufficiently large to ensure making proper joints. Exercise precautions to include the furnishing and placing of aggregate to prevent any pipe from resting directly on rock. Rock found in trench shall be removed to provide a clearance of at least six inches below and on each side of all pipe, valves and fittings and shall be replaced with select fill.
7. Iron pipe shall be jointed in full accordance with AWWA Standard C600, the manufacturer's recommendations and the following requirements:
    a. Push-on joints shall be thoroughly cleaned. Brush-coat gasket retaining groove with approved gasket lubricant and insert the rubber gasket in the bell socket. Apply a thin film of approved gasket lubricant to the exposed gasket surface. Clean and center the spigot end of the pipe into the socket complete the joint by forcing the spigot end to the bottom of the socket.
    b. Mechanical joints shall be thoroughly cleaned. Lubricate the gasket and spigot. Place the gland on the spigot end, followed by the gasket, and the pipe end seated and centered in the socket. The gasket shall then be seated in the sockets, gland moved into position and bolts and nuts loosely assembled by hand. Tighten with a wrench.
8. At the close of work each day, close end of the pipeline with an expansion stopper so that no dirt or other foreign substance may enter the line. Keep this stopper in place until pipe laying is resumed.
9. Remove and replace all defective materials at no additional cost to the County.

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B. Connections to Existing Mains

1. Notify the Project Officer two (2) working days prior to scheduling work on existing water mains (notify Project Officer on Thursday before proposed Monday work). No connections shall be scheduled for the day before weekends and holidays. Connect new water mains to the existing mains as shown on the drawings. Verify the location, type of pipe and size of the existing main well in advance of any work on the connection. The Contractor shall give DES at least five (5) days' notice of the need to shut down existing water mains so that DES may give advanced notice to the affected customers. Shutdowns in service, where permitted, and operation of any valves on the existing system shall be done only by DES. To minimize shutdown time, connections to water lines shall be made by the Contractor only after complete preparations for such work have been done to the satisfaction of the Project Officer.
2. Reaction backing at connections to existing mains shall be made with high early strength concrete. In the event that line pressure must be restored less than 48 hours after the placement of reaction backing at these connections, provide temporary deadman and/or similar devices as required to maintain stability of the water mains.

C. Installing Valves and Fittings

1. Install valves, fittings, and caps to pipe in the manner herein before specified for laying pipe. Provide valve boxes for each buried gate valve. Boxes shall not transmit shock or stress to the valve. Center and plumb boxes over the operating nut of the valve, with the box cover flush. Valves shall be strapped to adjacent fittings unless directed otherwise.
2. Inserting valves and tapping sleeves and valves shall be installed in accordance with the valve manufacturer's recommendations. Test pits shall be dug by the Contractor to determine type and size of existing pipe and suitability of tapping location on the pipe.

D. Thrust Restraint

1. Provide caps, tees, bends and inserting valves in water mains with reaction backing and mechanical joint restraints except where tie rods are specified or indicated. Reaction backing shall consist of concrete thrust blocks as shown on the Standard Details. Valves for connections to future lines, fire hydrants and related valves, and other fittings or valves so indicated shall be anchored by steel rods protected by two coats of acid-resisting asphalt paint.
2. The use of reaction backing may be waived in the sole discretion of DES if the designer provides calculations to indicate an adequate number of joints are restrained in proximity to caps, tees, bends and inserting valves. The limits of restraints shall be indicated clearly on the approved plans.
3. Concrete thrust blocks shall be installed per the requirements for cast-in-place concrete in Section 03100 of these Specifications and DES Standard Details.

E. Water Service Connections

1. Water meters, including taps, pipe fittings, meter box, and accessories from the water main through the meter, shall normally be furnished by, and installed by, Arlington County after payment of the appropriate fee. Connections from the meter installation to the building shall be installed by the Contractor.
2. For water meters installed as part of a contract, the taps, pipe fittings, meter box and accessories from the water main to the existing building service line, shall be furnished and installed by the Contractor. Water meters will be provided by the County.
3. For water meters relocated as part of a contract, the taps, pipe fittings, meter box and accessories from the water main to the existing building service line, shall be furnished and installed by the Contractor. The existing meters shall be re-installed in the new housing

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location. The Contractor shall clearly photograph the existing meter reading prior to and immediately after the relocation and submit the photographs to the Project Officer.

4. The Department of Environmental Services shall approve all water meter locations. Water meters shall be located in the utility strip or just behind the curb within public right-of-way or recorded easements and a minimum of 5 feet horizontally clear from other utilities, structures, or trees.
5. The Contractor shall assume complete responsibility for the installation, adjustments and any damage that may occur until final acceptance of the project.
6. New water mains shall pass all acceptance testing procedures before the installation of water service connections.
7. All services shall be installed by wet tap only. Service taps shall be located at the 10:00 and 2:00 position on the water main. Maintain a minimum of 12 inches between taps. Direct taps are allowed for 1-inch connections. Use approved saddles for 1 ½-inch and 2-inch connections.
8. Water service lines shall have a minimum of three feet of cover and shall be approved by the Project Officer, from the main to the meter prior to backfilling. Meter settings for 1-inch to 2-inch services shall be a minimum of 18-inches and a maximum of 24-inches below the meter box cover. Meter box covers shall be painted black with an exterior type of rust resistant enamel.
9. Where specified that Contractor shall install the water service, meter boxes, meter box covers, corporation stops, angle valves, yoke ells, yoke bars and all other appurtenances (except the water meter) necessary for a complete installation shall be provided in accordance with the approved plans, specifications and requirements of DES.

F. Abandoning Existing Water Mains

1. Drain and abandon existing water mains not required in the completed system. Abandoned mains and appurtenances that conflict with proposed construction shall be removed as required. Abandoned mains not removed shall be capped or bulk headed at all open ends.
2. Valves to be abandoned shall be removed along with the valve box, or if abandoned in place, the valve box shall be removed, and the resulting void shall be stabilized via use of flowable fill or other approved means to avoid any future settlement.
3. Cut and cap the existing water mains to remain in service at the locations indicated on the drawings and provide with thrust block. Keep the length of pipe removed to the minimum necessary for installing the cap and concrete blocking. A cap shall be placed over the end of the pipe to be abandoned. The concrete thrust block shall be placed to bear against undisturbed ground. After this work has been completed, the capped line shall not be recharged unless so directed by the Project Officer.
4. Existing fire hydrants not required in the completed system shall be carefully removed, cleaned and transported to the County storage yard. Cap and anchor hydrant lead as close as possible to its control valve with concrete thrust block and tie rods if main is to remain in service.
5. Existing water services shall be discontinued by DES unless a written request is provided to DES for the temporary use of the service during construction. Water meter boxes and vaults shall be removed by the Contractor. Water meters shall be removed by DES as required. No credit or allowance shall be given for discontinued water services.

G. Disinfection of Water Mains

1. When each pipe length has been placed and shut off, disinfect each section of the water main. Provide all labor, materials and equipment to perform the disinfection operations in compliance with all state and local regulations. Disinfection shall conform to AWWA C601 and C51 requirements.

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2. Water for disinfection, flushing and testing shall be furnished to the Contractor from the existing water system at no charge to the Contractor. Schedule water usage with the Project Officer to result in a minimum interference to water service throughout the existing water system. Temporary connections to the existing water system shall be provided and removed by the Contractor and shall include approved means to prevent backflow and possible contamination of the existing water system. Temporary taps for removing air and flushing the main shall be provided by the Contractor as necessary.
3. Disinfection of the water main shall be accomplished in the following manner:
    a. Preliminary Flushing of Mains: All mains shall be flushed prior to disinfection except when the tablet method of disinfection is used. The mains shall be flushed at a minimum velocity of 3 feet per second and all points in the main shall receive a minimum of five (5) consecutive minutes of flushing at this velocity, until the water runs clear.
    b. Form of Chlorine to be Used: Liquid chlorine, calcium hypochlorite or sodium hypochlorite may be used for disinfection. Liquid chlorine shall be used only when approved by the Project Officer. Calcium hypochlorite and sodium hypochlorite shall be added to water to form a chlorine water solution before being used.
    c. Methods of Application: The chlorine shall be applied by continuous feed method or by the tablet method only (slug method shall not be used). The application shall be performed as follows:
        1) Continuous Feed Method: Potable water shall be introduced into the pipe line at a constant flow rate. Chlorine shall be added at a constant rate to this flow so that the chlorine concentration in the water in the pipe is at least 50 mg/L. The chlorinated water shall remain in the pipe at least 24 hours, after which, the chlorine concentration in the water shall be at least 10 mg/L.
        2) Tablet Method: Tablet method shall not be used if trench water or foreign material has entered the main or if the water is below 5oC (41oF). Tablets are placed in each section of pipe and also in hydrant branches and other appurtenances. A sufficient number of tablets shall be used to ensure that a chlorine concentration in the water in the pipe is at least 25 mg/L. The tablets shall be attached by an adhesive to the top of the pipe sections and crushed or rubbed in all appurtenances. The adhesive shall be acceptable to the Virginia Department of Health (VDH). When installation has been completed, the main shall be filled with water at a velocity of less than one foot per second. The water shall then remain in contact with the pipe for at least 24 hours.
4. Contact Period: The chlorinated water shall be retained in the main for at least 24 hours during which time all valves and hydrants, in the section treated, shall be operated in order to disinfect the appurtenances. The tests for chlorine residual shall be made by the Contractor in the presence of the Project Officer . The Contractor shall install corporation cocks and copper tubing for the tests at the locations indicated by the Project Officer.
5. Flushing and Discharge: The Contractor shall be solely responsible for the disposal of all chlorinated water in accordance with these Specifications and with all applicable Local, State, and Federal regulations and permits.

H. Hydrostatic Testing
1. Pressure tests shall conform with Section 4 of AWWA Standard C600.
2. The water mains shall be tested for leakage by the Contractor at his own expense in the presence of the Project Officer. All tests shall be conducted in a manner to minimize any interference with the Contractor's work or progress. A maximum of 2,000 linear feet of water main may be tested at one time.

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3. The Contractor shall notify the Project Officer when the work is ready for hydrostatic testing and tests shall be taken soon thereafter as practicable under the direction of the Project Officer. Personnel for reading meters, gauges or other measuring devices shall be furnished by the Project Officer, but all other labor, equipment, water and materials, excluding meters and gauges, shall be furnished by the Contractor.
4. The water mains, including all appurtenances, shall be tested as a whole or in sections, valved or bulkhead at the ends. Test piping under a hydrostatic pressure of 200 psig unless shown otherwise on the approved plans. Testing shall not be conducted against existing valves. Apply pressure to the piping after it has been purged of air. Maintain water pressure for a minimum of two hours. The test pressure shall not vary by more than 5 psi during the test. Testing procedures shall be in accordance with AWWA Standard C600 with the exception that in no case shall the measured leakage exceed 10 gallons/ inch of diameter/mile/day.

I. Final Flushing
1. All water mains shall be flushed after the acceptance of the hydrostatic test and before bacteriologic testing. The water mains shall be flushed at the highest flow possible through hydrants and/or blow-offs. The operation of any valves on the existing water system shall be done only by DES. Water discharged to the environment, storm, or sanitary sewer system shall be done in accordance with these specifications and all applicable regulations.

J. Bacteriologic Test
1. After chlorination, hydrostatic testing and final flushing, and before the water main is placed in service, samples shall be collected from the main and tested for enteric bacterial contamination and shall show the absence of coliform organisms. At least two (2) sets of consecutive satisfactory bacteriological samples shall be obtained from the distribution system before the system can be placed into service.
2. Samples shall be collected in one of the following manners:
   a. At all accessible locations not exceeding 1,200 feet apart in the line downstream from where the pipe was filled with water. After the initial samples are taken, resample after 16 hours.

   -OR-

   b. At all accessible locations not exceeding 1,200 feet apart in the line downstream from where the pipe was filled with water. Allow main sit for 16 hours without water movement, then take first set of samples with a second set of samples after a 15-minute waiting period.
3. Samples shall be taken through the use of sample tap consisting of a corporation cock and copper tube or through other accessible appurtenances on the main. Samples shall be collected by a representative of the testing laboratory.
   a. All bacteriological sampling and testing shall be conducted by a state certified laboratory. If the initial disinfection fails to produce satisfactory samples, disinfection shall be repeated until satisfactory samples have been obtained. After each group of samples is taken, the Contractor shall submit in writing to the Project Officer a copy of the report stating the results of the tests.

K. Repairs: Cleaning, disinfecting, flushing, testing, or similar operational actions shall be in accordance with the most current standards issued by AWWA (AWWA C-601).

L. Discharge of chlorinated water

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1. The contractor shall be responsible to handle, discharge, and dispose chlorinated water in compliance with all regulations, including the County's Municipal Separate Storm and Sanitary Sewer (MS4) Permit.
2. No potable water shall be discharged to the environment or the storm sewer system until complete dichlorination has been achieved.
3. Contractor shall be responsible to identify, implement, and monitor appropriate dichlorination methods which comply with all applicable regulations.
4. Contractor shall conduct testing on-site to confirm that chlorine has been removed from any water discharged to the environment or storm sewer.
5. Contractor shall take care to ensure that any discharge of dechlorinated water to the storm sewer or environment does not create any adverse impacts to the environment or infrastructure, such as erosion, or water volumes, temperatures, or velocities which adversely affect existing aquatic or terrestrial life in the receiving bodies.
6. Super chlorinated water which has been used to disinfect the system, or any water which exceeds the generally prevailing chlorine concentration in the system (measured as less than 4 mg/L), shall be discharged to the sanitary sewer system after submittal and approval of a discharge plan. The discharge plan shall be submitted in accordance with Section 01300, and shall document at a minimum:
   a. the receiving sanitary sewer manhole,
   b. the anticipated rate and duration of discharge,
   c. plans to prevent any hydraulic connection between wastewater and the water distribution system (backflow prevention or an adequate air-gap),
   d. listing of methods and equipment to be used,
   e. accommodations to maintain vehicular and pedestrian traffic during the operation.
7. Discharge of water to the sanitary sewer shall not exceed 200 gallons per minute.
8. Discharge of water to the sanitary sewer shall not occur without the Project Officer present, and shall be conducted only after careful disinfection of all components connected to the water system.
9. At all times during discharge of water to the sanitary sewer system, the Contractor shall have personnel monitoring the discharge into the sewer to ensure there is no cross-connection and that there are no adverse impacts upon the water or sanitary sewer system.
10. If an adequate sanitary sewer facility is not available, the discharge plan may require use of a tanker truck to collect and dispose of the water in a sanitary sewer.

M. Unless otherwise directed, Contractors are expressly prohibited from operating any water valves or appurtenances. Contractors shall submit all requests for valve operations to the Project Officer at least 3 working days in advance of the required operation.

N. In the event of a water or sewer emergency, the Contractor shall immediately notify the County's Water Control Center at 703-228-5555 and the Project Officer

PART 4 - MEASUREMENT AND PAYMENT

4.1 Water Mains

A. Water mains for the various type, classes and sizes shown on the bid proposal shall be measured in linear feet along the pipe center line, regardless of depth, and shall include the length of fittings and valves. Payment shall include excavation, standard bedding, backfill, pipe, thrust restraint, fittings, laying of pipe, disinfection, flushing, erosion and sediment control, support of existing

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utilities, certification, testing, dewatering, restoration of roadways as shown in Standard M-6.1, all other restoration, trench maintenance, abandoning and/or removing existing mains and appurtenances as required and all other work necessary to prove a complete water main installation in compliance with the Construction Documents.

4.2 Valves

A. Valves shall be measured as each, by size and type. Payment shall include demolition. excavation, bedding, backfill, restoration, disinfection, certification, extension stems, thrust restraint, valve box and paved collar as required.

4.3 Fire Hydrants

A. Fire hydrants shall be measured as each. Payment shall include the hydrant and elbow, demolition, excavation, bedding, drainage gravel, thrust protection, backfill, restoration of roadways as shown in Standard M-6.1, all other restoration, disinfection, and certification.

4.4 Existing Fire Hydrants – Removed

A. Existing fire hydrants removed shall be measured as each. Payment shall include demolition, excavation, sheeting, shoring, backfilling, restoration of roadways as shown in Standard M-6.1, all other restoration, dewatering, removing, cleaning, capping hydrant branch, concrete thrust block and tie rods, joint restraint and testing of the cap.

4.5 Blow offs

A. Blow offs shall be measured as each by size. Payment shall include excavation, bedding, pipe, fittings, gate valve, adaptor, cap, meter box, frame and cover, service clamp, corporation stop, backfill, restoration of roadways as shown in Standard M-6.1, all other restoration and other incidental work to complete the installation.

4.6 Connections to Existing Water Mains

A. Connections of new water mains to existing water mains (except connections made with tapping sleeves and valves) shall be measured as each. Payment shall include test pits, excavation, backfill, restoration of roadways as shown in Standard M-6.1 and all other restoration, sleeves, dewatering, cutting, thrust restraint, and other work required to make the connection.

4.7 Tapping Sleeves and Valves

A. Tapping sleeves and valves shall be measured as each, by size. Payment shall include test pits, excavation, bedding, tapping, sleeve, valve, valve box, thrust restraint, backfill, restoration of roadways as shown in Standard M-6.1 and all other restoration.

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4.8 Inserting Valves

A. Inserting valves shall be measured as each, by size. Payment shall include test pits, excavation, bedding, thrust restraint, installation, valve, valve box, backfill, restoration of roadways as shown in Standard M-6.1 and all other restoration.

4.9 Air Release Valves

A. Air release valves shall be measured as each. Payment shall include the entire setting, excavation, tapping, bedding, nipples, piping, fittings, corporation cock, gate valves, air release valve, manhole, manhole steps, frame and cover, backfill, restoration of roadways as shown in Standard M-6.1 and all other restoration.

4.10 Cutting and Capping Water Main to Remain in Service

A. Cutting and capping the water main to remain in service shall be measured as each, by size. Payment shall include excavation, cutting, capping, disinfection, restraints, backfill, restoration of roadways as shown in Standard M-6.1, and all other restoration

4.11 Water Service Connections

A. Water Service Connections shall be measured as each, by size. Payment shall include excavation, provision of all materials, backfill, restoration of roadways as shown in Standard M-6.1 and all other restoration. The County shall provide the water meter at no cost for service relocations.

B. Water Service Relocations shall be measured as each, by size. Payment shall include excavation, provision of all materials, backfill, restoration of roadways as shown in Standard M-6.1 and all other restoration, and photo documentation of the existing meter reading before and after relocation. If the Project Officer deems the existing meter is unsuitable for relocation, the County shall provide a new water meter at no cost

END OF SECTION 02550

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SECTION 02580 - ELECTRICAL UNDERGROUND DUCTS

PART 1 - GENERAL

1.1 Description of Work

A. This work shall consist of furnishing and installing all the necessary equipment and services to existing power customers that are currently served by aerial service lines which are to be converted to underground power services. Work includes coordination with Dominion Energy, Arlington County and residents/business owners/property owners that are affected by the conversion of overhead power services to underground power services.

B. All existing electrical service(s), shall be maintained during the construction period until the new service has been installed and tested, ready for operation. After new service has assumed the building's entire power load, the existing service(s) shall be removed.

1.2 Related Work Specified Elsewhere

A. Section 02100- Clearing and Grubbing

B. Section 02200- Earthwork

1.3 1.3 Applicable Standards and Specifications

A. Utilities (Chapter 26 of the Arlington County Code)

B. Underground Utility Protection Ordinance (Chapter 55 of the Arlington County Code)

C. Erosion and Sediment Control (Chapter 57 of the Arlington County Code)

D. Dominion Energy Blue Book – latest edition

E. Virginia Soil and Water Conservation Commission Erosion and Sediment Control Handbook

1.4 Submittals

A. Construction work shall not commence until the schedule of work and the methods of operations have been reviewed and approved by the Engineer / Project Officer.

1.5 Permits

A. The Contractor is responsible for complying with all applicable State, Federal, and Local permits which are required for construction. The contractor is also responsible for any inspection fees.

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1.6 All equipment, materials and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these specifications.

A. All equipment and material shall be listed by Underwriter's Laboratories, Inc. (UL) for their intended use and shall bear the UL Label.

B. Equipment shall be constructed in accordance with the National Electrical Manufacturer's Association (NEMA) standards.

C. All electrical work specified under this Section of these Specifications shall conform to the requirements of the electric utility company.

D. The grounding systems shall comply with the National Electrical Code (NEC).

PART 2 - PRODUCTS

2.1 Materials shall be at the Contractor's option with the approval of the Engineer/Project Officer in accordance with these specifications.

2.2 Primary electrical service shall be provided and installed by Dominion Energy.

PART 3 - EXECUTION

3.1 The Contractor shall disconnect and remove the existing meters and wiring for the existing service(s). Contractor shall coordinate removal of existing meter with Dominion Energy

3.2 The Contractor shall install the new meter bases(s) provided by Dominion Energy.

3.3 The Contractor shall extend Dominion Energy's conduit(s) (installed to the building by Dominion Energy) into the new meter(s).

3.4 The Contractor shall furnish and install a new disconnect(s) next to the meter(s).

3.5 The Contractor shall disconnect and remove the existing meters and wiring for the existing service(s). Contractor shall coordinate removal of existing meter with Dominion Energy

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3.6 The Contractor shall install the new meter bases(s) provided by Dominion Energy.

3.7 The Contractor shall extend Dominion Energy's conduit(s) (installed to the building by Dominion Energy) into the new meter(s).

3.8 The Contractor shall furnish and install a new disconnect(s) next to the meter(s).

3.9 The Contractor shall furnish and install wiring to connect the meter(s) to the disconnect(s) and the to the existing electrical panel(s) located inside the property owner's building.

3.10 Conduits for the secondary electrical service shall be installed a minimum thirty-sixtwenty-four (3624) inches below grade, or as required by the electrical utility company.

3.11 The Contractor shall make all necessary final arrangements with the electric utility company for the installation of the permanent underground electrical service.

3.12 The Contractor shall coordinate all scheduling of the installation with the electric utility company.

3.13 The Contractor shall make all necessary final arrangements with electric utility company for the phased removal of the existing electrical service(s) and associated equipment.

3.14 The Contractor shall coordinate with the property owner(s) for the installation of the secondary electrical service as well as the connection to the property owner(s) electrical panel(s).

3.15 Minimum Requirements for As-Built Drawings

A. Contractor shall provide horizontal and vertical location of all ducts, vaults, transformers, meters, switches, terminal poles, junction boxes, and other such equipment or facilities associated with the construction of underground duct banks.

B. Contractor shall mark deviations on the plan and provide any field revisions or deviations from the design on the as-built drawings.

C. Contractor shall indicate the sizes of electrical vaults and provide survey information as to the as-built location of each outside corner of the vault including top and bottom elevation of such vaults.

D. Contractor shall note which conduit ducts contain electrical conduit including the size of wire and which conduits are empty or spare.

E. For those conduits encased in concrete the contractor shall note the width and depth of the exterior dimensions of the encased concrete around the conduits.

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PART 4 - MEASUREMENT AND PAYMENT

4.1 Secondary Underground Electric Services as indicated in the bid line item shall be paid in lump sum. Payment shall include furnishing all labor, tools, equipment, materials, coordination and incidentals to complete the underground electrical services.

4.2 No separate payment shall be made by the County for changes to the plans which are the result of the Contractor's work schedule or resource allocation, weather delays, or other factors not controlled by the County.

4.3 Testing, travel, parking, reimbursable items are considered incidental to the work and no payment will be made by the County for these items.

END OF SECTION 02580

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SECTION 02581 - COMMUNICATION UNDERGROUND DUCTS

PART 1 - GENERAL

1.1 All electrical conduit formations shall be constructed to the latest Dominion Energy Standards. Where the plans and the standards conflict, the standards shall take precedence. These standards are published in the Virginia Power Distribution Construction Manual in the applicable sections related to Conduit, Ducts and Risers sections; Pad section, Grounding section and Vaults, Manholes, Splicing Boxes and Overhead Distribution. For Dominion Virginia Power Conduit Specifications, see appendices on this Bid Documents.

1.2 All telephone conduit formations shall be constructed to the latest Verizon Communications standards. Where the plans and the standards conflict, the standards shall take precedence.

1.3 Inspection and monitoring of work: The contractor shall provide 72 hours prior notice for inspection and approval of duct bank installation with the Project Officer or his duly authorized representative in accordance with this contract. All electrical duct layouts shall be visually inspected by a Dominion Virginia Power representative prior to concrete encasement. All telephone duct layouts shall be visually inspected by a Verizon representative prior to concrete encasement.

1.4 Overhead utility lines and utility poles shall be relocated or abandoned by the utility owner or designated Contractor.

1.5 Related Work Specified Elsewhere

A. Section 01310 – Project Management and Coordination

B. Section 02200 - Earthwork

C. Section 02650 – Restoration of Roadways

D. Section 03400 - Precast Concrete

E. Section 04200 - Masonry Units

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PART 2 - PRODUCTS

2.1 All materials shall be the exact same as those specified in Verizon Communication's or Dominion Virginia Power's current design standards unless a substitution is approved in writing.

2.2 The name, address and telephone of all conduit suppliers used by the contractor shall be furnished as a shop drawing. A product information sheet containing the material type, lot number and manufacturing standard for each different type of conduit used shall also be furnished as a shop drawing.

2.3 Concrete mix design for encasing concrete shall be furnished as a shop drawing. In lieu of mix design submission, three test cylinder compressive strength test results for each day pour, cured for 27 days may be substituted for mix design submittals, upon written approval from the County.

2.4 The Contractor is advised that Dominion Virginia Power will furnish the following items "at no cost" to the Contractor:

A. All manhole frames and covers

B. Transformer Pads

C. Switch Pads

D. All "marker balls"

The Contractor shall be responsible for the pick-up and delivery of all items furnished by Dominion from the Dominion Virginia Power material yard located at 907 W. Glebe Road, Alexandria VA. 22305 and for storage on the project site.

2.5 The Contractor shall be responsible for the pick-up and delivery of any items furnished by Verizon. The Contractor must contact Verizon's Development Liaison to make these arrangements. The Development Liaison must be notified at least 4-weeks in advance of the requested pick-up date.

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PART 3 - EXECUTION

3.1 Work shall be performed in accordance with the latest version of the applicable Verizon, Dominion Virginia Power, VDOT, and Arlington County Standards.

3.2 Before excavation in paved areas, the contractor shall saw cut a neat, smooth, and true line through the pavement to a depth of at least six-inches. The pavement shall be removed from the trench area to prevent damage to the surrounding pavement.

3.3 Obstructions encountered in conduit construction that cannot be economically relocated shall be bypassed either by splitting or offsetting the conduit line, or by going over or under the obstruction. The method of bypassing the obstructions shall be decided solely by the Project Officer and shall be performed at no extra cost beyond that included in the unit prices established in the contract. When a conduit structure employing a concrete envelope is split, each portion shall be encased in concrete and the intervening space backfilled with compacted select material. However, approval of the Dominion Virginia Power or Verizon engineer is required before using this method. The diverging of the ducts shall start a minimum of eight (8) feet before the obstruction and return to a normal duct bank a minimum of eight (8) feet beyond.

3.4 When the conduit line is completed, all ducts shall be rodded with a mandrel having a diameter of one-fourth of an inch less than bore diameter of the duct. The duct should then be brushed with a stiff wire brush.

3.5 All conduit runs shall contain pull lines and shall be capped at each end, including within manholes.

PART 4 - MEASUREMENT AND PAYMENT

4.1 All conduit installed shall be measured in linear feet along the centerline of duct formation installed. Payment shall include all work necessary to install the conduit formations as shown on the plans and including but not limited to: saw cutting, test holes, excavation to the required depth, bedding stone, conduit, spacers and supports, encasing concrete, connections to existing manholes, backfill with compaction, rodding, brushing, pull lines, plating, trench backfill with select material Type 1 (Min CBR-30), restoration of roadways as shown in Standard M-6.1, and all other incidentals necessary to build the duct bank complete and in place according to the Dominion Virginia Power, and Verizon standard details and specifications.

4.2 Manholes shall be measured as each. Payment shall include furnishing the structure, saw cutting, excavation, bedding, installation, backfilling, compaction, installation of the frame and cover,

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shoring, or close sheeting, connecting to the new ducts, and all other incidentals necessary to build the manholes complete and in place according to the Dominion Virginia Power, and Verizon standard details and specifications.

4.3 Splice Boxes shall be measured per each. Payment shall include furnishing the structure, excavation, bedding, installation, backfilling, compaction, connecting to the new ducts, and all other incidentals necessary to build the Splice Box complete and in place according to the Dominion Virginia Power standard details and specifications.

4.4 Excavation and saw cutting pavement for the pavement restoration shall be included in the unit prices of the component items for pavement restoration. There will be no separate payment for excavation and saw cutting pavement for the pavement restoration.

END OF SECTION 02581

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SECTION 02600 - BITUMINOUS ROADWAY PAVEMENTS

PART 1 - GENERAL

1.1 Description of Work

A. Provide all plant, labor, material and equipment to furnish and construct bituminous concrete pavements in reasonably close conformity with the lines, grades, thicknesses and typical cross sections shown on the construction standards and as called for on the approved plans and specified herein.

B. The specifications referenced for each material shall fully apply and no deviations from said specification limits or quality shall be permitted unless specifically stated otherwise in this Section. The failure of any component of a product to comply with the referenced specifications shall constitute failure of the whole product.

1.2 Related Work Specified Elsewhere

A. Section 02200 - Earthwork

B. Section 02601 - Bituminous Hiking, Biking and Jogging Trails

C. Section 02650 - Restoration of Roadway

D. Section 02900 - Pavement Markings

E. Section 09900 - Protected Coatings

1.3 Applicable Standards and Specifications

A. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

B. Arlington County, VA Materials Specification Testing Reference .

C. American Association of State Highway and Transportation Officials (AASHTO)

D. American Society for Testing and Materials (ASTM)

1.4 Release

A. The Contractor shall obtain a Release from the Project Officer prior to commencing paving operations.

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PART 2 - PRODUCTS

2.1 Subbase

A. The aggregate base shall be aggregate having CBR-30 and conforming to VDOT Section 208, gradation 21A, except as specified on approved construction plans.

2.2 Base Course

A. The base course shall be bituminous concrete consisting of course and fine aggregate combined with asphalt cement, resulting in a mixture of Type BM-25.0A in conformance with Section 211 of the VDOT Specifications.

2.3 Surface Course

A. The surface course shall be bituminous concrete consisting of crushed stone, crushed slag, or crushed gravel and the fine aggregate, slag or stone screenings, or combination thereof, combined with asphalt, cement, resulting in a mixture of Type SM-9.5A in conformance with Section 211 of VDOT Specifications.

B. The use of fine or coarse aggregate which tend to polish under traffic shall not be permitted in the top layer of surface courses except in driveways, entrances, scratch courses and other areas permitted elsewhere in these specifications.

2.4 Tack Coats

A. Tack coat shall be asphalt cement of viscosity grade CMS-2 or CRS-2 in conformance with Section 310 of VDOT Specifications.

2.5 Pavement Marking

A. Traffic marking shall be provided by the Contractor as part of the work in conformance with Section 02900 Pavement Markings.

PART 3 - EXECUTION

3.1 Furnish for test and analysis by an independent testing Agency, representative samples of the materials to be used in the work. Samples and testing shall be in accordance with VDOT Specification 211.06 and with the Arlington County, VA Materials Specification Testing Reference .

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3.2 Thoroughly prepare and compact the sub grade as specified in Section 305 of VDOT Specifications. Do not prime the sub grade.

3.3 Lay the subbase to the compacted thickness as shown on the Construction Standard Details and defined on the Contract Drawings in conformance with Section 308 of VDOT Specifications.

3.4 Lay the asphalt pavement to the compacted thickness as shown on the Construction Standard Details and defined on the Contract Drawings in conformance with Section 315 of VDOT Specifications.

3.5 Place the tack coat in conformance with Section 310 of VDOT Specifications.

3.6 The surface tolerance of the completed work shall be as specified in Section 315.07(a) of VDOT Specifications.

3.7 Maintain pavement placed under this Contract in a safe and satisfactory condition during the Work, and repair depressions and holes with material equal to that specified.

3.8 Pavement Restoration Limit

A. Contractor shall submit the extent of the pavement restoration to the Project Officer for approval, prior to any saw cuts and/or milling and paving to the existing pavement.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Bituminous pavement shall be paid per the plan dimensions as verified in the field by the Project Officer or his designee and shall be based on 120 pounds per sq. yd. per inch depth. Payment shall be in tons of bituminous concrete per category of street payment and shall include demolition, excavation, the necessary preparation of the sub grade surface, tack coats and bituminous concrete materials.

4.2 Subbase shall be measured to the width and depths shown on the approved plans as verified in the field by the Project Officer or his designee. Payment shall be in cubic yards of material.

END OF SECTION 02600

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SECTION 02611 - CONCRETE WALKS AND CONCRETE DRIVEWAY ENTRANCE

PART 1 - GENERAL

1.1 Description of Work

A. Provide all labor, plant, materials and equipment to lay all concrete walks and driveway entrance as detailed in the Construction Standards and as called for on the approved plans.

1.2 Related Work Specified Elsewhere

A. Section 02200 – Earthwork

B. Section 02600 – Bituminous Roadway Pavements

C. Section 03100 - Concrete Formwork, Reinforcement and Materials

1.3 Applicable Standards and Specifications

A. American Society for Testing and Materials (ASTM)

B. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

C. Arlington County, VA Materials Specification Testing Reference

PART 2 - PRODUCTS

2.1 Aggregate Base

A. The aggregate base shall be aggregate having CBR-30 and conforming to VDOT Section 205 gradation 25 or 26 or coarse aggregate of size 68 in conformance with Section 203 of the VDOT Specifications.

2.2 Concrete

A. Concrete shall be Portland Cement air-entrained Class A3 in conformance with Section 03100.

2.3 Joint Filler

A. Joint filler shall be 1/2-inch preformed asphalt expansion joint material conforming to ASTM D994 or ASTM D1751.

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PART 3 - EXECUTION

3.1 Concrete testing shall be conducted in conformance with Section 03100 of these specifications. All testing must be in compliance with the Arlington County, VA Materials Specification Testing Reference.

3.2 Thoroughly prepare and compact the sub grade as specified in Section 305 of VDOT Specifications.

3.3 Place the aggregate base in conformance with Section 309 of the VDOT Specifications.

3.4 Joints shall be constructed at intervals of 40 feet, except for closures, but a slab shall not be less than 6 feet in length. Separate slabs by transverse pre-molded expansion joint filler for the full width of the slab, extending from the bottom of the slab to within one-quarter (1/4) inch of its top surface. Divide the slab between expansion joints into blocks 5-feet in length by scoring transversely. Where slabs are more than 7-feet in width, they shall be scored longitudinally to secure uniform blocks approximately square. Extend traverse and longitudinal scoring to at least 1/3 of the depth of the concrete slab. Scoring of transverse and longitudinal joints may be done with trowels, finishing and edging tools or by other means approved by the Project Officer.

3.5 Where sidewalks are constructed adjacent to permanent structures or other rigid construction on one side and curb on the other, extend an expansion joint of pre-molded material only along back at curb and place for the full depth of the slab. Place a pre-molded expansion joint between the sidewalk and adjacent curb at all crosswalks both public and private. Fasten pre-molded expansion joint filler to prevent displacement.

3.6 Where sidewalk is constructed in conjunction with adjacent curb, the expansion joints in the curb and sidewalk shall coincide. Where such construction is adjacent to existing curb, the expansion joints shall, if practicable, coincide. Prior to placing concrete around any permanent structure, place pre-molded expansion joint material around such structure for the full depth of the sidewalk.

3.7 Where existing structures, such as light standards, poles, fire hydrants, etc., are within the limits of the sidewalk area, place pre-molded expansion joint around the structure for the full depth of the concrete.

3.8 Place sidewalk stress columns 6 inches in diameter and a minimum depth of 12 inches below the bottom of the sidewalk at locations shown in Construction Standards unless otherwise specified by the Project Officer. The holes for the columns may be dug with a post hole digger or other approved means. The concrete must be the same type used in the sidewalk and placed at the same time.

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3.9 Provide concrete forms and pour the concrete in conformance with Sections 316 and 504 of the VDOT Specifications.

3.10 Finish concrete walks and driveways as specified in Section 316.04 of the VDOT Specifications.

3.11 The surface tolerance of the completed work shall be as specified in Section 316 of the VDOT Specifications.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Concrete sidewalks shall be paid by the square yard per the plan dimensions as verified in the field by the Project Officer or his designee. Payment shall include the cost of demolition, excavation, stress columns, aggregate base and restoration.

4.2 Concrete driveway entrances shall be paid by the square yard of driveway entrance per the plan dimensions as verified in the field by the Project Officer or his designee. Payment shall be in square yards for each type of driveway entrance. Payment shall include the cost of demolition, excavation, aggregate base and restoration.

END OF SECTION 02611

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SECTION 02612 - INTERLOCKING CONCRETE AND BRICK PAVERS

PART 1 - GENERAL

1.1 Description of Work

A. Provide all labor, plant, material and equipment to lay interlocking concrete or brick pavers to line and grade as detailed in the Construction Standards and as called for on the approved plans.

1.2 Relate Work Specified Elsewhere

A. Section 02200- Earthwork

B. Section 02611 - Concrete Walks and Concrete Driveway Entrances

C. Section 02613 - Paver Crosswalk

D. Section 03100 – Concrete, Formwork, Reinforcement, and Materials

E. Section 04100 - Mortar and Grout

1.3 Applicable Standards and Specifications

A. American Association of State Highways and Transportation Officials (AASHTO)

B. American Society for Testing and Materials (ASTM)

C. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

D. Concrete Paver Institute (CPI), a division of the National Concrete Masonry Association (NCMA)

1.4 Quality Assurance

A. Installation shall be performed by an installer with at least one year experience in placing interlocking concrete and brick pavers.

1.5 Submittals

A. Submit shop or product drawings and product data.

B. Submit samples of paver units to indicate color and shape selection.

C. Submit sieve analysis for grading of bedding and joint sand.

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D. Submit test results for compliance of paver unit requirements to ASTM C936 from an independent testing laboratory.

1.6 Environmental Conditions

A. Do not install sand or pavers during rain or snowfall.

B. Do not use frozen sand.

PART 2 - PRODUCTS

2.1 Interlocking concrete pavers shall be manufactured for compliance of paving unit requirements to ASTM C936, as indicated below. Concrete pavers shall be 6 centimeters thick for sidewalk application and 8 centimeters thick for driveways.

A. Minimum average compressive strength of 8000 psi (55 MPa).

B. Maximum absorption of 5% when tested in accordance with ASTM C140.

C. Resistance of 50 freeze-thaw cycles, when tested in accordance with ASTM C67.

Bedding and joint sand shall be clean, non-plastic, free from deleterious or foreign matter. The sand shall be natural or manufactured from crushed rock. Grading of samples shall be done according to ASTM C136. The particles shall be sharp and conform to the grading requirements of ASTM C33 as shown in Table below.

Table 1-Grading requirements for Bedding and/or Joint sand

Sieve Size	Percent Passing
3/8 in. (9.50mm)	100
No. 4 (4.75mm)	95 to 100
No. 8 (2.36mm)	80 to 100
No. 16 (1.18mm)	50 to 85
No. 30 (600 um)	25 to 60
No. 50 (300 um)	10 to 30
No. 100 (150 um)	2 to 10

2.2 Brick pavers shall be manufactured according to ASTM C-902. Mortar for brick pavers and setting base shall be Type M as specified in Section 04100.

2.3 The color of the concrete or brick pavers shall be as indicated on approved plans.

2.4 Aggregate used for compacted base shall be well graded crushed limestone or crushed stone specified as VDOT grade 21A, 25 or 26.

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2.5 Geotextile filter fabric shall be in accordance with Section 245 of the VDOT Specifications.

2.6 Rigid and flexible style edge restraint shall have the following properties:

A. Triangular reinforced, hollow core design with a solid and uniform footprint surface containing voids no larger than 50% and a minimum height of 1 5/8 inches.

B. Frost heave/sand retention lip shall extend a minimum 1/2 inch under the bedding layer with a minimum of 75% coverage along the length of the edging.

C. Frictional resistance rib(s) shall have a minimum of one rib under the lip.

D. Connection piece shall provide complete end to end contact on all pavement facing edges without piece to piece lippage. Connection device shall extend beyond splice at least 2” in each direction from splice.

E. Pre-drilled spike holes spaced evenly every 12 inches to accommodate 3/8 inch landscape spikes

F. Anchoring shall be completed with 12-inch x 3/8-inch diameter galvanized steel pins at 1 foot on center.

PART 3 - EXECUTION

3.1 Base requirements shall be a minimum of 6-inch of compacted aggregate for sidewalks when interlocking concrete pavers are used or 4-inch concrete base for brick pavers and 6-inch concrete slab for residential driveway and 9-inch for commercial driveway conditions.

3.2 Aggregate base materials shall be compacted to a density of 95 percent of Modified Proctor density with a tolerance of +1/4-inch to the following grades.

A. 6 cm concrete pavers - 3 1/2-inch below finish grade of pavers

B. 8 cm concrete pavers - 4 1/4-inch below finish grade of pavers

C. brick pavers - N/A

3.3 Install 18-inch minimum width filter fabric on top of the aggregate. Turn up at sides to cover pavers.

3.4 The sand leveling course for concrete pavers shall be screeded loose to a thickness of 1-inch to 1-1/2-inch. The exact thickness shall be determined at the job site. Care shall be taken to ensure the leveling base is loose and is not disturbed.

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3.5 The leveling base shall be treated with a soil stabilizer to prohibit the growth of grass.

3.6 The concrete pavers shall be installed hand tight being careful not to disturb the laying bed. The use of string line may be required to keep straight lines. A motor-driven masonry saw shall be used to cut edges where straight pavers cannot be used. Hammer cutting is not acceptable. No cut segment shall be smaller than one third of a paver unit measured in any direction.

3.7 Concrete pavers shall then be vibrated into leveling base with a vibratory plate capable of 3,500 to 5,000-pound compaction force. This must be done prior to any rain.

3.8 Joints shall be filled after vibration using dry sand. Brush and vibrate sand into joints until they are completely filled, then remove surplus sand.

3.9 All work to within three feet of the laying face must be left fully compacted with sand filled joints at the completion of each day. Cover the remaining uncompacted edge of the laying face and sand with waterproof covering.

3.10 Brick pavers shall be laid into a mortar setting bed and leveled. All joints shall be filled completely with mortar.

3.11 Select pavers from four or more cubes to blend color and texture variations. The laying pattern of pavers shall be herringbone unless specified otherwise.

3.12 Do not finish concrete base as provided for in Section 02611.

3.13 Edge restraints shall be 1/4-inch below the top of the edge of pavers to minimize the potential for tripping and to allow for minor settlement of the pavers and to assure drainage of pavement runoff. Edge restraint shall be installed per manufacturer’s specifications.

3.14 The final surface elevations shall not deviate more than 3/8-inch under a 10-foot-long straight edge.

3.15 The surface elevation of pavers shall be 1/8 to 1/4 inch above adjacent drainage inlets, concrete collars or channels.

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PART 4 - MEASUREMENT AND PAYMENT

4.1 Interlocking concrete and brick pavers for sidewalk application shall be paid in square yards per the plan dimensions as verified in the field by the Project Officer or his designee. Payment shall be for each type of masonry walk installed, complete in place and shall include the necessary demolition, excavation, restoration, preparation of the sub grade surface, aggregate base, concrete base, sand leveling base, filter fabric and edge restraints, if required.

END OF SECTION 02612

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SECTION 02613 - PAVER CROSSWALK

PART 1 - GENERAL

1.1 Description of Work

A. Provide all labor, materials, equipment and services necessary to complete the crosswalk as shown on the drawings and specified herein.

1.2 Related Work Specified Elsewhere

A. Section 02200 - Earthwork

B. Section 02611 - Concrete Walks & Concrete Driveway Entrance

C. Section 02612 - Interlocking Concrete and Brick Pavers

D. Section 03100 - Concrete, Formwork, Reinforcement and Materials

E. Section 04100 - Mortar and Grout

1.3 Applicable Standards and Specifications

A. American Society for Testing and Materials (ASTM)

B. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

C. Concrete Paver Institute (CPI), a division of the National Concrete Masonry Association (NCMA)

1.4 Submittals

A. Samples: Submit the following samples:
   1. Five concrete units of masonry showing full range of color and texture.

B. Certificates of Conformance: Submit certificates from the manufacturer attesting that the concrete pavers meet the requirements specified.
   1. Concrete Pavers
   2. Mortar Coloring

1.5 Quality Assurance

A. Handling and Storage
   1. Handle, sort, and protect masonry units in a manner to avoid chipping, breakage or contact with the soil. Keep ties, and joint reinforcement free of rust. Steel reinforcing bars shall be

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free of loose scale and rust. Reject rusted steel reinforcing, ties and joint reinforcement. Deliver cement in unbroken bags, barrels, or other sealed containers, plainly marked and labeled with the manufacturer's names and brands. Store cementitious materials in dry, weather tight sheds or enclosures or under watertight tarpaulins. Sort and handle cement in a manner which shall prevent the inclusion of foreign materials and damage by water or dampness.

B. Environmental Conditions
1. Hot Weather Installation: Protect masonry when the ambient air temperature is more than 99 degrees F in the shade, and the relative humidity is less than 50 percent from direct exposure to wind and sun for 48 hours after installation.
2. Cold Weather Construction: Do not lay masonry when the air temperature is below 40 degrees F and falling, or when it appears that air temperature shall drop to 40 degrees F or below before the mortar has set. Work shall not be permitted with or on frozen materials.
3. Do not install sand or pavers during heavy rain.

PART 2 - PRODUCTS

2.1 Mortar

A. Mortar shall be in compliance with Section 04100 of these specifications.

B. Grading: Bedding and joint sands shall be graded per ASTM-C33 shown in Table 1. below.

Table 1-Grading requirements for Bedding and/or Joint sand

Sieve Size	**Percent Passing**
3/8 in. (9.50mm)	100
No. 4 (4.75mm)	95 to 100
No. 8 (2.36mm)	80 to 100
No. 16 (1.18mm)	50 to 85
No. 30 (600 um)	25 to 60
No. 50 (300 um)	10 to 30
No. 100 (150 um)	2 to 10

C. Bedding and joint sand shall be natural or manufactured from crushed rock, and shall be clean, non-plastic, free from deleterious or foreign matter. Particles shall be neither flat nor elongated.

D. Limestone screenings and stone dust are not acceptable.

E. Sieve analysis on samples shall be graded per ASTI-C236.

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2.2 Concrete Pavers

A. Concrete pavers shall be 8 centimeters thick for crosswalk application and shall be as specified in Section 02612. The color and laying pattern shall match the adjacent sidewalk as indicated on the drawings.

2.3 Concrete Base Slab

A. The concrete base slab, slab reinforcing, and expansion joints shall be as specified in Section 03100 of these specifications and as shown in the Contract drawings.

2.4 Aggregate Subbase

A. The aggregate subbase shall be gradation 21A conforming to VDOT Specifications, Section 208.

2.5 Geotextile

A. Geotextile filter fabric shall be in accordance with Section 245 of the VDOT Specifications.

PART 3 - EXECUTION

3.1 Examine the areas and conditions where masonry is to be installed and notify the Project Officer of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Project Officer.

3.2 Lay the aggregate subbase to the compacted thickness shown on the drawings and in conformance with Section 308 of the VDOT Specifications.

3.3 The concrete base slab shall be installed in accordance with the drawings, details and Section 03100 of these specifications.

3.4 All paving adjoining the crosswalk shall be complete before the sand setting bed is laid. This includes all patching of existing adjoining pavement. Steel rollers used to compact the pavement shall not run over the pavers.

3.5 All pavers shall be free of foreign materials before installation. Do not use concrete pavers with excessive chips, cracks, voids stains or other defects that might be visible in the finished work. allowed on the bottom of the pavers.

3.6 The base concrete slab shall be cleaned of all asphaltic concrete components, dust, oil, or any other material. The finished surface of the base to receive the bedding sand shall be uniform and

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even, and shall not deviate by more than +0 and -1/2 inch (13mm) over 10' (3m) when measured in any direction.

3.7 Place sand for setting bed and screed to thickness of 1 inch to 1 1/2 inch (25 to 40 mm), taking care that moisture content remains constant and the density if loose and constant until all pavers are set and compacted.

3.8 Lay setting bed so that elevation of top surface of pavers shall be 1/8 inch (3mm) min to 1/4 inch (6mm) max. above adjacent drainage inlets, concrete collars, channels, or other pavements after compaction.

3.9 Lay unit pavers in joint pattern shown on the drawings.

3.10 Set concrete pavers with a minimum joint width of 1/16 inch (1.5mm) and a maximum of 3/16 inch (5mm), being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Concrete pavers with spacer bars on sides of each unit are recommended when installation is performed with mechanical equipment. Use string lines to establish deep, straight lines. Select units from 4 or more cubes to blend color and texture variations. Fill gaps at edge restraints that exceed 3/8 inch (10mm) with pieces cut to fit from full size unit pavers.

3.11 Vibrate concrete pavers into leveling course with a low amplitude plate vibrator capable of a 3,000 to 5,000 pound (13 to 22 KN) compaction force.

3.12 Vibrate after edge pavers are installed, and there is a completed, restrained surface: or before surface is exposed to rain. Vibrate installed concrete pavers within 3 feet (1m) of the laying face and cover with sand BEFORE ENDING EACH DAY'S WORK.

3.13 Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Brush and vibrate sand into joints until they are completely filled, then remove surplus sand.

3.14 Do not allow traffic on installed concrete pacers until sand has been vibrated into joints.

3.15 Final surface elevations shall not deviate more than 3/8 inch (10 mm) under a 10 foot (3m) long straightedge.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Paver crosswalks shall be paid per the plan dimensions as verified in the field by the Project Officer or his designee. Payment shall be in square yards for the type paver crosswalk installed, including the necessary preparation of sub grade, restoration of adjacent pavement, demolition,

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excavation, aggregate subbase, concrete base and incidentals necessary for a complete installation.

END OF SECTION 02613

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SECTION 02619 - PERMANENT SIGNS

PART 1 - GENERAL

1.1 Description of the Work

A. Provide all necessary labor, materials and equipment to provide, fabricate, and install the permanent signs, posts, and connections as shown on plans, details, and these specifications. All work under this section is subject to the Special and General Conditions and Instruction to Bidders which form a part of these specifications and to the current editions of the Arlington County Construction Standards and Specifications Manual and Virginia Department of Transportation Road and Bridge Specifications (VDOT). The Contractor shall be responsible for and governed by all the requirements thereunder.

1.2 Related Work Specified Elsewhere

A. Section 03100 – Concrete, Formwork, Reinforcement and Materials

B. Section 13180 – Maintenance and Control of Traffic

1.3 Applicable Standards and Specifications

A. Virginia Department of Transportation Road and Bridge Specifications (VDOT)

B. Virginia Department of Transportation Road and Bridge Standards (VDOT)

C. Manual on Uniform Traffic Control Devices (MUTCD)

D. Virginia Department of Transportation Supplement to the Manual on Uniform Traffic Control Devices

E. Virginia Standard Highway Signs Manual

F. American Association of State Highway and Transportation Officials (AASHTO)

G. American Society for Testing and Materials (ASTM)

H. Federal Highway Administration (FHWA)

1.4 Submittals

A. The Contractor shall submit colors and shop drawings of the signs to the Project Officer for approval prior to fabrication.

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B. The Contractor shall submit, with the sign shipment, copies of the sheeting manufacturer certifications noting that the sheeting material on the sign supplied meets all of the sheeting federal specifications.

PART 2 - PRODUCTS

2.1 All signs shall conform to the latest editions of the Manual on Uniform Traffic Control Devices (MUTCD) and the VDOT supplement to the MUTCD.

2.2 All signs shall be in compliance with the latest version of the Virginia Standard Highway Signs Manual.

2.3 Sign anchors, bases, or sleeve bases shall meet current AASHTO, FHWA, and VDOT requirements for breakaway and yielding and shall be galvanized or stainless steel.

2.4 Sign posts shall be 2-inch square black powdered coated 14 gauge steel tube posts with full length punching on all four sides of 7/16-inch diameter holes spaced 1 inch on center starting 1 inch from each end. Posts shall conform to the standard specification for Hot-Rolled Carbon Sheet Steel, structural quality ASTM designation A570, Grade 50.

2.5 Anchor sleeves set in concrete shall be 30-inch long, 2.5-inch square 7 gauge galvanized steel posts with full length punching on all four sides of 7/16-inch diameter holes spaced 1 inch on center. Installation hardware shall include a 5/16 corner bolt with flanged nut.

2.6 Sign attachments will be made with 3/8-inch driver rivets with washers.

2.7 Sign bracing products, if needed, shall conform to VDOT Road & Bridge Standards (Details 1321.19, 1321.20, 1321.21).

2.8 Sign surface image shall conform to applicable portions of Sections 247 and 701 of the VDOT Road and Bridge Specifications.

2.9 Signs shall be drilled for bolts prior to painting.

2.10 Post footings shall be Class A-3 concrete per Section 03100 of the Arlington County Construction Standards and Specifications Manual.

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PART 3 - EXECUTION

3.1 The signs shall be installed in locations as shown on the plans.

3.2 Posts located in earth shall be anchored or driven to a minimum depth of 36 inches.

3.3 Driving caps shall be used when driving posts following the manufacturer's instructions.

3.4 Posts located in concrete sidewalk or concrete medians shall be installed per VDOT Detail 1321.13 Square Tube Sign Post Foundation Type A for 2-inch square tube post, except that the post shall extend 36" (thirty-six inches) minimum below finished grade.

3.5 Posts located outside of concrete surfaces shall be installed per VDOT Detail 1321.17 Square Tube Sign Post Foundation Type D for 2-inch square tube post.

3.6 Concrete for footings shall be poured in accordance with the requirements outlined in the Section 03100 of the Arlington County Construction Standards and Specifications Manual.

3.7 The sign shall be centered on the post and fastened with the specified bolts.

3.8 The lower edge of signs shall be in accordance with VDOT Detail 1321.10 Square Post Sign Detail.

PART 4 - MEASUREMENT AND PAYMENT

4.1 New Traffic Sign

A. New Traffic Signs as shown on the Drawings and as specified herein shall be measured in units of each, complete-in-place. Payment shall be at the contract unit price per each, and shall include the furnishing of all signs, posts, concrete, fastening materials, and other material required to provide a complete sign installation, as well as all other work incidental to providing a complete installed sign.

4.2 Relocate Traffic Sign

A. Relocate Traffic Sign as shown on the Drawings and as specified herein shall be measured in units of each. The Project Officer may allow the Contractor to reuse the sign, post, or related hardware for re-installation at the new location, subject to approval by the Project Officer. If the Project Officer determines that the sign, post, or hardware is damaged or does not meet this specification; and that the reinstallation of any or all of the materials shall not result in a

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satisfactory traffic sign installation the Contractor shall furnish and install new materials as required to provide a complete-in-place traffic sign.

END OF SECTION 02619

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SECTION 02650 - RESTORATION OF ROADWAY

PART 1 - GENERAL

1.1 Description of Work

A. Provide the necessary plant, labor, materials and equipment to restore and maintain the various street and driveway surfaces of all types, pavement and driveway bases, curbs, curb and gutter, and sidewalks disturbed, damaged or demolished during the performance of the work.

1.2 Related Work Specified Elsewhere

A. Section 02200 – Earthwork

B. Section 02600 - Bituminous Roadway Pavements

C. Section 02601 - Bituminous Hiking, Biking and Jogging Trails

D. Section 02611 - Concrete Walks and Concrete Driveway Entrance

E. Section 02612 - Interlocking Concrete and Brick Pavers

F. Section 02750 - Curb and Gutters

G. Section 03100 - Concrete Formwork, Reinforcement and Materials

1.3 Applicable Standards and Specifications

A. American Society for Testing and Materials (ASTM)

B. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

C. American Association of State Highway and Transportation Officials (AASHTO)

1.4 Permits

A. Before performing any work, secure the necessary permits to work within the County or State right of way and easements when surface materials shall be disturbed or demolished.

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PART 2 - PRODUCTS

2.1 The quality of materials used in the restoration of existing pavements and driveways shall produce a street surface equal to or better than the condition before the work began.

2.2 Concrete shall be Class A3 air-entrained Portland cement type as specified in Section 03100.

2.3 The base and surface courses shall be BM-25.0A and SM-9.5A respectively as specified in Section 02600.

2.4 Crusher run aggregate shall be size 25 in conformance with Section 206 of the VDOT Specifications.

2.5 Joint filler shall be 1/2-inch preformed asphalt expansion joint material conforming at ASTM 1751.

2.6 Asphalt for a temporary patch shall be BM-25.0A as specified in Section 02600.

2.7 Prime Coat shall conform to VDOT Section 310 for Asphalt Binders.

PART 3 - EXECUTION

3.1 At the end of each work day, the road surface shall be brought flush with the adjacent surface using hot mix asphalt. A minimum of 4" of hot mix asphalt shall be installed. All lanes shall be open for traffic during non-work hours unless otherwise directed in writing by the Project Officer. The Contractor shall maintain all road surfaces within the work area to provide a smooth drivable surface with no significant potholes, dips, or bumps of any kind.

3.2 Where trenches have been opened in any roadway or street that is a part of the VDOT highway system, restore surfaces in accordance with the requirements of VDOT. All other restoration shall be done in accordance with the Contract Drawings, these specifications, and the Arlington County Construction Standards.

3.3 Contractor shall submit the extent of the pavement restoration to the County for approval, prior to any saw cuts and/or milling and paving to the existing pavement.

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3.4 Existing manhole frames, covers, valve boxes and other appurtenances shall be adjusted to the final grade or replaced, as necessary

3.5 Removal of concrete pavement, if encountered, will be to the next joint. In some cases, and when approved by the County Project Officer, the Contractor may be allowed to saw cut a neat joint mid-span of the existing concrete pavement. The limits of concrete pavement restoration shall be determined by the County Project Officer.

3.6 Excavation in the pavement area shall require that pavement surfaces be saw-cut to provide a straight and smooth edge. Cut out pavement 24-inches wider than the trench width or excavation opening as shown on Construction Standard M-6.0.

3.7 Upon completion of installation of utility and backfill, fill the top 18-inches of the trench with crusher run and temporary asphalt patch until such time that the permanent pavement patch shall be constructed.

3.8 Complete the pavement restoration for the various types of streets in conformance with Construction Standard M-6.0 and Section 02600 of these specifications.

3.9 Concrete curb and gutter, and sidewalks, shall be restored as required to match existing construction. Replace damaged sections with complete new sections or squares; patching of damaged sections shall not be permitted.

3.10 Maintain restored sections and surfaces as part of the Contract requirements for a period of one year following the date of final acceptance.

3.11 When a manhole top requires adjustment to an elevation one inch or more above the existing pavement grade and is exposed to traffic before final paving is completed, a temporary ramp shall be constructed by feathering bituminous concrete for 360 degrees around the manhole. A taper slope of not less than two feet per one inch shall be used. During the paving operation, but prior to the placement of the topping course, the bituminous concrete taper shall be removed from around the manhole to a minimum depth of one inch below the top of manhole.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Restoration of roadways, sidewalks, curb and gutter, entrances, medians and all other public improvements disturbed as a part of any contracted work shall be considered incidental to the Contract work and therefore no separate payment shall be made for any restoration items unless

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specifically stipulated otherwise in the Contract or otherwise directed by the Project Officer in writing.

4.2 Restoration of Roadway necessary for the connection of storm structures is considered incident and no separate payment will be made.

4.3 Temporary top asphalt installed to provide even grades with the existing roadway before the paving of the entire roadway shall be considered incidental and no payment shall be made by the County for furnishing materials and installation.

4.4 Installation and maintenance of temporary repairs shall be considered incidental to the Contract and therefore no additional payment shall be made for this work

END OF SECTION 02650

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SECTION 02750 - CURB AND GUTTERS

PART 1 - GENERAL

1.1 Description of Work

A. Provide all plant, labor, materials and equipment to install the concrete curbs and combination concrete curb and gutters as called for on the approved plans, as detailed on the Construction Standards, and as specified herein.

1.2 Related Work Specified Elsewhere

A. Section 02200 – Earthwork

B. Section 02600 – Bituminous Roadway Pavements

C. Section 02611 - Concrete Walks and Concrete Driveway Entrance

D. Section 03100 - Concrete Formwork, Reinforcement and Materials

1.3 Applicable Standards and Specifications

A. American Association of State Highway and Transportation Officials (AASHTO)

B. American Society for Testing and Materials (ASTM)

C. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

PART 2 - PRODUCTS

2.1 Concrete

A. Concrete shall be air entrained Portland cement class A3 in conformance with Section 03100.

2.2 Joint Filler

A. Joint filler shall be 1/2-inch preformed asphalt expansion joint material conforming to ASTM D994 or ASTM D1751.

2.3 Subbase

A. The aggregate base shall be aggregate having CBR-30 and conforming to VDOT Section 208, gradation size 21A.

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PART 3 - EXECUTION

3.1 Construct the sub grade to the required elevation below the finished surface of the gutter in accordance with dimensions and design as shown on Construction Standards. Remove all soft and unsuitable material and replace with subbase material, which shall be compacted to 95% density in accordance with AASHTO T-99 and finished to a smooth surface. Moisten the subbase prior to placing the concrete.

3.2 When curb and gutter or structures along the curb are being replaced adjacent to an existing roadway surface, the roadway surface must be excavated and restored as per VDOT detail WP-2 to allow for formwork.

3.3 Construct forms of wood or metal conforming to VDOT Section 316.

3.4 Prior to placing concrete, check the line and grade for accuracy and fasten the face forms of the curb to the gutter forms. Spade the concrete and tamp sufficiently to bring the mortar to the surface, after which finish with a magnesium float. Construction shall be in sections of uniform lengths, providing transverse joints at approximately 10-feet intervals and when the time elapsing between placements exceeds 45 minutes. No section shall be less than 6 feet in length. Separate sections by plate steel templates set perpendicular to the grade and center line of the unit specified. The templates shall be 1/8-inch in thickness and shall have a width and depth equal to the unit cross-section. Leave these templates in place until the concrete has set sufficiently to hold its shape.

3.5 Form expansion joints at intervals of 100 feet or less. When the curb and gutter is constructed adjacent to rigid pavements, the location and width of expansion joints shall coincide with those in the pavement, where practicable. Where stationary structures, such as catch basins and drop inlets, are within the limits of the curb and gutter, place an expansion joint between the structure and the curb and gutter. Place expansion joints at all returns.

3.6 Screed the face and top of curb and surface of gutter smooth and round the edges to a radius as shown on the Construction Standards.

3.7 As soon as the concrete has attained sufficient set, remove the face forms of the curb. The exposed surfaces shall be screeded with a straight edge and finished with a steel trowel. Remove all trowel marks with a brush wet with clear water. Do not use mortar in finishing.

3.8 The finished surface of curb and gutter shall be true to line and grade with an allowable tolerance as specified in Section 316.05 of the VDOT Specifications.

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3.9 After the concrete has set in conformance with Section 03100, fill the spaces on both sides of gutter or the back side of curb to the required elevation with suitable material and compact to 95 percent density in accordance with AASHTO T-99 in layers of not more than 6-inches.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Measurement shall be in linear feet per the plan dimensions as verified in the field by the Project Officer or his designee. Payment shall be at the contract unit price per type of curb section.

4.2 Demolition, excavation, subbase material and restoration shall be considered incidental to the work and therefore, no separate payment shall be made for demolition, excavation, subbase material or restoration.

END OF SECTION 02750

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SECTION 02780 - PERMEABLE UNIT PAVERS

PART 1 - GENERAL

1.1 Description of the Work

A. This work shall consist of installing permeable unit pavers, Permeable Interlocking Concrete Pavement (PICP), on a prepared sub-grade in accordance with these specifications, the Interlocking Concrete Pavement Institute Technical Specification No. 18 (latest version) and in conformity with the lines, grades, thicknesses and typical sections shown in the contract documents or as directed by the Project Officer. This work shall also be in compliance with the latest edition of the Arlington County Stormwater Management Ordinance Guidance Manual and the Virginia DEQ Stormwater Design Specification No. 7: Permeable Pavement.

The permeable unit pavers shall consist of a combination of unit pavers and aggregate for the joints and bedding layer, to form an integrated, structural wearing surface when compacted.

1.2 Related work specified elsewhere

A. Section 01400 – Quality Requirements

B. Section 02200 – Earthwork

C. Section 02500 – Gravity Sewers and Appurtenances

D. Section 03100 - Concrete Formwork Reinforcement and Materials

1.3 Applicable Standards and Specifications

A. Interlocking Concrete Pavement Institute Technical Specification No. 18 (latest version)

B. Virginia DEQ Stormwater Design Specification No. 7: Permeable Pavement, Version 2.0 (latest version)

C. Arlington County Stormwater Management Ordinance Guidance Manual

D. Arlington County Material Testing Specification Reference

E. ASTM C67 – Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile

F. ASTM C140 – Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units

G. ASTM C150 – Standard Specification for Portland Cement

H. ASTM C418 – Standard Test Method for Abrasion Resistance of Concrete by Sandblasting

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I. ASTM C595 – Standard Specification for Blended Hydraulic Cements

J. ASTM C936 – Solid Concrete Interlocking Paving Units

K. ASTM C979 – Standard Specification for Pigments for Integrally Colored Concrete

L. ASTM D4751 – Standard Test Methods for Determining Apparent Opening Size of a Geotextile

1.4 Submittals

A. Contractor shall submit drawings and documentation as required in this specification and obtain written acceptance of submittals before using the materials or methods requiring approval.
   1. Contractor Qualifications – At the time of task order assignment, Contractor shall:
      a. Submit the name and qualifications of the Certified Concrete Paver Installer, providing written evidence of Interlocking Concrete Pavement Institute (ICPI) certification, and proficiency in successfully completing permeable unit paver construction including a minimum of two (2) completed projects, total square footage to exceed the project quantities with owner information, address and a sample of the product used, or photographs thereof, and the following: complete description of the product type and style; and details of the manufacturer's mold assembly with patterns, dimensions, all edge details and radii, spacer bars, and the mold head or shoe; and
      b. Submit the name and certification of the Supervisory Installer who will be on site at all times during the unit paver installation. Provide current certificates from the Interlocking Concrete Pavement Institute (ICPI): 1) Certified Concrete Paver Installer certification; and 2) PICP Specialist certification.
   2. Testing Agency – Within seven (7) days after notice to proceed, the Contractor shall submit the name, qualifications, and contact information of a third party QA Testing Agency with experience in testing permeable interlocking unit pavements, who will oversee and document installation. Use of testing services will not relieve contractor of the responsibility to furnish materials and construction in full compliance with the Contract Documents.
   3. Producer Qualifications – Within seven (7) days after notice to proceed, the contractor shall furnish the name and location of the plant that will produce the unit pavers.
      a. Product Information: The plant shall provide product information including all material sources and all manufacturers' recommendations that are relevant to the project.
      b. Certifications: The plant shall provide current certifications, signed by the material sources as relevant, stating that the materials will meet or exceed all specified requirements.
      c. Samples: The plant shall provide three (3) samples of the specified unit pavers to indicate color, shape and dimensions.
   4. Submit shop or product drawings and product data, including independent laboratory test results from the manufacturer indicating compliance with ASTM C936.
   5. Submit mold rotation plan (if necessary).
   6. Submit samples and sieve analysis for grading of sub-base, bedding material and joint filler.
   7. Test Panels (if required by the Project Officer or specified on the Contract documents)– At least fifteen (15) days before construction of permeable interlocking unit pavers and

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following the engineer's acceptance of the qualifications described above, the Contractor shall provide a minimum of one (1) test panel for acceptance. Place, joint and cure the test panel, to be a minimum of 275 square feet in size or as specified in the Contract Documents, at the required project thickness to demonstrate to the engineer's satisfaction that the unit pavers and design flow rates are acceptable, and that a satisfactory pavement can be installed at the site location. Testing shall be in accordance with ICPI Technical Specification 18 and Section 3.3 of this Specification.

8. Test Reports - Submit third party QA test reports certifying compliance with ICPI Technical Specification 18, Virginia DEQ Stormwater Design Specification No. 7: Permeable Pavement and all material and physical requirements stated herein.

PART 2 - PRODUCTS

2.1 Materials shall be approved in accordance with Arlington County Standards & Specifications requirements, and as described below.

A. All unit pavers shall meet surface requirements of the latest Americans with Disabilities Act (ADA) requirements and accessibility guidelines.

B. Unit pavers shall be of the type, style, color, and other details as described in the Contract Documents and in accordance with all manufacturer's recommendations for the selected unit paver system.
   1. Shape: as specified in design plans.
   2. Thickness: 3 1/8 in. for vehicular use, 2 3/8 in. for pedestrian use.
   3. Color: as specified in design plans.
   4. Surface Open Area: 5% to 15%.
   5. Paver physical properties:
      a. Provide only sound units free of defects that would allow proper placing of units to achieve the specified pavement strength and performance.
      b. Compressive strength: ASTM C140, when delivered to the project site, average compressive strength of not less than 8,000 psi, with no individual unit less than 7,200 psi.
      c. Absorption: ASTM C140, average absorption not greater than 5%, with no individual unit greater than 7%.
      d. Resistance to freezing and thawing: ASTM C67, with no breakage and not greater than 1% loss in dry mass of any individual unit after 50 cycles of freezing and thawing.
      e. Abrasion resistance: ASTM C418, maximum volume loss of 0.915 cubic inches/7.75 sq. in. Average thickness loss of no more than 0.118" (3 mm) due to abrasion testing.
      f. Dimension tolerances: Length +/- 1/16", Height +/- 1/8".

C. Concrete Unit Pavers: The material and fabrication for the unit pavers shall meet or exceed the requirements of ASTM C936 "Solid Concrete Interlocking Paving Units" and must allow a minimum infiltration rate of 100 in/hr through the pavement upon installation.

D. Bedding Layer: AASHTO #8 aggregate or similar, as directed by the Contract Documents and in accordance with Virginia DEQ Stormwater Design Specification No. 7: Permeable Pavement.

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E. Reservoir Layer: AASHTO #57 and/or #2 aggregate, washed and free of all fines as directed by the Contract Documents and in accordance with Virginia DEQ Stormwater Design Specification No. 7: Permeable Pavement.

F. Geotextile Filter Fabric (If Specified): Non-woven geotextile fabric with a flow rate greater than 125 gpm/sf (ASTM D4491), and Apparent Opening Size (AOS) equivalent to US #70 or #80 sieve (ASTM D4751) as directed by the Contract Documents and in accordance withthe latest version of the Arlington County Stormwater Guidance Manual and Virginia DEQ Stormwater Design Specification No. 7: Permeable Pavement.

G. Impermeable Liner (If Specified): 30 mil PVC geomembrane liner or as directed by the Contract Documents. The liner shall be placed per manufacturer's specifications and Virginia DEQ Stormwater Design Specification No. 7: Permeable Pavement.

H. Underdrain (If specified): 6" diameter perforated PVC (AASHTO M 252) pipe, with 3/8-inch perforations at 6 inches on center. Installed at a minimum 1.0% slope located 20 feet or less from the next pipe.. Perforated pipe shall be installed for the full length of the permeable pavement cell, and non-perforated pipe, as needed, shall be used to connect with the storm drain system. T's and Y's installed as needed, depending on the underdrain configuration. Extend cleanout pipes to the surface with vented caps at the Ts and Ys.

I. Observation Well: 6" diameter vertical PVC pipe (AASHTO M 252) with a lockable cap, installed flush with the surface.

J. Sand Filter Layer (If specified) – For infiltration facilities only, a 6 to 8 inch layer of coarse sand (e.g. ASTM C 33, gradation).

K. Joints: AASHTO #8 aggregate, ASTM #89, #9 or similar, as directed by the contract documents and in accordance with Virginia DEQ Stormwater Design Specification No. 7: Permeable Pavement

L. Edge Restraints: May be standard curbs, curb and gutter, steel, block pavers or other.

PART 3 - EXECUTION

Execution shall be in accordance with this specification and ICPI Technical Specification 18.

3.1 Pre-Installation Conference

A. Pre-Installation Conference - A mandatory pre-installation conference will take place at least two (2) weeks prior to installation of the unit pavers and shall include at a minimum the Project Officer, Arlington County SWPPP Inspector/BMP Reviewer, general contractor, Certified Concrete Paver Installer, Supervisory Installer, manufacturer's representative, and third party testing agency.

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3.2 Preparation of Grade

A. Sub-Grade Preparation
1. The proposed site should be checked for existing utilities prior to any excavation.
2. Grading of subgrade shall be with low ground pressure equipment when within six (6) inches of final subgrade elevation.
3. Sub-grade shall not be compacted unless otherwise specified on the Contract Documents or directed by the Project Officer.
4. The Contractor shall verify in writing that the sub-grade elevations, compacted density, and preparation conforms with the Contract Documents prior to installation of the unit pavers. Written density test results shall be provided to the Project Officer.

B. Base Materials – Preparation and protection of base materials so that they are not contaminated prior to installation shall be in accordance with the latest edition of the Arlington County Stormwater Management Ordinance Guidance Manual and the Virginia DEQ Stormwater Design Specification No. 7: Permeable Pavement and/or as specified on Contract Documents.

C. Edge Restraints - Install all edge restraints of the types, locations and dimensions shown on the Contract Documents and at the lines and grades required. Place edge restraints and verify location, type and elevations of edge restraints, utility structures and drainage pipes and inlets before the base layer, bedding and pavers are installed. Permeable pavement shall not be allowed without edge restraints around the entire perimeter without the written approval of the Project Officer.

3.3 Installation

A. Installation of the unit pavers shall only begin after the entire contributing drainage area has been stabilized. Do not install the system in rain or snow or when the subgrade is frozen, and do not install frozen bedding materials.

B. For installations requiring flow barriers, cast in place or impermeable liner/gravel flow barriers shall be installed in accordance with the Contract Documents and the latest edition of the Arlington County Stormwater Management Ordinance Guidance Manual. Flow barriers shall be installed prior to or in conjunction with base materials.

C. Install base materials (in 6-inch lifts), underdrain (if specified), observation well (if specified), geotextile fabric (if specified)and impermeable liner (if specified) in accordance with the latest edition of the Arlington County Stormwater Management Ordinance Guidance Manual and the Virginia DEQ Stormwater Design Specification No. 7: Permeable Pavement and/or as specified on the Contract Documents.

D. Spread, screed & compact aggregate bedding material and fill any voids left by screed rails.

E. Lay the unit pavers in the type, style, pattern, dimensions, and locations with joint widths as recommended by the Manufacturer and shown on the Contract Documents. Maintain consistent and uniform patterns for the entire pavement area.

F. Fill gaps at the edges of the paved area with cut units. Cut unit pavers subject to vehicular traffic shall be no smaller than 1/3 of a whole unit and shall have no sharp edges. Patterns shall be maintained to the extent possible in placing cut units to fill gaps in the pattern. Stagger blocks to avoid running bond or other straight joints or seams in the pattern.

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G. Fill the openings and joints with washed ASTM #8 aggregate or as specified on the Contract Documents. Once the joints are full (within ¼ in or 6 mm within paver surface), sweep excess aggregate from the surface.

H. Compact and seat the unit pavers into the bedding material using a low amplitude, 75-90 Hz plate compactor capable of at least 5,000 lbf centrifugal compaction force. This will require at least two (2) passes with the plate compactor over the entire surface. The second pass should be made perpendicular to the first pass. The path of the plat compactor should overlap by several inches.

I. Apply additional ASTM #8 aggregate to the openings and joints as needed, filling them in completely, then remove excess aggregate by sweeping, and make at least two (2) more passes with the plate compactor over the entire surface.

J. All unit pavers within six (6) feet of the laying face must be fully compacted at the completion of each day's work.

3.4 Quality Assurance Testing

A. Testing will be performed by the Contractor's testing agency. All material testing shall comply with the Arlington County Material Testing Specification Reference and shall demonstrate concurrence with ICPI Technical Specification 18.

1. Smoothness Testing - Test finished unit paver system with a 10-foot straight edge, applied parallel with and at right angles to the center line of the paved area. Correct deviations in the surface in excess of 3/8-inch by removing the unit pavers as necessary and then loosening, adding or removing material, re-shaping, watering, and recompacting. The smoothness requirements specified herein apply only to the top lift of each layer, when base course is constructed in more than one lift.
2. Surface Permeability Testing - The full permeability of the pavement surface shall be tested prior to final acceptance by application of clean water at least 5 gallons per minute, using a hose or other distribution device. Water used for the test shall be clean, free of suspended solids and deleterious liquids. All applied water shall infiltrate directly without large puddle formation or surface runoff, and the testing shall be observed by the Project Officer. A minimum infiltration rate of 100 inches per hour is required.
3. Infiltration Testing– For infiltration facilities only, a post-construction infiltration test of the facility shall be conducted after a natural rainfall over 1 inch, or by flooding the BMP during consistently dry weather. The water level in the observation well must be measured periodically until the water is gone from the observation well. Record the day/time for each measurement. Using these recordings, a drawdown rate can be reached. Provide a signed/sealed testing report

3.5 Protection

A. As construction is completed, maintain and protect the permeable pavement. Correct deficiencies in thickness, composition, construction, and smoothness, which develop during the maintenance, to conform to the requirements specified herein.

B. Protection of the edges and edge restraints shall remain in place throughout construction and until the site is fully stabilized, at which time excess filter fabric and impermeable liners can be cut back to the pavement edges.

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C. In addition, runoff onto permeable pavement shall be prevented until the site is fully stabilized as described in the Contract Documents. Diversion ditches or other approved types of erosion and sediment control measures shall be placed at the toe of slopes which are adjacent to permeable pavement, to prevent sediment from washing into pavement areas at all times during and after construction. Any sediment accumulation onto the permeable pavement shall be removed immediately by cleaning or replacement of the aggregate by the Contractor at no cost to the owner.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Pavement shall be installed in accordance with the dimensions indicated on the approved drawings. Pavement shall be measured to the actual dimensions installed in the field. In an event, it becomes necessary to deviate from the dimensions indicated on approved drawings, the contractor must obtain approval from Project Officer in advance prior to pavement installation. Payment for PERMEABLE PAVEMENT shall be in square yards of pavement installed and shall include the necessary excavation, preparation of the subgrade surface, subbase, and all other items listed in the PART 2 - PRODUCTS as indicated on approved plans.

4.2 Subbase and bedding material shall be installed to the width and depths shown on the approved plans. Subbase and bedding material installed in excess of what is shown on approved plans must be approved by the Project Officer prior to installation. Subbase and bedding material installed in excess of what is shown on approved plans shall be measured to the actual dimensions installed in the field. Payment for SUBBASE AGGREGATE and BEDDING AGGREGATE installed in excess of what is shown on approved plans shall be in cubic yards of material installed.

END OF SECTION 02780

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SECTION 02795 - PERVIOUS CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 Description of the Work

A. This work shall consist of constructing pervious Portland cement concrete roadway pavements, alleys, sidewalks, or trails on a prepared sub-grade in accordance with these specifications and in conformity with the lines, grades, thicknesses and typical sections shown in the contract documents or as directed by the Project Officer. Work shall also comply with the latest edition of the Arlington County Stormwater Management Ordinance Guidance Manual and the Virginia Department of Environmental Quality Stormwater Design Specification No. 7: Permeable Pavement, (latest version).

B. The pervious concrete pavement and sidewalks shall consist of a mixture of Portland cement, aggregate, water, admixtures and other ingredients as may be specified. Except as herein stated, the requirements specified for VDOT Standard Specifications 214 Portland Cement Concrete Pavement and 504 Portland Cement Concrete Sidewalk and Driveway are applicable to this specification in addition to Arlington County Standards & Specifications.

1.2 Related work specified elsewhere

A. Section 01330 – Submittal Procedures

B. Section 01400 – Quality Requirements

C. Section 02200 – Earthwork

D. Section 02500 – Gravity Sewers and Appurtenances

1.3 Applicable Standards and Specifications

A. ACI 522R-10 Report on Pervious Concrete

B. ACI 522.1-13 Specifications for Pervious Concrete Pavement

C. Virginia Department of Environmental Quality Stormwater Design Specification No. 7: Permeable Pavement (latest version)

D. Arlington County Stormwater Management Ordinance Guidance Manual

E. ACI 211.3R - Guide for Selecting Proportions for No-Slump Concrete

F. ASTM C42 - 39TStandard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

G. ASTM C94 - 39TStandard Specification for Ready-Mixed Concrete

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H. ASTM C150 – Standard Specification for Portland Cement

I. ASTM C595 - 39TStandard Specification for Blended Hydraulic Cements

J. ASTM C979 – Standard Specification for Pigments for Integrally Colored Concrete

K. ASTM C1077 - 39TStandard Practice for Agencies Testing Concrete and Concrete Aggregates for use in Construction

L. ASTM C1116 – Standard Specification for Fiber Reinforced Concrete

M. ASTM C1688 - 39TStandard Test Method for Density and Void Content of Freshly Mixed Pervious Concrete

N. ASTM C1701 - 39TStandard Test Method for Infiltration Rate of In Place Pervious Concrete

O. ASTM C1754 - 39TStandard Test Method for Density and Void Content of Hardened Pervious Concrete

P. ASTM D994 - 39TStandard Specification for Preformed Expansion Joint Filler for Concrete

Q. ASTM D1751 - 39TStandard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction

R. ASTM D1752 - 39TStandard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction

S. ASTM D4751 – Standard Test Methods for Determining Apparent Opening Size of a Geotextile

T. NRMCA – National Ready Mix Concrete Association

U. VDOT Standard Specifications 214 & 504

V. VDOT Standard Specifications Section 220

W. VDOT Standard Specifications Section 316

X. AASHTO R18

Y. AASHTO M85

1.4 Submittals

A. Contractor Qualifications
   1. Contractor shall submit the name, qualifications and certification of the pervious concrete installer, providing written evidence of the following:
      a. Employment of one (1) NRMCA Certified Pervious Concrete Craftsman who shall be on site, overseeing each placement crew, during all concrete placement; or
      b. Employment of at least three (3) NRMCA Certified Pervious Concrete Installers who shall be on site, working as members of each placement crew during all concrete placement unless otherwise specified.

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c. Employment of at least two (2) NRMCA certified Pervious Concrete Technicians on each placement crew.

2. Testing Agency – Within seven (7) days after notice to proceed, Contractor shall furnish the name, qualifications and certification of the proposed third-party testing agency. Agencies that perform testing services on concrete shall be AASHTO accredited per AASHTO R18 and meet the requirements of ASTM C1077. Field tests of pervious concrete shall be made by an individual certified as an NRMCA Certified Pervious Concrete Technician, who is also an ACI Concrete Field Testing Technician, Grade 1 in accordance with ACI CPI.
3. Concrete Producer Qualifications – Within seven (7) working days after notice to proceed, Contractor shall furnish the name and location of an NRMCA certified plant that will produce and provide pervious concrete.
4. Concrete Mix Design – No later than thirty-five (35) days before construction of pervious concrete, Contractor shall furnish:
   a. A proposed mix design with proportions of materials for acceptance as described in section D of this specification or otherwise specified in Contract Documents. The data shall include unit weight, void ratio, and strength.
   b. Samples of individual concrete materials contained in the mix design for sampling and testing of material prior to use.
5. Submit manufacturer's shop drawings in accordance with Section 01330 – Submittal Procedures, including manufacturer's product data, samples and section layout.
6. Submit sieve analysis for grading of bedding material.
7. Product Sample (Test Panels) – At least fifteen (15) working days before construction of pervious concrete and following the Project Officer's acceptance of the mix design, Contractor shall provide two (2) samples of the product (test panels) in accordance with following specifications.
   a. Contractor shall provide a minimum of two (2) test panels for acceptance. Place, joint and cure the test panels, a minimum of 225 square feet in size or as specified in the Contract Documents, at the required project thickness to demonstrate that in-place void contents, unit weights, and infiltration rates can be met and to demonstrate effective jointing that does not compromise the cured concrete integrity.
   b. Test Panel Infiltration: Test panels shall be tested for infiltration in accordance with ASTM C1701.
   c. Test Panel Cores: Test panels shall have three (3) cores, each six (6) inches in diameter, taken from the panel a minimum of seven (7) days after placement of the pervious concrete. At least one core shall be taken within six (6) inches of a contraction joint. The cores shall be measured for thickness, void structure, and unit weight. Untrimmed, hardened core samples shall be used to determine thickness in accordance with ASTM C42. After thickness determination, the cores shall be trimmed and measured for unit weight in a saturated condition and void content in accordance with ASTM C1754.
   d. Test Panel Acceptance: Satisfactory test panels will be determined by:
      1) Infiltration rate of at least 60 inches per hour.
      2) Compacted thickness within 1/4" of the specified thickness.
      3) Void Content ± three (3) percent of the design void content.
      4) Unit weight ± five (5) pounds per cubic foot of the design unit weight.
   e. If test panels meet the above-mentioned requirements, they can be left in-place and included in the completed work. If test panels do not meet the above-mentioned requirements, they shall be removed and disposed of in an approved manner and replaced with an acceptable test panel at the contractor's expense.

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PART 2 - PRODUCTS

A. Portland Cement shall be:
   1. Type I or II conforming to AASHTO M85 or ASTM C150; or
   2. Type IP or IS conforming to ASTM C595.

B. Aggregate
   1. Maximum coarse aggregate size shall be No. 57.
   2. Coarse and fine aggregate conforming to Sections 803.02 and 803.01 of the VDOT Standard Specifications shall be double-washed. Washing shall be sufficient to remove dust and other coatings.

C. Admixtures – Water reducing, hydration stabilizers, air entrainment, and other admixtures conforming to VDOT Specifications shall be allowed in the mix design.

D. Fibers – Reinforcing fibers conforming to VDOT Specifications and ASTM C1116/C1116M, 4.1.3 or 4.1.4 shall be allowed in the mix design.

E. Pigments – Pigments conforming to ASTM C979/C979M shall be allowed in the mix design.

F. Joint Material – Joint material shall be in accordance with ACI 522.1-13 and Arlington County standards and specifications.

G. Geotextile (If Specified): Non-woven geotextile fabric with a flow rate greater than 125 gpm/sf (ASTM D4491), and Apparent Opening Size (AOS) equivalent to US #70 or #80 sieve (ASTM D4751) as directed by the Contract Documents and in accordance with the latest version of the Arlington County Stormwater Guidance Manual and Virginia DEQ Stormwater Design Specification No. 7: Permeable Pavement.

H. Impermeable Liner (If Specified): 30 mil PVC geomembrane liner or as directed by the Contract Documents. The liner shall be placed per manufacturer's specifications, the Contract Documents and Virginia DEQ Stormwater Design Specification No. 7: Permeable Pavement.

I. Underdrain (If specified) - 6" diameter perforated PVC (AASHTO M 252) pipe, with 3/8-inch perforations at 6 inches on center. Installed at a minimum 1.0% slope located 20 feet or less from the next pipe. Perforated pipe shall be installed for the full length of the permeable pavement cell, and non-perforated pipe, as needed, shall be used to connect with the storm drain system. T's and Y's installed as needed, depending on the underdrain configuration. Extend cleanout pipes to the surface with vented caps at the Ts and Ys.

J. Observation Well: 6" diameter vertical PVC pipe (AASHTO M 252) with a lockable cap, installed flush with the surface.

K. Concrete Mix - Comply with ASTM C94/C94M and develop a concrete mix design meeting the following requirements in accordance with ACI 211.3R, Appendix 6 and ASTM C1688/C1688M:
   1. Concrete shall achieve a minimum infiltration rate of 60 inches/hour (30 gallons/hour in a 12-inch diameter cylinder). Testing shall be in accordance with ASTM 1701.
   2. Concrete shall meet a minimum compressive strength when specified in the Contract Documents.
   3. A combined coarse and fine aggregates gradation shall be provided and material passing the #4 sieve shall be between 4% and 7%.

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4. Mix Water: Mix water quantity shall be such that the cement paste displays a wet metallic sheen without causing the paste to flow from the aggregate. Mix water yielding a cement paste with a dull-dry appearance has insufficient water for hydration. Insufficient water results in inconsistency in the mix and poor bond strength between aggregate particles. High water content results in the paste reducing or eliminating the void system required for porosity.

PART 3 - EXECUTION

3.1 Preparation of Grade

A. Sub-Grade Preparation
   1. Provide physical barriers or direct traffic to minimize vehicular traffic on subbase during construction. Regrade and recomplete subbase disturbed by construction traffic, as needed. Grading of subgrade shall be with low ground pressure equipment when within six (6) inches of final subgrade elevation. Sub-grade not meeting Contract Document requirements for compactions shall be scarified prior to installation of base materials.
   2. Subbase shall be within ±3/4 inches of the specified elevation.

B. Base Materials – Shall be installed in accordance with the latest edition of the Arlington County Stormwater Management Ordinance Guidance Manual and the Virginia DEQ Stormwater Design Specification No. 7: Permeable Pavement, Version 2.0, January 1, 2013and as specified on the Contract Documents.

3.2 Handling, Measuring and Batching Materials

A. Pervious concrete shall be transported from batching plant to the location of placement by a rolling drum mixer truck with current (within 12 months) certification by the NRMCA. Non-agitating trucks shall not be used. Each truck should not haul more than two (2) loads before being cycled to another type of concrete, unless a stabilizing hydration agent is used in the pervious concrete mix design or if Project Officer determines that there is no significant concrete build-up in the concrete mixer after delivery of each load.

3.3 Mixing Concrete

A. Concrete shall be mixed for a minimum of one (1) minute after introduction of all materials into the mixer. Begin mixing immediately after cement has been added to aggregates. Truck mixers shall be operated at the speed designated by the concrete producer for at least 75 to 100 revolutions of the drum.

B. Concrete mixing shall comply with ASTM C94/C94M except that discharge shall be completed within sixty (60) minutes after the introduction of mix water to the cement. This time can be increased to ninety (90) minutes when utilizing a hydration stabilizer. Further water addition is permitted at the point of discharge provided the design water/cement ratio is not exceeded.

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C. Do not install pervious concrete when ambient temperature is below 40°F or above 90°F, or when ambient temperature is forecasted to be below 40°F or above 90°F at any time during the seven (7) days following placement, unless otherwise permitted in writing by the Project Officer.

3.4 Placing and Consolidating Concrete

A. Pre-Placement Conference - A mandatory pre-placement conference will take place at least seven (7) days prior to installation of work and shall include at a minimum Project Officer, Arlington County SWPPP Inspector/BMP Reviewer, general contractor, pervious concrete contractor, concrete supplier, and field testing agency.

B. Wet the base materials or sub-grade such that the material is saturated but without any standing water immediately prior to concrete placement.

C. Deposit concrete directly from the transporting equipment onto the base materials or sub-grade, as appropriate.

D. Discharge: Each truckload shall be visually inspected for moisture consistency prior to discharge. Water addition shall not be permitted at the point of discharge to obtain the required mixture consistency and truckloads lacking the required moisture consistency shall be rejected as determined by the inspector. Discharge shall be a continuous operation and shall be completed as quickly as possible. Concrete shall be deposited as close to its final position as practical and such that discharged concrete is incorporated into previously placed and plastic concrete. If consolidation occurs during concrete discharge, placement shall be halted, the mixture shall be addressed, and the consolidated portion removed and replaced immediately.

E. Other methods of discharging the concrete may be used when specified in the Contract Documents or as allowed by the Project Officer.

F. Spread the concrete using a come-along, short-handle square ended shovel or rake, or similar equipment.

G. Rolling compaction shall be achieved using a motorized or hydraulically actuated, rotating, weighted tube screed that spans the width of the section placed and exerts a minimum vertical pressure of 10 psi on the concrete. Alternatively, a steel pipe roller meeting the same criteria may be used.

H. Plate compaction is not recommended but may be necessary in small areas. When necessary, a standard soil plate compactor with a base area of at least two square feet that exerts a minimum pressure of 10 psi on the concrete through a ¾ inch minimum plywood cover shall be used.

I. Cross rolling shall be performed using a roller specifically designed to smooth and compact pervious concrete. Lawn rollers are not allowed.

J. Foot-traffic shall not be allowed on fresh concrete.

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3.5 Strike-Off, Consolidation and Finishing

A. Strike off concrete between forms using a form riding paving machine, vibrating screed, or roller screed. Other strike off devices may be used when accepted by Project Officer.

B. Do not use steel trowels or power finishing equipment.

C. Final surface texture shall be achieved by finishing the fresh concrete using a full-width steel roller that provides a minimum compactive pressure to achieve the required tolerances.

D. Hand tools shall be used to finish the concrete along the slab edges immediately adjacent to forms.

E. Other methods of producing final surface texture may be permitted when specified in the Contract Documents or approved by the Project Officer.

3.6 Curing

A. Begin curing within twenty (20) minutes of concrete discharge unless otherwise specified or permitted.

B. Curing Material:
1. The pavement surface shall be entirely covered with a minimum six (6) mil thick polyethylene sheet or in accordance with Section 220 of the VDOT Standard Specifications whichever is more stringent. Sheeting shall be cut to a minimum of the full lane width and pavement shall remain covered for at least seven (7) uninterrupted days.
2. Alternate curing materials may be used as approved by the Project Officer.

C. Curing sheets shall be secured and kept secure at all times without using dirt. The method of securing the cover material shall prevent wind from removing the sheet and from blowing under the sheet across the surface of the concrete.

D. Hot Weather Curing: A fog shall be sprayed above the surface, before covering, when required due to hot weather conditions. Equipment must include fog nozzles that atomize water using air pressure to create a fog blanket over the slab.

E. Cold Weather Curing: Curing shall be in accordance with VDOT Standard Specification.

3.7 Joints

A. Contraction joints shall be installed at locations and spacing shown in the Contract Documents at one-quarter (¼) the depth of the thickness or a maximum of one and a half (1½) inches for roadway and alley pavements, and at one-half inch (½”) for sidewalks and trails. Allowable methods for joint placement, as directed by the Project Officer, include:
1. Rolled Joints - shall be formed in plastic concrete using a steel pipe roller to which a beveled fin with the required diameter to achieve the joint depth has been attached around the circumference of the roller. Rolled joints are formed immediately after roller compaction and before curing. Sidewalks and trails shall have rolled joints.
2. Sawed Joints – shall not be constructed except with prior approval by the Project Officer and shall be in accordance with ACI 522.1-13.

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B. Construction joints shall be installed at locations, depths, and with horizontal dimensions and spacing shown in the Contract Documents and whenever concrete placement is suspended for a sufficient length of time that concrete may begin to harden.

C. Expansion joints shall be installed when pervious concrete will abut existing concrete slabs or other structures such as walls, footings, columns, catch basins, stairs, light poles, and other points of restraint.

D. To reduce raveling at joints, or where pervious concrete meets impervious pavement, finishing may be necessary in accordance with Section 3.5 of this specification.

3.8 Testing

A. Testing responsibilities will be performed by the Testing Agency at the Contractor's expense. Concrete materials and operations may also be tested and inspected by the owner as work progresses. Use of testing services will not relieve Contractor of the responsibility to furnish materials and construction in full compliance with the Contract Documents. Failure to detect defective work or materials early will not prevent rejection if a defect is discovered later nor shall it obligate the Project Officer for final acceptance at any time.

B. Testing Procedure:
   1. Conduct tests in accordance with ASTM C1688 at the beginning of each pervious concrete placement operation for each batch, or for every 50 cubic yards (maximum), or a minimum of one test for each day's placement, to verify fresh density and void content.
   2. A minimum of seven (7) days following each placement, three (3) cores, six (6) inches in diameter, shall be taken. The cores shall be measured for thickness, void content and unit weight determined using the methods described in Section 1.4.A.7 of this specification entitled Product Sample (Test Panels). Satisfactory test panels will be determined by:
      a. Compacted thickness +3/4", -1/4" of the specified thickness.
      b. Void Content ± three (3) percent of the design void content.
      c. Unit weight ± five (5) pounds per cubic foot of the design unit weight.

C. The permeability of the pavement surface shall be tested in accordance with ASTM C1701. All applied water shall infiltrate directly without puddle formation or surface runoff, and the testing shall be observed by the Project Officer. A minimum infiltration rate of 60 inches per hour shall be achieved.

D. Infiltration Testing – For infiltration facilities only, conduct post-construction infiltration testing of facility after a natural rainfall over 1 inch, or by flooding the BMP during consistently dry weather. The water level in the observation well shall be measured periodically until the water is gone from the observation well. Record the day/time of each measurement. Using these recordings, an infiltration rate can be reached. Provide a signed/sealed testing report.

E. Submit all test results to the Project Officer.

F. Cores holes shall be filled with conventional concrete.

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3.9 Tolerances

A. Pavement must be mechanically swept or vacuumed with clean equipment and finished before testing for compliance with tolerances. Construct pavement to comply with the tolerances of Section 316 of the VDOT Standard Specifications and the following:
   1. Thicknesses: + 3/4 inch; - 1/4 inch
   2. Elevation: + or - 1/2 inch
   3. Contraction joint depth: +1/4 inch, -0 inch
   4. Smoothness: similar to approved test panel with no abrupt offsets unless required by the contract drawings.

3.10 Opening to Traffic

A. Both vehicular traffic and pedestrian traffic shall be excluded from pervious concrete pavement after the placement of curing materials as follows:
   1. 7 days for pedestrian traffic on sidewalks or pavements
   2. 14 days for vehicular traffic on alleys
   3. As determined by Contractor's Engineer for vehicular traffic on roadways, but not less than 14 days.
   4. Ambient temperature must reach 55 ºF or more during any time each day of the curing period.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Pavement shall be installed in accordance with the dimensions indicated on the approved drawings. Pavement shall be measured to the actual dimensions installed in the field. In an event, it becomes necessary to deviate from the dimensions indicated on approved drawings, the contractor must obtain approval from Project Officer in advance prior to pavement installation. Payment for PERVIOUS CONCRETE PAVEMENT shall be in cubic yards of pavement installed and shall include the necessary excavation, preparation of the subgrade surface, subbase, and all other items listed in PART 2 - PRODUCTS as indicated on approved plans.

4.2 Subbase and bedding material shall be installed to the width and depths shown on the approved plans. Subbase and bedding material installed in excess of what is shown on approved plans must be approved by the project officer prior to installation. Subbase and bedding material installed in excess of what is shown on approved plans shall be measured to the actual dimensions installed in the field. Payment for SUBBASE AGGREGATE and BEDDING AGGREGATE installed in excess of what is shown on approved plans shall be in cubic yards of material installed.

END OF SECTION 02795

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SECTION 02840 - VEHICLE DELINEATORS

PART 1 - GENERAL

1.1 Description of the Work

A. Provide all necessary labor, materials and equipment to provide, fabricate, and install Vehicle Delineators as shown on plans, details, and these specifications. All work under this section is subject to the Special and General Conditions and Instruction to Bidders which form a part of these specifications and to the current editions of the Arlington County Construction Standards and Specifications Manual and Virginia Department of Transportation Road and Bridge Specifications (VDOT). The Contractor shall be responsible for and governed by all the requirements thereunder.

1.2 Related Work Specified Elsewhere

A. Section 02600- Bituminous Roadway Pavements

B. Section 02601- Bituminous Hiking Biking and Jogging Trails

C. Section 02650- Restoration of Roadway

D. Section 13180- Maintenance and Control of Traffic

1.3 Applicable Standards and Specifications

A. Virginia Department of Transportation Road and Bridge Specifications (VDOT)

B. Virginia Department of Transportation Road and Bridge Standards (VDOT)

C. Manual on Uniform Traffic Control Devices (MUTCD)

D. American Association of State Highway and Transportation Officials (AASHTO)

E. American Society for Testing and Materials (ASTM)

1.4 Submittals

A. The Contractor shall submit shop drawings of Vehicle Delineators to the Project Officer for approval prior to fabrication.

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PART 2 - PRODUCTS

A. Vehicle Delineators shall conform to the requirements of Section 702 of the VDOT Road and Bridge Specifications.

B. Flexible Post Delineator shall have white reflectors at the top of the device and be white or yellow in color unless otherwise noted on the plan. Flexible delineators shall be 3 inches round and 36 inches in height and made of thermoplastic polyurethane. The base shall be black in color and assembled by bolting down with pin locks. Flexible delineators shall be installed per manufacturer's recommendations and shall not vary more than ½ inch in 36 inches from a vertical plane.

PART 3 - EXECUTION

A. Vehicle Delineators type, and installation shall conform to the requirements of Section 702 of the VDOT Road and Bridge Specifications.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Vehicle Delineators as shown in the Contract Documents and as specified herein shall be measured in units of each, complete-in-place. Payment shall be at the contract unit price per each, and shall include the furnishing of all Vehicle Delineators, fastening materials, and other material required to provide a complete installation, as well as all other work incidental to providing a complete installed Vehicle Delineator.

END OF SECTION 02840

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SECTION 02870 - BICYCLE RACKS

PART 1 - GENERAL

A. Provide all labor, materials and equipment to bicycle racks as detailed in the Construction Standards and as called for on the Contract Drawings.

B. This technical specification is included by reference in the Arlington County Bicycle Parking Standards Guide, where additional information is also provided.

1.2 Related Work Specified Elsewhere

A. Section 02611 - Concrete Walks and Concrete Driveway Entrances

B. Section 02612 - Interlocking Concrete and Brick Pavers

C. Section 05500 – Structural Steel

1.3 Applicable Standards and Specifications

A. American Society for Testing and Materials (ASTM)

B. American Society of Mechanical Engineers (ASME)

C. American Concrete Institute (ACI)

D. American Welding Society (AWS)

E. American Iron and Steel Institute (AISI)

F. Federal General Service Administration Specification A-A-1925a

G. Arlington County Bicycle Parking Standards Guide

PART 2 - PRODUCTS

2.1 Bicycle Racks

A. Bicycle racks shall be of an accepted design that provides two points of contact with a parked bicycle. Inverted “U” racks and other designs constructed of tubing shall be 2” Nom. (2.38” O.D.) Sch. 40 steel pipe as per ASTM A53, or 2” square section 8 gauge as per ASTM A-500.

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2.2 Material and Coating

A. Pipe (and flanges, rails, anchor pins, shims, and fasteners, if applicable) shall be hot-dip galvanized (HDG) as per ASTM A123 and A304; or stainless steel as per ASTM A666 and A240.

B. Bicycle racks may be powder coated over HDG as per ASTM D 7803, or thermoplastic coated as approved by the County. Coating must be complete dipped or completely powder coated.

2.3 Fasteners

A. Fasteners when used shall:
1. Be of acceptable material and coating.
2. Meet one of the following requirements

Type	**Specification**	**Minimum Size**	**Minimum Installation Depth**	**Acceptable Embedment Material**
Threaded (metal to metal)	ASME B18.18:2017	3/8”	As Necessary	Metal to metal. Tamper resistant nuts required.
Threaded (concrete) see Note 5	ACI 355.2 ASTM F 1554	3/8”	3.5”	Concrete
Friction	A-A-1925a, ASTM E 488	3/8”	3”	Concrete
Mechanically expanded	A-A-55614, ASTM E 488	3/8”	3.5”	Concrete
Adhesive Bonded	ASTM C 881 ASTM E1512	3/8”	6”	Concrete, Asphalt

3. Be able to provide firm, secure anchoring with a maximum of ¼-inch non-trip hazard projection above finished grade.
4. Be threaded or driven anchors. Threaded fasteners to be fixed with tamper-resistant nuts as approved by the County.
5. Threaded fasteners in concrete shall be Type 316 and Type 304 stainless steel with carbon-steel lead threads.

PART 3 - EXECUTION

3.1 General

A. Top of installed bicycle racks shall be minimum 33” above finished grade.

B. Bicycle racks shall be installed using the following options only:

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1. Flange-mounted to cured concrete
2. In-ground (anchored in new concrete)
3. Mounted on rails mounted to cured concrete or asphalt

C. If multiple racks are installed, they shall be uniformly aligned, and evenly spaced. For layout purposes, each bicycle rack shall be centered in a “design stall” of minimum dimension 36” x 72”.

D. Bicycle racks shall be anchored firmly and installed vertical (plumb) in two planes.

E. No component of the installed bicycle rack shall result in a tripping hazard.

F. Bicycle racks shall not be mounted directly to unit pavers only.

3.2 Flange Mounted Installation

A. Flange-Mounted racks shall be installed on existing cured concrete. Use flange racks with fasteners as specified above. Existing concrete shall conform to Concrete Sidewalk Std., Arlington County Construction Specification Section 02611, and Std. Dwg. R-2.0 (min. 4” thickness).

B. Rack legs shall be welded to flanges with complete seamless continuous fillet welds conforming to ASTM A36, ASTM A312 and AWS D1.1. Spot, tack, or intermittent welding is not acceptable.

C. Flanges shall be minimum 3/8” thick, with minimum two ½” dia. holes (two fasteners) per flange.

D. Flange mounted racks shall not be bolted to unit pavers.

E. Where concrete pavers or fired clay brick are installed over continuous concrete sub-base, flange-mounted racks shall be installed on concrete sub-base. Installation must not compromise any waterproofing of concrete. (For example, installation above underground parking structure.)

F. Unit pavers shall be installed in accordance with Arlington County Construction Specification section 02612.

G. Unit pavers shall be neatly cut and fit around flanges, fasteners, and legs of rack.

H. Legs of flange mounted racks shall be of sufficient length to provide minimum acceptable height of 33” above finish grade.

3.3 In-Ground Rack Installation

A. Legs of in-ground racks shall be fitted with anchor pins to prevent lift-out. Anchor pins shall be:
1. Of acceptable material.
2. Min. 3/8” diameter with min. 3” concrete encasement.

B. In-ground racks shall be installed and firmly anchored in new concrete of minimum dimensions shown on the Arlington County Standard details prefaced with R-8.#. Anchored portions of rack shall have min. 3” concrete encasement on all sides.

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C. For rack installations on sites with concrete pavers or fired clay brick installed *over compacted soil sub-base and sand leveling course* as per Arlington County Standard Specifications Section 02612, and Arlington County Standard Detail R-2.1, racks shall be installed in concrete footing of dimensions shown on details prefaced with R-8-#.

D. Where in-ground racks are installed in unpaved soil, or sod/grass/turf, provide a single concrete footing of dimensions shown on the Arlington County Standard details prefaced with R-8.#. Provide a tamped gravel pad min. 4" thickness, and min. 36" x 72" centered on each installed rack.

E. Legs of in-ground racks shall be of sufficient length to provide anchoring below grade a minimum of 9" and be a minimum height of 33" above finish grade.

3.4 Installation on Rails

A. Bicycle racks may be approved in "ganged" assemblies of from 2 to 7 racks on continuous rails.

B. Rails shall be type AISI C3 x 4.1 steel channel as per ASTM A36, HDG, or powder coated over HDG to match racks.

C. Individual racks can be welded to rails. Welds shall be complete seamless continuous fillet welds conforming to ASTM A36, ASTM A312 and AWS D1.1. Spot, tack, or intermittent welding is not acceptable.

D. Individual racks can be bolted to rails.

E. If racks are bolted to rails, fasteners shall be:
1. Of acceptable material.
2. Min. 3/8" diameter.
3. Able to provide firm, secure anchoring with threaded nuts on underside of steel channel.
4. Fitted with tamper- resistant threaded nuts as approved by the County.

F. Racks on rails may be approved for installation on finished asphalt. In such cases, a permanently grouted, internally threaded asphalt anchor as approved by the County shall be used to provide attachment.

PART 4 - MEASUREMENT AND PAYMENT

4.1 When applicable, Measurement shall be lump sum. Payment shall include all demolition, excavation, restoration, compaction, furnishing of equipment and materials, providing for the installation of the bicycle rack.

END OF SECTION 02870

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SECTION 02900 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 Description of The Work

A. Provide all labor, materials, tools, equipment, transportation, supplies, and incidentals to establish the location of pavement markings, install pavement markings, and reflectorized material on specified pavements in accordance with these specifications, the MUTCD, and as directed by the Project Officer.

B. This work shall also include furnishing and installing colored coating for bicycle lanes.

C. This work shall also include removal and eradication of pavement markings.

1.2 Applicable Standards and Specifications

A. Virginia Department of Transportation Road and Bridge Specifications (VDOT)

B. Virginia Department of Transportation Road and Bridge Standards (VDOT)

C. Manual on Uniform Traffic Control Devices (MUTCD)

D. Virginia Department of Transportation (VDOT) Supplement to the Manual on Uniform Traffic Control Devices (MUTCD)

E. Arlington County Pavement Marking Specifications

PART 2 - PRODUCTS

2.1 Pavement Markings

A. Pavement Markings shall conform to the requirements of Section 246 of the VDOT Road and Bridge Specifications.

2.2 Glass Beads

A. Glass Beads shall conform to the requirements of Section 234 of the VDOT Road and Bridge Specifications.

2.3 Retroreflectors

A. Retroreflectors shall conform to the requirements of section 235 of the VDOT Road and Bridge Specifications

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2.4 Colored Asphalt Coating

A. Colored asphalt coating shall be red or green Methyl Methacrylate (MMA). Contractor to submit a sample of the color for approval to the Project Officer prior to installation of the product.

PART 3 - EXECUTION

3.1 Timing of Installation

A. The Contractor shall have a certified VDOT Pavement Marking Technician present during pavement marking operations.

B. Pavement markings shall be installed on new roadways prior to opening the roadway to traffic. Pavement marking installation shall be completed within the time limits herein on roadways where the pavement markings have been removed or obscured and the roadway is open to traffic unless otherwise directed by the Project Officer. Installation of edge lines on roadways where the existing pavement markings have been removed or obscured are also required within these time limits unless otherwise indicated by the Project Officer. Exceptions to the below time limits shall be granted only for weather restrictions, and installation of epoxy resin pavement markings on new pavement shall not commence until after 24 hours of final surface placement.
   1. Pavement marking installation on roads having traffic volumes of 10,000 ADT or more shall be completed within 24 hours after the end of the workday where the pavement markings were removed or obscured.
   2. Pavement marking installation on roads having traffic volumes between 3,000 and 10,000 ADT shall be completed within 48 hours after the end of the workday where the pavement markings were removed or obscured.
   3. Pavement marking installation on roads having traffic volumes of less than 3,000 ADT shall be completed within 72 hours after the end of the workday where the pavement markings were removed or obscured.
   4. The Project Officer may authorize exceptions to these time limits for the installation of Type B, Class VI, pavement markings on asphalt roadways if they are inlaid with the last pass of the asphalt roller or directly after the asphalt roller using a separate roller.

3.2 Provision for Temporary Markings

A. If the Contractor shall not have pavement markings installed within the time limits specified, the Contractor shall install Type D construction pavement markings within the same time limits and maintain such until the final pavement markings can be installed. The cost of installing, maintaining, and removing the Type D construction pavement markings shall be borne by the Contractor at no cost to the County.

3.3 Premarking

A. When establishing the location of pavement markings, the Contractor may mark the locations on the roadway by installing premarkings.

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B. Premarkings shall be accomplished using Type D (removable, any class) tape, chalk, or lumber crayons except special pavement markings such as stop lines, crosswalks, messages, hatching, etc., shall be made using chalk or lumber crayons.

C. Premarkings shall be of the same general color as the pavement markings being premarked.

D. When tape is used as premarking, premarking shall consist of 4-inch by 4-inch-maximum squares or 4-inch-maximum diameter circles spaced at 100-foot-minimum intervals in tangent sections and 50-foot-minimum intervals in curved sections.

E. At locations where the pavement marking shall switch colors, e.g., gore marking, the ends of the markings may be premarked regardless of the spacing.

F. When chalk or lumber crayon is used as premarking, the entire length of the pavement marking may be premarked.

G. Premarkings shall be installed whereby their installation shall not affect the adhesion of the pavement markings.

H. When Type D tape is used as the premarking and the lateral location of such premarkings to the final pavement markings exceeds 6 inches, the premarkings shall be removed at no cost to the County.

I. Unless otherwise specified and approved by the Project Officer, the premarkings for each work assignment shall be inspected and approved by the Project Officer prior to installing permanent markings. Work completed incorrectly without premarkings or approval of premarkings from the Project Officer will not be paid and will be subject to removal and/or replacement at the Contractor's expense.

3.4 Pavement Markings

A. Pavement markings shall be white or yellow markings (unless another color is specified in the Contract) as required by the MUTCD for the specific location or as specified by the Project Officer and shall be installed in accordance with the manufacturer's recommendations and approved by the Project Officer. The Contractor shall furnish a copy of the manufacturer's installation recommendations to the Project Officer.

B. Pavement Line Markings
   1. Pavement line markings shall consist of stop lines, crosswalks, and solid or skip lines used for, but not limited to, dividing lanes, marking edges, channelizing, outlining and marking safety zones around objects, and forming islands and parking lot stalls. Crosswalks and stop lines shall be installed using Type B, Class I or IV, markings. Solid lines or skip lines shall be installed using Type A or Type B markings as specified.

C. Pavement Message Markings
   1. Pavement message markings shall be installed using Type B, Class I, IV, or VI, markings and shall include, but not be limited to, school zone markings, railroad crossing markings, disabled parking symbols, elongated arrows, word messages, etc.
   2. The word SCHOOL shall be formed with characters that are 10 feet in height where permitted by the normal roadway width. School zone markings shall extend transversely

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across both lanes of two-lane roadways and across two or more approach lanes of roadways of three or more lanes.

3. International Symbol of Accessibility parking symbols shall be 41 inches in height, 36 inches in width, and shall use a 4-inch stroke width for the lines.

3.5 Application

A. The Contractor shall protect the public from damage attributable to pavement marking operations. The Contractor shall be responsible for the complete preparation of the pavement surface, including, but not limited to, removing dust, dirt, loose particles, oily residues, curing compounds, concrete laitance, residues from eradication, and other foreign matter immediately prior to installing pavement markings.

B. The pavement surface shall be dry at the time of installation when tested in accordance with VTM-94. Marking material shall not be applied within 24 hours following rain or other inclement weather.

C. Liquid markings shall be applied so as to prevent splattering and overspray and shall be protected from traffic until track free by the use of guarding or warning devices as necessary. If a vehicle crosses a marking and tracks it or if splattering or overspray occurs, the affected marking and resultant tracking shall be removed and new markings applied at the Contractor's expense.

D. Equipment shall also be thoroughly cleaned between changes in colors of materials. Pavement markings shall have clean and well-defined edges without running or deformation; shall be uniform, free of waviness; shall be straight on tangent alignment; and shall be on a true arc on curved alignment.

3.6 Tolerance

A. Pavement markings shall have clean and well-defined edges without running or deformation; shall be uniform, free of waviness; shall be straight on tangent alignment; and shall be on a true arc on curved alignment. The lateral deviation of pavement markings shall not exceed one (1) inch from the proposed location as specified on the plans, sketches, and aerial images or as directed by the Project Officer. The widths of pavement markings shall not deviate more than 1/4 inch on tangent nor more than 1/2 inch on curves from the required width. The length of the gap and the length of the individual stripes that form skip lines shall not deviate more than two inches. The length of the gap and individual skip line shall be of such uniformity throughout the entire length of each that a normal striping machine shall be able to repeat the pattern and superimpose additional striping upon the existing marking.

B. Glass Beads

1. Glass beads shall be applied at the rate specified herein and shall be evenly distributed over the entire surface of the marking. Beads shall be applied to the surface of liquid markings by a bead dispenser attached to the applicator that shall dispense beads simultaneously on and in the just-applied marking. The bead dispenser shall be equipped with a cut-off control synchronized with the cut off of the applied marking material so that the beads are applied totally to the completed line.
2. Beads shall be applied while the liquid marking is still fluid. Approximately 70 percent of beads shall be buried in the marking, and the remaining 30 percent shall be 50 to 60 percent

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embedded in the surface. Beads installed on crosswalks and stop lines on roadways with curbs only (no gutter) may be hand applied for two feet at the end of each line next to the curb with 100 percent of the beads embedded 50 to 60 percent in the surface.

C. Markings found to be unacceptable shall be removed, and new markings applied at the Contractor's expense.

3.7 Type A Markings

A. Paint may be applied to asphalt concrete and hydraulic cement concrete pavements. Paint shall not be applied over existing pavement markings of other materials unless the existing marking is 90 percent removed. Paint may be applied over existing paint markings. Paint shall be applied with a line painting machine that is capable of hot spraying paint directly onto the pavement surface with a uniformity of feed through its nozzles for widths of 4 through 8 inches. The machine shall be capable of applying two pavement stripes, either solid or skip, at the same time when double line markings are required. Paint tanks on the equipment shall be equipped with a mechanical agitator and paint shall be thoroughly mixed and heated such that it shall not track within 60 seconds after its application.

B. Non-truck mounted equipment shall be self-propelled and regulated to allow for calibration of the amount of material applied. Glass beads shall be applied to the surface of the paint at the rate of 6 pounds per gallon of paint.

3.8 Type B Markings

A. Equipment shall be capable of providing mixing, heating, and agitation of material. Material shall be uniformly heated throughout the system in accordance with the manufacturer's recommendations. Thermoplastic material shall be maintained in the heating kettle and applied to the road surface at a minimum temperature of 400 degrees F. Heating kettles shall be equipped with an automatic thermostatic control device. The Contractor shall furnish a properly calibrated infrared instrument for the purpose of measuring the actual temperature of molten thermoplastic material.

B. Multi-component material shall be applied using internally injected guns for the mixing of catalyst and hardener.

C. Non–truck mounted equipment for application of thermoplastic material shall be of the screed extrude type with a screw driver or shall be self-propelled and regulated to allow for calibration of the amount of material applied. Non–truck mounted equipment for application of polyester and epoxy resin material shall be self-propelled and regulated to allow for calibration of the amount of material applied.

D. Thermoplastic (Class I)
   1. Thermoplastic (Class I) material shall be applied only on asphalt concrete pavements and shall be applied by screed extrude, ribbon gun, or spray equipment. Alkyd thermoplastic may be applied directly after the paving operations; however, hydrocarbon thermoplastic shall not be applied less than 30 days after the paving operations.
   2. Alkyd and hydrocarbon materials shall not be mixed together. Equipment shall be thoroughly cleaned before types of material are changed.

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3. Thermoplastic shall not be applied over existing pavement markings of other materials unless the existing marking is 90 percent removed. Thermoplastic may be applied over existing thermoplastic markings. For concrete bridge decks that occur in asphalt roadways, Type B, Class VI, tape shall be used.
4. Primer/adhesive shall be applied to asphalt concrete surfaces more than 2 years old and shall be from the same manufacturer as the thermoplastic.
5. Glass beads shall be applied to the surface of the marking at the rate of 7 pounds per 100 square feet.

E. Polyester Resin (Class II)
1. Polyester resin (Class II) material shall be applied only on hydraulic cement concrete pavements. Polyester resin shall not be applied over existing pavement markings of other materials unless the existing marking is 90 percent removed.
2. Polyester resin may be applied over existing polyester resin markings.
3. Glass beads shall be applied to the surface at the rate of 8 pounds per gallon of material.

F. Epoxy Resin (Class III)
1. Epoxy resin (Class III) material shall be applied only to asphalt concrete pavement more than 1 day old and hydraulic cement concrete pavement. Epoxy resin shall not be applied over existing pavement markings unless the existing marking is 90 percent removed.
2. Glass beads shall be applied by the gravity method to the surface at the rate of 25 pounds per gallon of material.

G. Plastic Backed Preformed Tape (Class IV)
1. Plastic-backed preformed tape shall be installed in accordance with the manufacturer's recommendations and as denoted herein. Tape may be applied to asphalt concrete and hydraulic cement concrete pavements. Tape may be installed immediately following the final rolling of the new asphalt concrete surface. Tape shall not be applied over existing pavement markings of other materials unless the existing marking is 90 percent removed.
2. Primer/adhesive shall be used for all installations except when tape is applied immediately following the final rolling of the new asphalt concrete surface and shall be from the same manufacturer as the tape.
3. Tape for pavement line markings shall be applied by an application cart as recommended by the manufacturer. Tape shall be tamped into place with a tamper cart with the weight as recommended by the manufacturer. The use of a vehicle to ride over the markings for tamping shall not be permitted.

3.9 Eradication

A. Eradication of pavement markings for restriping when required shall be in accordance with the requirements of Section 512 of the VDOT Road and Bridge Specifications except only 90 percent removal of the existing markings is required.

B. Eradication of markings shall be done with a Laser grinder or similar or by hydro blasting. Contractor shall do a test area before County approved method of eradication.

C. Eradication will consist of removing the markings with little or no impact to the underlying or adjacent asphalt surface.

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D. Contractor shall collect the eradication residue during or immediately after the eradication operation. Residue and dust is to be collected and contained during the entire operation. The Contractor shall not store any eradication residue on-site. The Contractor shall be responsible for disposing of all residue from the removal of any pavement marking in a permitted waste disposal facility in accordance with all Federal, state and local laws and regulations.

3.10 Colored Asphalt Coating

A. Installers shall be accredited by the manufacture. Materials shall be installed in accordance with the manufacturer's written instructions. The Contractor shall apply a minimum of two coats.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Temporary pavement line markings

A. The cost of installing, maintaining, and removing all temporary pavement markings shall be borne by the Contractor at no cost to the County.

4.2 Pavement Line Marking

A. Measurement of pavement line markings (type, class, width) shall be per linear foot of line furnished and installed.

B. No additional measurement shall be made when more than one line can be installed on a single pass such as center line with no-pass line, double center line, double lane line, reversible lane line, or two-way left turn center line.

C. Payment for pavement line markings (type, class, width) shall be per linear foot and shall include all labor, materials, tools, equipment, transportation, supplies, and incidentals required to furnish and install the line markings as specified.

D. No deduction shall be made for the unmarked area when the marking includes a broken line such as, skip lane line.

4.3 Colored Asphalt Coating

A. Measurement of colored asphalt coating shall be per square foot of area completed. Payment for colored asphalt coating shall be per square foot and shall include all labor, materials, tools, equipment, transportation, supplies, and incidentals required to complete the coating.

4.4 Removal/Eradication of Existing Pavement Markings

A. Payment for pavement line markings (type, class, width) removal and/or eradication shall be paid by actual work performed as listed in the contract and shall include all labor, materials, tools, equipment, transportation, supplies, and incidentals required to remove and/or eradicate the line markings as specified.

END OF SECTION 02900

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SECTION 02952 - TRENCHLESS CROSSING

PART 1 - GENERAL

1.1 Description of Work

A. Provide all plant, labor, materials and equipment to furnish and install pipelines, utilities, cables, and/or appurtenances below the ground with minimal excavation by one or a combination of methods commonly known as Trenchless Technology such as jacking, boring, ramming, directional drilling or tunneling.

B. Definitions

1. *Carrier pipe*: pipe for conveyance of water, gas, sewage, or other products and services.
2. *Trenchless Crossing:* as defined in the Description of Work.
3. *Working Drawings*: drawings of the proposed trenchless crossing method, prepared by an engineer and submitted by the Contractor to the Project Officer for approval

C. Job Conditions

Trenchless Crossing shall be performed so as not to interfere with, interrupt or endanger surface and activity thereon, and minimize subsidence of the surface, structures, and utilities above and in the vicinity of the tunnel. Support the ground continuously in a manner that will prevent loss of ground and keep the perimeters and the trenchless crossing operations stable. The Contractor shall be responsible for all settlement resulting from operations and shall repair and restore damaged property to its condition prior to being disturbed at no cost to the Owner.

1.2 Related Work Specified Elsewhere

A. Section 02200 – Earthwork

B. Section 02202 – Rock Excavation

C. Section 02500 – Gravity Sewers and Appurtenances

D. Section 02505 – Storm Sewers and Appurtenances

E. Section 02510 – Sanitary Sewers and Appurtenances

F. Section 02550 – Water Mains and Appurtenances

1.3 Applicable Standards and Specification–

A. American National Standards Institute (ANSI)

B. American Society for Testing and Materials (ASTM)

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C. Virginia Department of Transportation Road and Bridge Specifications (VDOT)

D. Arlington County Utilities Code (Chapter 26 of the Arlington County Code)

1.4 Permits and Regulations

A. The County shall obtain all permits required except those permits required for blasting as specified in Section 02202 Rock Excavation. The Contractor shall conform to the regulations set forth by the authorities having jurisdiction over the work performed in the areas of tunnel crossings.

1.5 Submittals

A. The Trenchless Crossing Contractor shall submit to the Project Officer, a full response to the requirements outlined below.

1. Submit a coversheet, including date, company name, address, telephone and telefax, contact person, etc.
2. Submit resumes of key personnel performing the Trenchless Crossing work, including managerial, supervisory and operational personnel. Resumes shall include detailed descriptions of their Trenchless Crossing projects, demonstrating their experience in a minimum of three (3) previous Trenchless Crossing projects of similar size and scope.
3. Submit a summary sheet of previous projects demonstrating that the company has a minimum of five (5) years experience and expertise performing Trenchless Crossing of similar size and scope. The summary sheet shall include the following for each named project:
   - Full name of project
   - Project Location
   - Date
   - Owner’s name, address, contact person, telephone and fax numbers
   - Client’s name, address, contact person, telephone and fax numbers
   - Key project personnel at both head office and site
   - Description of the relevant work successfully completed, including site conditions, features under which pipe passed, depth below the water table, photos, published articles, etc. Add additional information as necessary.

B. Preconstruction Survey
1. The Trenchless Crossing Contractor shall submit to the Project Officer, the Preconstruction Survey, as required herein.

C. Working Drawings and Calculations
1. The Trenchless Crossing Contractor shall submit to the Project Officer, Working Drawings and Calculations for the design of the tunnel, pits, and any excavation support systems and dewatering systems to be utilized for the project, as required herein.

D. Product Submittals

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1. The Trenchless Crossing Contractor shall submit to the Project Officer, for approval, material certifications, certified laboratory test reports, manufacturer's product catalog data, shop drawings and specifications, showing compliance with the requirements necessary to install the required Trenchless Technology.
2. All submittals, regardless of origin, shall be stamped with the approval of Contractor and identified with the name and number of the Project, Contractor's name, and references to applicable specification paragraphs and Contract Drawings. Each submittal shall indicate the intended use of the item in the Work. When catalog pages are submitted, applicable items shall be clearly identified, and inapplicable data crossed out. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data.

E. Methods and Procedures

1. The Trenchless Crossing Contractor shall submit to the Project Officer, for information review and record purposes, full details describing the proposed methods and procedures of the entire operation to be used, and the resources, sequencing and schedule of the following.
   a. Detection of ground movement.
   b. Establishment of drive line of the trenchless crossing equipment..
   c. Monitoring and maintaining line and grade and the reestablishment of line and grade as required.
   d. Dewatering and drainage.
   e. Handling of auxiliary stabilization equipment and connections.
   f. Connection details and grout hole details.
   g. Excavation and removal of soil materials, spoil and slurry containment, and separation and disposal.
   h. Installing the carrier pipe to prevent flotation and surge pressure buckling.

F. Daily Activity Log

1. The Trenchless Crossing Contractor shall submit to the Project Officer, on a daily basis, for information review and record purposes, an activity log maintained during Trenchless Crossing operations. The information and activities to be logged shall include but not limited to the following.
   a. Start and finish time of trenchless crossing operations.
   b. Total length of trenchless crossing installed.
   c. General description for each discernible ground condition mined.
   d. Settlement monitoring readings.

1.6 Quality Assurance

A. The Contractor shall be responsible for providing evidence that all methods and materials used in the Work shall meet all applicable standards and certifications. Such evidence shall comply with the requirements of Section 01400 Quality Requirements.

B. All Trenchless Crossing work shall be supervised by at least one person with previous experience of the Trenchless Technology process being used, as required in the Submittals section of this specification.

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C. System operators shall be personnel with prior knowledge and experience in the proper operations of the Trenchless Crossing method being employed, as required in the Submittals section of this specification.

1.7 Preconstruction Survey and Subsurface Investigations

A. The Contractor shall survey, photograph, and videotape all structures, and roadways, within a horizontal distance of the centerline of the Trenchless Crossing that is three times the vertical distance from the invert of the Crossing to the finished grade over the Crossing. This survey shall be performed by a company that can show acceptable previous experience to the Project Officer. The survey shall be prepared and submitted to the Project Officer 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 Crossing is under wetlands or other surface, the complete condition of the wetlands or other surface which is over the proposed Crossing shall be documented. The Preconstruction Survey shall be made before any excavation is performed, and is included in the Submittals section of this specification.

B. Subsurface Investigations
1. If the contractor deems it necessary shall hire a Geotechnical Consultant to provide subsurface investigation/recommendations for the installation of the Trenchless Crossing. The Contractor shall review the geotechnical data from the Geotech Consultant, and shall become familiar with the site and the subsurface conditions, as required in Section 02200 EARTHWORK. Ignorance of conditions will not be accepted as a basis of claim for additional compensation. The Owner and Project Officer do not warrant or guarantee that the conditions encountered in the execution of the work under this contract will be the same as the conditions indicated in the geotechnical data.
2. Blasting is prohibited without explicit approval of the Project Officer.
3. The cost for Subsurface Investigations shall be incidental to other items in the Contract; therefore, there will be no separate payment for Subsurface Investigations

1.8 Working Drawings and Calculations

A. The Contractor shall submit Working Drawings and Calculations for the design of the trenchless crossing installation method to be utilized for the project. The Working Drawings and Calculations shall be performed by a professional engineer, licensed in Virginia, obtained and paid for by the Contractor. The Working Drawings and Calculations shall include typical sections and details. All design shall be in accordance with OSHA, and all federal, state, and local regulations.

B. Working Drawings shall contain certification by the Contractor's engineer that the proposed trenchless crossing method and the proposed construction of the access pits have been designed in accordance with these Specifications. Review of the Working Drawings and Calculations shall not relieve the Contractor of the responsibility for accuracy in the Working Drawings when implemented in the field.

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PART 2 - PRODUCTS

2.1 Materials

A. The Contractor will provide the material appropriate for the Trenchless Crossing method that the Contractor has chosen, unless otherwise specified on the Contract Documents.

B. The Contractor shall submit to the Project Officer, for approval, material certifications, certified laboratory test reports, manufacturer's product catalog data, shop drawings and specifications, showing compliance with the requirements necessary to install the required Trenchless Technology.

2.2 Carrier Pipe

A. Carrier pipe shall meet the requirements specified in the appropriate Section of these Specifications.

PART 3 - EXECUTION

3.1 Method

A. The Trenchless Crossing shall be installed to the lines and grades shown on the Drawings by a method chosen by the Contractor, unless otherwise specified on the Drawings.

B. The Contractor is responsible for selecting a method suitable for the conditions encountered in the field and to assure no disturbance to the existing surface. All work shall be in accordance with Section 02200 Earthwork of these specifications.

3.2 Preparation

A. The Contractor shall maintain clean working conditions inside the launching operation area and remove spoil, debris, equipment, and other material not required for operations.

B. For construction below highways and utilities, the installation shall be performed so as to prevent interference or disruption with the normal operation of these facilities.

C. During construction, access to private and commercial property shall be maintained at all times unless approval from both the property owner and the Project Officer has been obtained. Any costs associated with providing alternative access shall be borne by the Contractor at no additional cost to the Owner.

D. Power generation equipment and any other equipment operating on or with fuel or lubrication oils shall be provided with suitable barriers and safeguards to ensure no loss of oil to drains or water courses or to contaminate the ground.

E. Materials shall be unloaded and handled with equipment of adequate capacity, equipped with slings to protect the materials from damage. Storage of materials on the site shall be in a

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reasonably level and well drained area free from poison oak or ivy and brush. Individual pieces and bundles shall be stored with safe walking space between them to allow full view for inspection purposes.

3.3 Alignment Establishment

A. The Contractor's Surveyor will re-establish the control points and benchmarks indicated on the Drawings. The Contractor shall check all control points and benchmarks prior to beginning of work and report any errors or discrepancies to the Project Officer.

B. The Contractor shall use the control points and benchmarks established by the Contractor's Surveyor to furnish and maintain reference control lines and grades for the trenchless crossing.

C. The Contractor shall establish and be responsible for accuracy of control for the construction of the entire trenchless crossing.

D. The Contractor shall establish its own survey points sufficiently far from the trenchless crossing operation not to be affected by ground movement.

E. The Contractor shall check the primary control for the trenchless crossing system against an above-ground undisturbed reference at least once each day.

3.4 Rock Excavation

A. Rock excavation shall be as specified in section 02202

3.5 Access Pit Construction

A. Provide protective concrete barriers and steel plating at top of access pits.

B. Provide excavation support system in accordance with OSHA and other applicable standards.

C. Water Control: Maintain excavation free of water.

3.6 Utility Crossings

A. When trenchless operation activity reaches in proximity to existing utilities, the existing utility shall be exposed to verify the exact location and inverts of the utility to allow for possible changes in the line or grade as directed by the Project Officer. This shall be incidental to the work and no separate payment shall be made.

3.7 Ground Movement Monitoring

A. 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, at no additional cost to the Contract.

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

PART 4 - MEASUREMENT AND PAYMENT

4.1 Measurement shall be lump sum. Payment shall include all demolition, excavation, steel plates and other protection of excavation, restoration, compaction, furnishing of equipment and materials, providing for the monitoring of movement of the surface, installing the carrier pipe, tracer wire, and subsurface investigations.

END OF SECTION 02952

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SECTION 03100 - CONCRETE, FORMWORK, REINFORCEMENT AND MATERIALS

PART 1 - GENERAL

1.1 Description of Work

A. Provide all plant, labor, materials and equipment necessary for the completion of the plain and reinforced concrete called for on the approved plans.

1.2 Related Work Specified Elsewhere

A. Section 03400 - Precast Concrete

1.3 Applicable Standards and Specifications

A. American Concrete Institute (ACI)

B. American Society for Testing and Materials (ASTM)

C. United States Product Standards PS I-66

D. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

E. Wire Reinforcement Institute (WRI)

1.4 Quality Assurance,

The following codes and standards are hereby made a part of this specification and concrete work performed shall conform with the applicable references except as specified otherwise in this section.

A. ACI Standard 318-71 - Building Code Requirements Reinforced Concrete (Working Stress Design) ACI Standard 318 - Building Code Requirements for Reinforced Concrete ACI Standard 315 - Manual of Standard Practice for Detailing Reinforced Concrete Structures ACI Committee Report - Concrete Sanitary Engineering Structures, ACI Committee 350 ACI Standard 301 - Specifications for Structural Concrete for Buildings Wire Reinforcement Institute, Inc., WRI - Manual of Standard Practice, Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

1.5 Submittals

A. Shop drawings shall include bar tabulations, placement drawings and details.

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B. The Concrete Plant shall provide the concrete mix design and certified test reports on the aggregate, admixture, cement, and curing materials to be incorporated in the concrete for the project.

C. The steel fabricator shall provide certified mill test reports for the reinforcing steel and accessories to be incorporated in the work.

D. The Contractor shall provide delivery tickets for concrete and shall include the date, time, truck identification, concrete plant, plant inspector, ticket and load number, concrete class and design mix, moisture content of aggregates, quantity and location of placement.

PART 2 - PRODUCTS

2.1 General

A. Concrete materials, methods of mixing, conveying, curing, placing, and reinforcementshall conform to the latest requirements of Section 217 of the VDOT Specifications.

B. The making and removal of forms shall conform to the latest requirements of Sections 316 and 404 of the VDOT Specifications.

2.2 Class of Concrete

A. Cast-in-place concrete shall be Class A4 (4,000 psi) for Precast structures and bridge deck, Class A3 General Use (3,000 psi) or Class B2 (2,200 psi) unless stated otherwise on the approved plans.

2.3 Earth Forms

A. Except for the bearing surface of thrust blocks, concrete cradle, concrete encasements, and the second pours of drop manholes, do not place concrete directly against vertical surfaces of the soil.

2.4 Plywood

A. Except where noted otherwise on the approved plans, use plywood forms for all concrete which shall be exposed in the finished work, and for all exterior walls below grade which are to receive membrane waterproofing. Plywood shall be a minimum of 5/8-inch thick. Each panel shall carry the grade trademark of the American Plywood Association along with the DFPA (Douglas Fir Plywood Association) Quality stamp.

2.5 Form Coating

A. Use non-grain raising and non-staining type that shall not leave residual matter on surface of concrete or adversely affect proper bonding of subsequent application of other material applied

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to concrete surface, such as "Nox-Crete Form Coating" as manufactured by the Nox-Crete Company, "Arcal-80" as manufactured by Arcal Chemical Corporation, "Synthex" as manufactured by Industrial Synthetics Company, or approved equivalent. Do not use coatings containing mineral oils or other non-drying ingredients.

PART 3 - EXECUTION

3.1 General

A. Employ a competent and acceptable crew leader for concrete work. This crew leader shall be thoroughly familiar with all phases of concrete construction, including forms.

B. Be responsible for the capacity of all form work, shoring and bracing to carry all superimposed live and dead loads before, during and after concrete is poured.

C. Provide form work with adequate cleanout openings to permit inspection and easy cleaning after reinforcement has been placed. Where possible, place these openings in the side of the unexposed surfaces.

3.2 Construction of Forms

A. General: Construct wood forms of sound material, and of the correct shape and dimensions, constructed tightly and of sufficient strength. Brace and tie the forms together so that the movement of men, equipment, materials, or placing and vibrating the concrete shall not throw them out of line or position. Forms shall be strong enough to maintain their exact shape under all imposed loads. Camber where necessary to assure level finished soffits. Construct forms that may be easily removed without damage to the concrete. Before concrete is placed in any form, the horizontal and vertical position of the form shall be carefully verified and all inaccuracies corrected. Complete all wedging and bracing in advance of placing concrete.

B. Chamfered Corners: Unless otherwise indicated, provide chamfered corners on all exposed corners. Provide 3/4 inch moldings in forms for all chamfering required.

C. Embedded Items: Make provision for sleeves, anchors, inserts, water stops, and other features.

D. Form Ties: Use form ties of sufficient strength and in sufficient quantities to prevent spreading of the forms. Place ties at least 1-inch away from the finished surface of the concrete. Do not use ties consisting of twisted wire loops. Leave inner rods in concrete when forms are stripped. Space all form ties equidistant, and symmetrical, and line up both vertically and horizontally.

E. Cleanouts and Access Panels: Provide removable cleanout sections or access panels at the bottom of all forms to permit inspection and effective cleaning of loose dirt, debris, and waste material. Clean all forms and surfaces to receive concrete of all chips, sawdust, and other debris and thoroughly blow out with compressed air just before concrete is placed.

F. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.

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3.3 Preparation for Placing

A. Remove water from excavations before concrete is deposited. Divert any flow of water through proper side drains and remove water without washing over freshly-deposited concrete. Remove hardened concrete, debris, ice, and other foreign materials from the interior of the forms, and from the inner surfaces of mixing and conveying equipment. Do not place on frozen ground. Secure reinforcing in position and place vapor barrier and have inspected and approved before the concrete is poured. Do not wheel equipment used to deposit concrete over reinforcement.

B. Prior to placing of any concrete, and after placement of reinforcing steel in the forms, notify the Project Officer so that proper inspection may be made. Such notification shall be made at least 48 hours in advance of placing concrete to permit proper arrangements for inspection.

3.4 Delivery

A. Submit a delivery ticket indicating the mix and design strength of the concrete, design slump, and time of leaving the truck mixer with each batch at the time of delivery. Record on the back of the delivery ticket: (a) the time of arrival of the truck mixer on the site; (b) the time of deposit of the concrete from the truck; and (c) the place of deposit of the concrete. The completed delivery ticket shall be delivered to the Project Officer. Failure to deliver such completed ticket to the Project Officer shall be cause for the Project Officer to reject the deposited concrete at any time and cause it to be removed and replaced at no additional expense to the County.

B. Do not use concrete on the job site when it has exceeded the allotted mixing time as specified in Section of the 217.09 of the VDOT Specifications.

3.5 Placing Concrete

A. Before placing concrete, remove all construction debris, water and ice from the places to be occupied by the concrete. Give particular attention to the removal of dirt and debris from all formed construction joints.

B. Concrete, when deposited, shall have a temperature ranging between a minimum of 50 degrees Fahrenheit and a maximum of 90 degrees Fahrenheit. When the temperature of the surrounding air is below 50 degrees or above 90 degrees Fahrenheit, concreting shall be done in accordance with the recommendations noted in ACI-306 and ACI-305 respectively.

C. Mix concrete in such quantities as required for immediate use and place prior to loss of slump. Do not retemper concrete.

D. Spade, work and vibrate concrete as it is being poured, to secure its maximum density, free from voids and completely filling the forms. Thoroughly work concrete to secure the complete envelopment of all parts of the reinforcing steel and completely fill the corners of the forms. Maintain not less than 2 approved vibrators on the work at all times. Use tremies or chutes for drops of more than 5-feet.

E. Fill under Slabs on Grade: Clean sand, or aggregate, evenly spread and compacted to the full depth, unless otherwise shown on the Contract Drawings.

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3.6 Removal of Forms

A. After concrete has been placed, all forms, bracing and supports shall remain undisturbed long enough to allow the concrete to reach the strength necessary to support with safety its own weight plus any live load and earth pressure that might be placed upon it without causing excessive settlement or deflective or any temporary or permanent damage to the structure. Prevent the breaking of edges and corners of concrete in the stripping of forms. Upon removal of formwork, immediately patch honeycombed areas and other voids to the satisfaction of the Project Officer.

B. Thoroughly clean forms and recoat with specified form coating before each reuse. Do not reuse any form for exposed work which cannot be reconditioned to ”like new” condition. Discard forms considered unsatisfactory by the Project Officer. Apply form coating to all forms in accordance with the manufacturer's specifications. Apply form coatings before placing reinforcing steel.

3.7 Protection of New Work

A. Protect all freshly placed concrete from mechanical injury or action of the elements until such time as the concrete is thoroughly set.

B. Protect projecting inserts, anchor bolts and other embedded items from disturbances until the concrete has sufficiently set to hold such items. \

3.8 Preformed Joints

A. Furnish and install preformed expansion joint material at locations shown on the Contract Drawings. Cut preformed expansion joint material slightly less than the full width of the cross section of the concrete to allow for a liquid joint sealant with any backup material.

B. Tool the concrete edges at expansion or contraction joints to a one-eighth (1/8) inch radius.

3.9 Finishing

A. All areas of exposed concrete walls and appendages from the top of the wall to 1'-6-inch below the finished grade or water level of the structure shall receive a rubbed finish applied in the following manner:
   1. After removal of forms, point cavities, stone pockets, and tie holes in exposed surfaces with mortar by thoroughly wetting the repair area. Cut out honeycombs down to dense concrete, and then patch and point as described above. The mortar mix for patching shall be determined by trial to obtain a good color match with the concrete when both patch and concrete are cured and dry. The amount of mixing water shall be as little as consistent with the requirements of handling and placing the mortar.
   2. Ground off form joint marks and fins to a smooth surface, dense and free of prominent grain markings and bulges or depressions more than 1/8-inch in 4 feet.
   3. When the mortar pointing has set, the entire exposed concrete surface shall be thoroughly covered with water by means of brush and rubbed with carborundum brick to remove all blemishes and leave the entire exposed surface uniform in color and texture.

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B. All areas of walls not covered above shall have all fins and projections removed. Patch all voids and depressions exceeding 3/8-inch in any dimensions.

C. Unless otherwise noted or specified, all slabs shall be finished monolithically. Exposed concrete slabs shall have a tolerance of 1/8-inch in 10 feet with maximum high and low variance not occurring in less than 20 feet, and with 1/16-inch tolerance in any one running foot with no abrupt variations.

D. After screeding and floating, give concrete steps and slabs a light steel toweling to seal the surface and remove any irregularities left by the float. Just before the concrete becomes non-plastic, the surface of the concrete shall be given a fine broom finish perpendicular to the line of traffic and so executed that the corrugations thus produced shall be uniform in character and width. The broomed surface shall be free from porous spots, irregularities, depressions, and small pockets or rough spots such as may be caused by accidentally disturbing particles of coarse aggregate embedded near the surface. Use a coarse broom to provide a non-slip surface for ramps.

3.10 Curing

A. Curing shall be started as soon as it is possible to apply the curing medium without damaging the surface, preferably immediately upon completion of the finishing operation.

B. Curing shall continue uninterrupted for a minimum period of 14 days. Rapid drying upon completion of the curing period shall be prevented. At no time during the curing period shall the temperature of the concrete be permitted to drop below 40 degrees Fahrenheit.

3.11 Sampling, Testing and Enforcement

A. The Contractor shall furnish such facilities as the Project Officer may require for on site testing and for collecting and forwarding concrete samples for testing to an approved independent laboratory selected by the Project Officer. The laboratory shall establish the mix proportions and test the concrete. One test shall be performed for each 10 cu. yds. of concrete. The laboratory shall maintain records showing brand of cement, brand and quantity of admixtures, time and location of the batch from which the test was made, air content, slump, and compressive strength. The laboratory shall supply the test cylinders, slump cones, field technicians, and all equipment necessary for performance of field and laboratory testing specified herein.

B. One strength test shall consist of four field specimens. One (1) specimen for testing at seven (7) days, one (1) specimen for testing at fourteen (14) days, and two (2) specimens for testing at twenty-eight (28) days. The samples for strength tests shall be taken in accordance with –"Method of Sampling Fresh Concrete" (ASTM C-172). Cylinders for acceptance tests shall be molded and laboratory-cured in accordance with "Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Field" (ASTM C-31) and tested in accordance with "Method of Test for Compressive Strength of Molded Concrete Cylinders" (ASTM C-39). Each strength test result shall be the average of two cylinders from the same sample tested at seven (7), fourteen (14) and twenty-eight (28) days.

C. When the frequency of testing shall provide less than five strength tests for a given class of concrete, make tests from at least five randomly selected batches or from each batch if fewer than five are used. When the total quantity of a given class of concrete is less than 30 cu. yds., the

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strength tests may be waived by the Project Officer if, in his judgment, adequate evidence of satisfactory strength is provided.

D. Should individual tests of laboratory-cured specimens produce results more than 500 psi below specified strength (f'c), or tests of field-cured cylinders indicate deficiencies in protection and curing, take steps to assure that load carrying capacity may have been significantly reduced, tests of cores taken from the area in questions shall be required in accordance with "Standard Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete" (ASTM C-42). Three cores shall be taken for each cylinder test more than 500 psi below specified strength (f'c). If the concrete in the structure shall be more than superficially wet under service conditions, the cores shall be immersed in water for at least 48 hours and tested wet.

E. Concrete represented by the above core tests shall be considered structurally adequate if the average of the three cores is equal to at least 85 percent of specified strength (f'c) and if no single core is less than 75 percent of f'c. To check testing accuracy, locations represented by erratic core strengths may be retested. If these strength acceptance criteria are not met by the core tests, and if structural adequacy remains in doubt, the Project Officer shall order load tests for the questionable portion of the structure or declare the section to be defective.

3.12 Defective Concrete

A. Defective concrete is defined as concrete in place which does not conform to strength, shapes, alignments, appearance, and/or elevations as shown on the drawings; areas which contain faulty surface areas and/or concrete surfaces not finished in accordance with these specifications.

B. Remove all defective concrete and replace in a manner meeting with the Project Officer's approval. Should only surface imperfections occur, patch at the discretion of, and in a manner satisfactory to, the Project Officer. Permission to patch the work shall not be considered as a waiver of the County's right to require complete removal and replacement of such defective work should the patching fail to satisfactorily restore the required quality and appearance of the work.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Concrete work associated with cast-in-place structures, curbs, sidewalks shall be paid for under the appropriate unit item called for in the bid proposal.

4.2 Concrete steps shall be measured by step per width category. Payment shall include all labor, materials and equipment necessary for a complete installation.

4.3 Demolition, excavation and restoration shall be considered incidental to the work and therefore, no separate payment shall be made for demolition, excavation or restoration.

END OF SECTION 03100

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SECTION 03400 - PRECAST CONCRETE

PART 1 - GENERAL

1.1 Description of Work

A. Provide all plant, labor, equipment and material to provide the precast concrete structures including manholes but excluding pipe, as called for on the approved plans, Construction Standards and this section.

1.2 Related Work Specified Elsewhere

A. Section 02500 - Storm Sewers and Drainage Systems

B. Section 02510 - Sanitary Sewers and Appurtenances

C. Section 03100 - Concrete, Formwork, Reinforcement and Materials

1.3 Applicable Standards and Specifications

A. American Society for Testing and Materials (ASTM)

B. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

1.4 Quality Assurance

A. All precast concrete items shall be products of one or more manufacturers having demonstrated competence in the design and production of precast concrete specialties of the types specified herein for a minimum of 3 years.

B. The referenced documents of Section 03100 shall become a part of this section.

1.5 Submittals

A. Prior to delivering any material to the project site, submit to the Project Officer for approval shop drawings for fabrication and setting of the precast concrete work, along with manufacturer's detailed descriptive literature.

B. Submit certified concrete mix design for the structures to be furnished to the job site.

C. Submit certified test reports for the aggregate, cement, admixtures, reinforcing and curing materials used in the fabrication of the structures.

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1.6 Class of Concrete

A. Concrete for precast structures shall be VDOT Class A4 General. Use unless stated otherwise on the approved plans.

PART 2 - PRODUCTS

2.1 General

A. Concrete materials, methods of mixing, conveying, curing, placing, and reinforcement shall conform to the latest requirements of Section 217 of the VDOT Specifications.

B. The making and removal of forms shall conform to the latest requirements of Sections 316 and 404 of the VDOT Specifications

2.2 Precast Concrete Manholes

A. Precast concrete manhole bases, risers and cones shall conform to requirements of ASTM C478 with configurations as shown in the drawings. Cones shall be eccentric. Manhole sections for sanitary sewers shall be of male and female end type with a preformed groove provided in the male end for placement of a round rubber gasket ring. Rubber gasket rings shall meet the requirements of ASTM C-361 or C-443. The gasket shall be the sole element utilized in sealing the joint from either external or internal hydrostatic pressure. Use the appropriate lubricant as directed by the manufacturer. Manhole sections for storm sewers may use mortared joints.

B. Each precast section shall be clearly marked on the inside near the top with the following information where applicable: ASTM designation, Standard detail or drawing number, station location and designation, date of manufacture and name or trademark of manufacturers. Precast concrete manholes shall be manufactured by Americast, Smith-Midland Corporation, Old Castle Intrastructure, the Virginia Precast Corp., Valley Blox, Inc., or approved equivalent.

2.3 Precast Concrete Catch Basin

A. Precast concrete catch basins shall conform to the requirements of ASTM A-185 for welded wire fabric construction, or ASTM A-165 for deformed steel billet bars and the applicable provisions specified in Section 03100 except that the design mix (f'c) shall be 4,000 psi concrete.

PART 3 - EXECUTION

3.1 Fabrication and testing of the precast concrete structures shall be in accordance with the stipulated execution procedures of Section 03100.

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PART 4 - MEASUREMENT AND PAYMENT

4.1 No separate measurement and payment shall be made for this work. It is covered under other work to which it relates.

END OF SECTION 03400

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SECTION 04100 - MORTOR AND GROUT

PART 1 - GENERAL

1.1 Description of Work

A. Provide all labor, materials and equipment necessary to furnish and install mortar required for the masonry and mortared rubble work and miscellaneous grout as called for on the approved plans.

1.2 Related Work Specified Elsewhere

A. Section 04200 - Masonry Units

1.3 Applicable Standards and Specifications

A. American Society for Testing and Materials (ASTM)

B. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

PART 2 - PRODUCTS

2.1 General

A. Mortar and grout shall conform to the latest requirements of Section 218 of the VDOT Specifications.

2.2 Mortar for Unreinforced Masonry and Brick

A. The mix for unreinforced masonry shall conform with ASTM C270, Type “M” with the following options:
   1. Portland Cement Mortar: 1-part Portland cement; 1/4-part hydrated lime and lime putty; 3-1/2 parts sand.
   2. Masonry Cement Mortar: 1-part Portland cement; 1-part masonry cement; 4-1/2 parts sand.

2.3 Mortar and Grout for Reinforced Masonry

A. The mix for reinforced masonry shall conform with ASTM C476 Type PM or PL.

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PART 3 - EXECUTION

3.1 Storage of Materials

A. Protect materials from moisture, foreign material and deterioration.

3.2 Weather Requirements

A. Hot Weather: Add water as needed to supplement evaporation losses. Cold Weather: When air temperatures range between 32oF and 40oF, heat mixing water or aggregate to between 70°F and 160°F maximum. When air temperature is below 32oF, and only with the approval of the Project Officer, heat both the mixing water and aggregate to between 70oF and 160oF maximum.

3.3 Quality Control

A. Prepare sample batches of mortars and grouts prior to beginning masonry work.

B. Test in accordance with ASTM C270 (Unit Masonry) or ASTM C476 (Reinforced Masonry), whichever applies. Send copies of test results to the Project Officer for approval.

3.4 Mixing Mortar and Grout

A. Mix mortar in accordance with ASTM C270 (Unity Masonry) and mortar and grout in accordance with ASTM C476 (Reinforced Masonry). Mortar or grout not used within 2-1/2 hours after mixing shall not be used in masonry work.

PART 4 - MEASUREMENT AND PAYMENT

4.1 No separate measurement and payment shall be made for this work. It shall be considered a subsidiary obligation of the Contract under other work to which it relates.

END OF SECTION 02550

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SECTION 04200 - MASONRY UNITS

PART 1 - GENERAL

1.1 Description of Work

A. Provide all labor, materials and equipment necessary to furnish and install masonry as called for on the approved plans and as specified herein.

1.2 Related Work Specified Elsewhere

A. Section 04100 - Mortar and Grout

B. Section 09900 - Protective Coatings

1.3 Applicable Standards and Specifications

A. American Society for Testing and Materials (ASTM)

B. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

1.4 Submittals

A. Submit to the Project Officer, two representative samples of each kind and type of masonry specified for the project and sample of anchors and ties. Do not purchase masonry until samples are approved by the Project Officer.

PART 2 - PRODUCTS

2.1 Masonry Units

A. Masonry block and brick units shall conform to Section 222 of the VDOT Specifications.

2.2 Welded Wire Fabric

A. Welded wire fabric shall conform to Section 223 of the VDOT Specifications.

2.3 Steel Reinforcement

A. Steel reinforcement called for on the approved plans shall be deformed bars, grade 40, in conformance with Section 223 of the VDOT Specifications.

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2.4 Reinforcement, Anchors and Ties

A. Masonry joint reinforcement shall be factory fabricated from zinc coated cold drawn steel wire, ASTM A82. Reinforcement shall consist of two or more deformed longitudinal wires minimum size No. W1.5, weld connected with minimum size No. 21.5 cross wires, forming a truss or ladder design. Zinc coating, ASTM A116, Class 1, except that cross wires used for cavity wall ties shall be Class 3. Out-to-out spacing of longitudinal wires shall be approximately 2-inches less than the nominal width of the block or with in which it is placed. Distance between welded contacts of cross wires with each longitudinal wire shall not exceed 16-inches. Joint reinforcement shall be furnished in flat sections 10 to 20 feet in length, except that factory-formed corner reinforcements and other special shapes may be less in length.

B. Anchors and ties shall be zinc-coated, ferrous metal of the types specified. Zinc coating ASTM A153, Class B-1, B-2, or B-3 as applicable. Cooper cladding of steel wire shall conform to the requirements as specified for Grade 30 HS wire in ASTM Specification B227.

PART 3 - EXECUTION

3.1 General

A. Build into masonry, bolts, anchors, nailing blocks, inserts, expansion joints and other items necessary and incidental to the completion of the project.

B. Masonry shall be laid with plumb, true to line, with level courses accurately spaced with a story pole, and unless otherwise shown, with each course breaking joints with the course next below. Each unit shall be adjusted to its final position in the wall while mortar is still soft and plastic. Any unit that is disturbed after mortar has stiffened shall be kept plumb throughout. Corners and reveals shall be plumb and true. Courses shall be so spaced that backing masonry shall level off flush with the face work at all joints where metal ties are used. Anchors, accessories, and other items required to be built in with masonry shall be built in as the masonry work progresses. Cutting and fitting of masonry shall be done by masonry mechanics with power-driven masonry saws.

C. Weather Requirements: Precondition and protect masonry units in cold weather as follows:
1. Avg. daily air temperature between 32oF and 40oF -- protect newly laid masonry from rain and snow 24 hours.
2. Avg. daily air temperature between 25oF and 32oF -- provide heat on both sides of construction masonry; use wind breaks for winds above 15 mph; cover masonry with insulating blankets for 24 hours.
3. Avg. daily temperature below 20oF -- provide enclosure and heat to maintain air at 32oF for 24 hours. Do not lay masonry units at temperatures colder than 30oF.

D. Before resuming work, top surface of masonry in place shall be cleaned of loose mortar and foreign material.

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3.2 Storage

A. Store cementitious materials on pallets under a tarpaulin cover in a dry place. Covers shall overhang 2 feet down each side and be held securely in place.

B. Reinforcing, metal ties, and anchors shall be protected from contact with soil and before being placed shall be free from loose rust and other coatings that shall destroy or reduce the bond.

3.3 Laying Concrete Masonry Units

A. All sections herein shall apply to both ordinary masonry units and concrete catch basin units.

B. All concrete masonry units shall be running bond with units in the courses above regularly breaking joints with the units below, unless otherwise indicated on drawings.

C. Layout all openings before construction. The final location of openings shall be adjusted so that partial size units may be kept to a minimum.

D. Reinforcing mesh shall be installed in the three courses above all openings and shall extend 3 ft. 9 in. beyond each side of opening. Mesh shall be installed in every third course of all masonry unit walls.

E. Do not set patched, chipped, cracked, broken or otherwise defective units. Cut out defective joints and repoint.

F. All intersecting walls shall be keyed together with masonry units.

G. Cut block with a carborundum saw. Do not cut with hammer chisel.

H. Use solid load-bearing block where required for structural purposes. Use hollow load-bearing block at all other locations.

I. Leave all necessary openings for the passage of pipes and drains. At completion of the work of other trades, return and close all openings.

J. Keep the open space at control joints and expansion joints free of mortar by using a continuous wood or metal strip temporarily set in the wall. Caulk control and expansion joints.

K. Standard width of mortar joints for both horizontal and vertical joints shall be 3/8 inch. Joints shall have full mortar coverage on vertical and horizontal face shells, but mortar shall not extend through unit on the web edges. Compact mortar joints on the weather side of exterior walls and press tight against the edges of the units with a proper tool.

3.4 Brick

A. Lay all face brickwork in straight running bond, level, with joints struck flush, then tooled with a concave pointing tool. Courses shall equal 3 to 8 inches in height. Mortar beds shall be full. Fill voids solid with mortar. Fill all vertical joints with mortar except weep holes.

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B. Carry facing and backing of exterior walls simultaneously and bond as required.

C. Set reinforcement flashing and ties every 2 sq. ft. of wall surface.

D. Provide rope wick weep holes, spaced approximately 32 in. on center, in vertical joints of first course, over all counter flashing and through wall flashing on all exterior walls.

E. Project bolts from the face of the masonry a sufficient distance to allow for the proper attachment intended. Oil all threads and protect by waterproof caps.

F. All joints shall be uniform and 3/8 inch thick unless otherwise indicated.

G. Joints in exposed or painted surfaces shall be tooled when thumbprint hard with a round jointer. Joints shall be flush on the vertical and concave on the horizontal.

H. Joints in unparged masonry below grade shall be pointed tight with a trowel.

I. Mortar joints in surfaces to be plastered, stuccoed, or covered with other masonry shall be cut flush.

J. Mortar protrusions extending into cells or cavities to be reinforced and filled shall be removed.

K. Fill horizontal joints between top of masonry partitions and underside of concrete slabs or beams with mortar.

3.5 Bonding with Masonry Bonders

A. Where two or more masonry units are used to make up a thickness of a wall, inner and outer wythes shall be bonded at vertical intervals not exceeding 34 inches by transverse lapping of stretcher units at least 3 inches over units below, or by lapping with units at least 50 percent greater in width than unit below at vertical intervals not exceeding 17 inches.

B. Bond intersecting bearing walls with metal ties at vertical intervals not to exceed 16 inches.

C. When intersecting bearing walls are carried up separately, regularly block (tooth) vertical joint with 8-inch maximum offsets. Provide joints with rigid steel anchors at vertical intervals not to exceed 48 inches. When approved, blocking may be eliminated and rigid steel anchors provided at vertical intervals not to exceed 24 inches.

D. Anchor abutting or intersecting interior non-load bearing walls with metal ties at vertical intervals not to exceed 24 inches and extending at least 4 inches into the masonry.

E. Construct all concrete masonry in accordance with the National Concrete Masonry Associations.

3.6 Angles and Beams

A. Adjust as required to keep masonry level and at proper elevation.

B. Embed beams firmly in mortar of same quality as used in laying masonry wall.

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3.7 Jointing and Cleaning

A. At the completion of the work, all holes in joints of masonry surfaces, except weep holes, shall be filled with mortar and suitably tooled.

B. Dry brush masonry surface at the end of each day's work and after final pointing using wire brushes if necessary to remove mortar but exercise care not to scratch or damage work.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Manholes, catch basins, and yard inlets constructed of masonry block and concrete block shall be measured as each. Payment shall include all masonry/block work, mortar, manhole steps, manhole frame and cover, inlet frame and cover, concrete slab, grout, demolition, excavation, backfill, restoration and all necessary appurtenant items. Other use of the masonry block and concrete block is covered under the work to which it relates.

END OF SECTION 04300

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SECTION 04300 - STONE AND MORTARED RUBBLE MASONRY

PART 1 - GENERAL

1.1 Description of Work

A. Provide all plant, labor, materials and equipment for the construction of mortar rubble retaining walls as called for on the approved plans and as detailed in the Construction Standards and specified herein.

1.2 Related Work Specified Elsewhere

A. Section 04100 - Mortar and Grout

1.3 Applicable Standards and Specifications

A. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

PART 2 - PRODUCTS

2.1 Mortar

A. Mortar shall conform to Section 04100 of these Specifications.

2.2 Stone

A. Stone shall conform to Section 204 and 506 of the VDOT specifications.

2.3 Concrete Rubble

A. Concrete rubble shall be approved by the Project Officer. Concrete rubble available from the County shall be so noted on the approved plans.

2.4 Concrete Rubble Backing

A. Class A3 concrete conforming to Section 217 of the VDOT Specifications.

2.5 Filter Material

A. Geotextile filter fabric shall be in accordance with Section 245 of the VDOT Specifications.

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2.6 Backfill

A. Porous backfill shall be clean crushed stone or gravel aggregate size no. 57 or 68, in conformance with Section 204 of the VDOT Specifications.

PART 3 - EXECUTION

3.1 Construct mortar rubble masonry walls in conformance with the approved plans and the standard details.

3.2 Shaping, dressing, cleaning, wetting, laying and other construction procedures for the walls shall be performed in accordance with Section 506.03(a) of the VDOT Specifications.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Mortar rubble masonry walls shall be measured in cubic feet based on the approved plans and sections. Payment shall include demolition, concrete rubble backing, excavation, backfill, restoration, testing of materials, labor, material and equipment necessary for a complete and structurally sound retaining wall in place.

END OF SECTION 04300

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SECTION 05500 - STRUCTURAL STEEL AND MISCELLANEOUS METAL

PART 1 - GENERAL

1.1 Description of Work

A. Provide all plant labor, supervision, material and equipment to furnish and install all structural steel and miscellaneous metal items, with accessories, fasteners, anchors, etc., complete in place as shown on the approved plans.

1.2 Related Work Specified Elsewhere

A. Section 09900 - Protective Coatings

1.3 Applicable Standards and Specifications

A. American Institute of Steel Construction (AISC)

B. American Society for Testing and Materials (ASTM)

C. American Welding Society (AWS)

D. Virginia Department of Transportation, Road and Bridges Specifications (VDOT)

E. American Association of State Highway and Transportation Officials (AASHTO)

1.4 Submittals

A. Before any fabrication is begun, submit detailed shop drawings of all miscellaneous metal items showing sizes of metal components, method of assembly, hardware, and anchorage or connection to other work.

B. Submittals shall include detailed descriptive literature of manufactured items specified herein.

1.5 Quality Assurance

A. The Contractor shall be responsible for providing evidence that all materials used in the Work shall meet all applicable standards and certifications. Such evidence shall comply with the requirements of Section 01400 Quality Requirements.

B. The Contractor shall provide accommodations to enable the Project Officer to inspect all materials upon delivery to the site and prior to utilizing the materials in the Work. The Contractor shall ensure that materials are stockpiled or otherwise stored such that the Project Officer has access to all aspects and components.

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C. Fabrication and installation procedures shall conform to the specifications and practices of the American Institute of Steel Construction.

PART 2 - PRODUCTS

2.1 General

A. Standard Structural Steel Shapes and Plates shall be in conformance with ASTM A-36.

B. Steel Pipe shall be in conformance with ASTM A-53, Type E or S, Grade A or B.C.Cast Iron shall be in conformance with ASTM A-48, Class 30, unless otherwise indicated. D. Fastenings shall be in conformance with Section 232(d), (e) and (f) of the VDOT specifications.

C. Welding Electrodes shall be as permitted by AWS Code D1.0.

D. The primers shall be as specified in Section 09900: Protective Coatings.

2.2 Pipe Handrails

A. Pipe handrails shall be galvanized steel pipe in conformance with Sections 233 of the VDOT Specifications. The rails shall be standard weight and the post shall be extra strong steel pipe. Standard or special fittings shall be used or the joints may be welded. Painting of railings shall meet the requirements of Section 09900.

2.3 Rail and Post Spacing

A. Post spacing shall not exceed 7' on center. Unless shown otherwise on the drawings, the top rail shall be located at a height of 3' 6-inch, (4'6-inch for bike trails), except stair runs shall have top rail at a height of 3' 6-inch and enclosed stair landings shall have top rail at a height of 3' 0-inch. Intermediate rails shall be located as shown on the Construction Standard R-3.1.

2.4 Gratings

A. All gratings shall be as indicated on the standard drawings.

2.5 Anchor Bolts

A. Anchor bolts shall conform to the requirements of VDOT Section 226.

B. Contractor shall submit certified test reports establishing shear and tensile pull out for the anchors used.

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PART 3 - EXECUTION

3.1 General

A. Furnish all bolts, nuts, screws, clips, washers, and any other fasteners necessary for proper installation of items specified or called for on the approved plans. For ferrous metal, use stainless steel or galvanized on exterior. On interior, match adjacent material.

B. Metal for shop-fabricated items shall be well formed to shape and size, with crisp lines or angles. Shearing and punching shall leave clean, true lines and surfaces. Weld permanent connections and grind smooth where exposed to view. Dress all sharp edges.

C. Verify all measurements at job.

D. Field drilled or punched holes; do not use cutting torch. Shearing and punching shall leave true lines and surfaces.

E. Construct to sizes indicated using rolled shapes and/or plates as detailed. Include wall and sill anchors for construction indicated.

F. Set all work plumb, true, rigid, and neatly trimmed out.

G. Grout plates, bolts, and similar items with non-shrink grout.

H. Ship railings with factory-preassembled posts and fittings. Assemble on location in accordance with manufacturer's instructions, keeping posts plumb and posts parallel to either horizontal or rake.

I. Castings subject to foot or street traffic shall have bearing surfaces machined to prevent rocking and rattling.

J. Protect all dissimilar metals from galvanized corrosion by pressure tapes, coatings or isolators.

3.2 Welding

A. Perform all ferrous metal welding in accordance with AWS Code D1.0. Use only pre-qualified welding procedures in accordance with AWS paragraph 103(a) and only by operators experienced in performing the type of work indicated.

B. Weld pipe handrail in accordance with Section 407 of VDOT Specifications.

3.3 Bolted Connections

A. In general, use bolts for field connections only and then only as detailed. Provide washers under all heads and nuts bearing on wood. Draw all nuts tight and nick threads of permanent connections to prevent loosening. Use beveled washers where bearing is on sloped surfaces.

B. Provide grating with necessary minimum clearances and fit so as to lie flat and not rock in any fashion. Provide U-clips in each corner of the grating sections.

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3.4 Protection of Surfaces

A. Provide protection by strippable coating, protective sleeves, polyethylene sheets, boarding, or other suitable means during fabrication, shipment, site storage, and erection to prevent damage to the finished work due to stains, discolorations, scratches, or any other cause. Replace damaged elements at no expense to the County.

B. After installation, and after danger of subsequent damage has passed, remove all protective coverings from all exposed surfaces, and clean those surfaces of all soil and discoloration, ready for acceptance.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Handrails shall be measured in linear feet installed. Payment shall include all labor, equipment and materials necessary for a complete installation.

4.2 Structural steel, including beams, girders, and miscellaneous steel, shall be paid for at the contract lump sum price or when specified in pounds of metal in the fabricated structure.

4.3 No separate measurement and payment shall be made for other work under this section. It shall be considered a subsidiary obligation of the Contract under other work to which it relates.

END OF SECTION 05500

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SECTION 06100 - STRUCTURAL TIMBER AND LUMBER

PART 1 - GENERAL

1.1 Description of Work

A. Provide all labor, material and equipment to furnish and construct with structural timber and lumber as called for in the Contract Documents and specified herein. The work includes timber and lumber construction and all other incidental construction.

1.2 Related Work Specified Elsewhere

A. Section 02100 - Clearing and Grubbing

B. Section 09800 - Wood Preservatives

1.3 Applicable Standards and Specifications

A. American Lumber Standards

B. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

C. American Association of State Highway and Transportation Officials (AASHTO)

D. National Forest Products Association (NFPA)

1.4 Product Handling

A. All structural timber and lumber shall be delivered, stored, handled and installed in a manner to prevent twisting, warping or other damage that would preclude satisfactory installation.

PART 2 - PRODUCTS

2.1 Structural timber and lumber shall conform to Section 236 of the VDOT Specifications.

2.2 Where treated timber or lumber is required, the preservative and treatment shall be as specified in Section 09800 of these specifications titled: Wood Preservatives.

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PART 3 - EXECUTION

3.1 Inspection

A. Timber and lumber shall be grade marked in accordance with grading rules and basic provisions of the ”American Lumber Standards” by a lumber grading or inspection bureau of agency approved by the Project Officer.

3.2 Installation

A. The structural timber of lumber shall be installed properly in the sizes and grades and to the alignment with fastenings as shown on the approved plans.

PART 4 - MEASUREMENT AND PAYMENT

4.1 All timber and lumber shall be measured in units of 1,000 feet-board-measure (MFBM) based on nominal sizing for the materials actually placed in the finished structure according to the approved plans or as directed by the Project Officer. Payment shall include all labor, materials and equipment, including preservatives and coatings, necessary for a complete installation.

END OF SECTION 06100

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SECTION 07100 - WATERPROOFING

PART 1 - GENERAL

1.1 Description of Work

A. Provide all plant, labor, equipment and materials intended to prevent the passage of water, usually through a section of hydraulic cement concrete, subject to hydrostatic head when called for on the Contract Drawings.

1.2 Related Work Specified Elsewhere

A. Section 07150 - Dampproofing

1.3 Applicable Standards and Specifications

A. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

B. American Association of State Highway and Transportation Officials (AASHTO)

C. American Society of Testing and Materials (ASTM)

1.4 Quality Assurance

A. The installation Contractor shall have at least three (3) years of experience in applying these types of specified materials and shall be certified in writing by the material manufacturer. The Contractor shall submit evidence that documents this requirement.

B. The Contractor shall perform the work in accordance with the printed requirements of the material manufacturer and this specification. One copy of the manufacturer's instructions shall be available at all times on the site.

C. Provide certified test reports of testing required by referenced specifications.

PART 2 - PRODUCTS

2.1 Primer, asphalt, fabric and joint sealers shall conform to Section 213 of the VDOT Specifications.

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2.2 Waterproof membranes shall be flexible, preformed, self-adhesive, rubberized asphalt or bitumen compound and bonded to HDPE film.

A. Waterproof membranes shall meet or exceed the following requirements:
1. Tensile Strength (ASTM D412) - 325 psi
2. Elongation of Membrane (ASTM D412) - 200%
3. Tensile Strength of film (ASTM D882) – 5000 psi
4. Resistance to hydrostatic head (ASTM 5385) 180 feet
5. Permeance (ASTM E96) – 0.02 perms
6. Puncture Resistance (ASTM E154) – 50 lbs
7. Peel Adhesion to Concrete (ASTM D903) – 9 lbs
8. Lap Peel Adhesion (ASTM 1876) – 4 lbs

PART 3 - EXECUTION

3.1 Perform work only when existing and forecasted weather conditions are within the limits established by the material manufacturer.

3.2 Protect adjacent surfaces not designated to receive waterproofing.

3.3 Surfaces shall be prepared in accordance with the material manufacturer’s recommendation.

3.4 New concrete should be cured for a minimum of fourteen days and shall be dry before waterproofing membranes are applied.

3.5 Patch all holes and voids and smooth out any surface misalignments

3.6 The waterproofing system shall be installed in accordance with the material manufacturer’s recommendations.

3.7 Waterproof exterior, below grade structures when called for on the approved plans.

3.8 The new system shall be tied into any existing systems with a minimum 6-inch overlap or in accordance with the manufacturer’s recommendations.

3.9 Do not place backfill before cure time recommended by the manufacturer and before the structure has been inspected by the Project Officer. The backfill shall be placed promptly after inspection by the Project Officer within time limits recommended by the manufacturer.

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PART 4 - MEASUREMENT AND PAYMENT

4.1 No separate measurement and payment shall be made for this work. It shall be considered a subsidiary obligation of the Contract under other work to which it relates.

END OF SECTION 07100

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SECTION 07150 - DAMPPROOFING

PART 1 - GENERAL

1.1 Description of Work

A. Provide all plant, labor, equipment and materials intended to prevent or delay the passage of water, usually through a section of hydraulic cement concrete not subject to hydrostatic head when called for on the Contract Drawings.

1.2 Related Work Specified Elsewhere

A. Section 07100 - Waterproofing

1.3 Applicable Standards and Specifications

A. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

B. American Association of State Highway Transportation Officials (AASHTO)

C. American Society for Testing and Materials (ASTM)

1.4 Quality Assurance

A. The installation Contractor shall have at least three (3) years of experience in applying these types of specified materials and shall be accepted in writing by the material manufacturer. The Contractor shall submit evidence that documents this requirement.

B. The Contractor shall perform the work in accordance with the printed requirements of the material manufacturer and this specification. One copy of the manufacturer's instructions shall be available at all times on the site.

C. Provide certified test reports of testing required by referenced Specifications.

PART 2 - PRODUCTS

2.1 Primer and asphalt shall conform to Section 213 of the VDOT Specifications.

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PART 3 - EXECUTION

3.1 Perform work only when existing and forecasted weather conditions are within the limits established by the material manufacturer.

3.2 Protect adjacent surfaces not designated to receive dampproofing.

3.3 Apply dampproofing product per procedures outlined in Section 417 of VDOT Specifications.

3.4 Particular care shall be given to the application of dampproofing at all construction joints which are encountered.

3.5 Do not place backfill before cure time recommended by the manufacturer and before the structure has been inspected by the Project Officer. The backfill shall be placed promptly after inspection by the Project Officer within time limits recommended by the manufacturer.

PART 4 - MEASUREMENT AND PAYMENT

4.1 No separate measurement and payment shall be made for this work. It shall be considered a subsidiary obligation of the Contract under other work to which it relates.

END OF SECTION 07150

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SECTION 09800 - WOOD PERSERVATIVES

PART 1 - GENERAL

1.1 Description of Work

A. Provide all plant, labor, material and equipment to treat piles, structural and miscellaneous timber called for on the approved plans.

1.2 Related Work Specified Elsewhere

A. Section 06100 - Structural Timber & Lumber

B. Section 09900 - Protective Coatings

1.3 Applicable Standards and Specifications

A. American Association of State Highway Transportation Officials (AASHTO)

B. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

C. American Wood Preserver's Association (AWPA)

1.4 Quality Assurance

A. Provide certified test reports as required by AASHTO M-133.

PART 2 - PRODUCTS

2.1 Materials shall conform to Section 236 of the VDOT Specifications.

PART 3 - EXECUTION

3.1 Preparation, treatment and penetration shall conform to Section 236 of the VDOT Specifications.

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PART 4 - MEASUREMENT AND PAYMENT

4.1 No separate measurement and payment shall be made for this work. It shall be considered a subsidiary obligation of the Contract under other work to which it relates.

END OF SECTION 09800

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SECTION 09900 - PROTECTIVE COATING

PART 1 - GENERAL

1.1 Description of the Work

A. Provide all labor, materials and equipment for the complete application of protective coatings for interior and exterior surfaces as required in accordance with these specifications and where called for on the approved plans.

1.2 Related Work Specified Elsewhere

A. Section 09800 - Wood Preservatives

1.3 Applicable Standards and Specifications

A. American Society for Testing and Materials (ASTM)

B. Steel Structures Painting Council (SSPC0)

1.4 Surfaces Not to be Painted

A. The following surfaces are not to be painted. (If surfaces referenced below are to be coated, specific instructions shall be given on the approved plans.)
   1. Non-ferrous metals; for example - Aluminum Copper Monel Brass
   2. Stainless Steel
   3. Chain link fencing
   4. Concrete walks, curbs
   5. Exterior concrete foundations
   6. Plastic
   7. Brick
   8. Galvanized steel

1.5 Submittals

A. In accordance with Section 01300, submit a complete list of materials and color charts. The Project Officer shall select colors.

1.6 Quality Assurance

A. Primers, intermediate and top coats for each surface shall be supplied by one manufacturer.

B. Thinner, solvents, cleaning compounds shall comply fully with the recommendations of the coatings manufacturer.

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C. The protective coating systems shall be tested and inspected for acceptance in accordance with Part 3.

1.7 Product Delivery, Storage and Handling

A. Deliver painting materials to the site in the original manufacturer's containers with labels intact and seals unbroken. Store materials in an area specifically assigned for storage. Storage area shall be well ventilated and kept locked. Keep storage area clean. Remove oily rags daily and dispose same properly. Take all necessary precautions to avoid fires.

1.8 Guarantee

A. Protective coatings shall be guaranteed for a period of one year after acceptance of the project by the County. Approximately one month prior to the expiration of this guarantee period, the Project Officer shall notify the Contractor to coordinate inspection of the coatings. All coatings for the project shall be inspected and failures repaired at no cost to the County. Normal wear, abrasion, or physical damage as determined by the Project Officer shall not be considered as failures.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers

A. The protective coating systems specified under this section are generic in form. The systems are manufactured by a number of acceptable manufacturers, no one of which can provide all of the systems for this contract. Manufactures are required to meet the requirements herein.

2.2 Paint Materials

A. The following descriptions apply to the short form identifications of the primers, intermediate and top coats specified under the various systems herein..

Coating	**Description**
Coal Tar - Black	High build coal tar solution containing 65% solids by volume.
Coal Tar Epoxy-White	High build 2-component white coal tar epoxy coating having a minimum epoxide resin content of 34% by weight in the weight
Epoxy - Polyamide	Two component Polyamide epoxy containing 55% solids by volume. With exposure at 45o facing ocean exhibit no blistering, cracking delamination after 36 months' exposure. Exhibits no more than 130 mg. loss after 100 grams load of Federal Test Method Std. No. 141 Method 6192.

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Epoxy-Primer - Red	Two component polyamide epoxy containing a minimum of 53% solids by volume having performance equal to the epoxy-polyamide above.
Modified Epoxy	High build decorative sand texture finish suitable for use on new and previously painted concrete and masonry and having 50% minimum solids by volume. When subject to ASTM D-2247 test for humidity shall exhibit no blistering, softening, or loss of film integrity, or change in color after 1,000 hours.
Polyurethane Enamel	Two component aliphatic polyurethane highly-resistant to abrasion; corrosive fumes, moisture and chemical contact and containing a minimum of 50% solids by volume. Shall show no blistering, cracking, softening or delamination of film after 5,000 hours' exposure (ASTM D-2247 humidity) and shall meet the abrasion and gloss test of the polyurethane aliphatic-1.

2.3 Paint Systems

A. Unless specified otherwise, it is understood that each stage of coating (primer, intermediate and top) receives only 1 coat. Note that the dry film thicknesses specified denotes the average. The minimum acceptable for the thickness tests are noted in parenthesis ().

B. Concrete and Masonry

1. System “A-1”
   Interior – Immersion

PRIMER	
Epoxy-Polyamide	5.0 mils d.f.t. (4.0 mils minimum)
FINAL COAT	
Polyurethane Enamel Semi-gloss (color)	2.0 mils d.f.t. (1.5 mils minimum)

2. Systems “A-4”
   Interior - Immersion or Non-immersion - Storm or Sewer Structures when specifically called for on the approved drawings.

1 COAT	
Coal Tar Epoxy – White	22.0 mils d.f.t. (20.0 mils minimum)

3. System ”A-3”
   Interior Walls or Exterior Walls Above Grade

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FINISH COAT	
Modified Epoxy	10.0 mils d.f.t. (8.0 mils minimum)

4. System "A-5"
Exterior Walls to be Backfilled

PRIMER	
Coal Tar - black	15.0 mils d.f.t.
FINAL COATS	
Coal Tar - black	15.0 mils d.f.t.
Total:	30.0 mils d.f.t. (27.0 mils minimum)

C. Steel and Iron

1. System "B-1"
Non-Immersion - Severe Corrosive Condition

PRIMER	
Epoxy - Polyamide (semi-gloss)	5.0 mils d.f.t. (4.0 mils minimum)
TOP COAT	
Polyurethane Enamel (semi-gloss - color)	2.0 mils d.f.t. (1.5 mils minimum)

2. System "B-2"
Non-Immersion - Mild Corrosive Condition

PRIMER	
Epoxy Primer - Red	4.0 mils d.f.t. (3.0 mils minimum)
TOP COAT	
Epoxy - Polyamide	5.0 mils d.f.t. (4.0 mils minimum)

D. Wood

1. System "C-1"

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All Exposures

PRIMER AND TOP COAT	
Epoxy - Polyamide - 2 coats	2.5 mils d.f.t. (2.0 mils min.) each coat

2.4 Galvanizing

A. All exterior and/or interior steel work, where indicated on the Contract Documents, shall be galvanized by the hot-dip process, conforming to ASTM A123 for assembled steel products. All required hot-dip galvanizing shall be done after fabrication, in the largest sections possible. Items too large for available dip tanks shall be sprayed, by approved methods, with molten zinc to coating thickness of .003 inch to .004 inch.

B. Weight of zinc coating per square foot of actual surface shall average not less than 2.0 ounces and no individual specimen shall show less than 1.8 ounces.

C. All bolts and screws for attachment of galvanized items shall be galvanized or non-corrodible material.

PART 3 - EXECUTION

3.1 Inspection

A. Complete records shall be kept by the Contractor and furnished to the Project Officer. These records shall identify the particular paints that were applied to a surface, the date of application, area coated, climatic conditions, and the following post application quality control data:
1. Wet film thickness: 3 readings per 100 sq. ft.
2. Dry film thickness: 1 reading per 250 sq. ft.

B. Repair all damaged coated areas, holidays and thickness test areas in accordance with the coating manufacturer's recommendations so that the repaired area is equal to the undamaged coated areas in all respects.

3.2 Surface Preparation

A. All surfaces to be coated shall be cleaned, free of harmful scale, rust, dirt, oil, grease, moisture, concrete mortar, loose and damaged coatings and all foreign matter.

B. Concrete:
1. Concrete shall be fully cured prior to coating. Fully cured shall be defined as 28 days at75oF or 49 days at 50oF or 53 days at 50oF. Rebuild rough, chemically attacked and/or abraded surfaces. Rebuild concrete surfaces containing air, water pits, splatter, fins, protrusions, bulges, or other surface irregularities while the concrete is still ”green”.

C. Steel and Iron:

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1. Remove all weld splatter. Grind all edges, projections, sharp corners and welds to a smooth, rounded contour.
2. Remove oil and grease from surfaces by solvent cleaning in accordance with the Steel Structures Painting Council Specifications (SSPC).
3. Abrasive blast steel and iron surfaces in accordance with SSPC-SP-20.
4. In areas where blasting is not feasible, obtain the approval of the Project Officer to use power tool cleaning in accordance with SSPC-SP-3.
5. Remove dust and spent sand from the surfaces after sand blasting by brushing and vacuum cleaning.
6. Apply the prime coat as soon as possible after the preparation is complete and before the dew point is reached. All surfaces blasted and power-tooled in one day shall be coated on the same day. Leave whipblast or power tool areas exposed overnight.

D. Galvanized Steel Surfaces:
1. Conform to ASTM A-123 and A-123M (Recommend Practices) pertaining to galvanizing assembled steel products. Unless otherwise permitted, do all galvanizing after fabrication, in largest sections practicable. Where galvanizing is removed by welding or other assembly procedure, touch up abraded areas with molten zinc or zinc-rich paint.

E. Concrete or Cinder Block:
1. Concrete or cinder block substrates shall be clean, dry and free of oils and release agent contaminants. If necessary, spot clean with solvent and wash with strong detergent and warm water. Flush with high pressure water and allow to dry for approximately one hour before application.

F. Brick:
1. Clean off all mortar, uneven loose or detrimental foreign matter. Apply a cleaning compound approved by the coating manufacturer. Allow to stand on the brick for at least 15 minutes. Thoroughly remove the cleaning compound by high pressure spray delivering 1 to 3 gpm at 1,000 psig. Allow to dry for at least one hour and paint as soon as possible after drying.

G. Wood:
1. Maintain the surface in a clean and dry manner. Fill cracks and nail holes with putty after the first coat has been applied. Seal knots and sap streaks with material approved by the manufacturer. Sand surfaces to a fine smooth finish.

3.3 Application

A. Mix all paint and tinting colors in strict accordance with the specifications of the paint manufacturer. Except for epoxies, mix paints at storage area and deliver to the site ready-mixed.

B. Apply coatings uniformly and in a continuous film by brush or spray, leaving no sags, holidays, pinholes, bubbles or other defects. Coatings judged unsatisfactory by the Project Officer shall be corrected at no additional cost to the County.

C. Do not apply paint when the surrounding air temperature, as measured in the shade, is below 50oF or less than 5oF above the dew point. Do not apply paint to wet or damp surfaces or when the humidity exceeds 85%.

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D. Vary the colors of successive coats.

E. Do not apply successive coats until the Project Officer has completed inspection.

F. All shop galvanized steel work necessitating field welding which in any manner removes original galvanizing shall be restored by field cold galvanizing per ASTM A780.

PART 4 - MEASUREMENT AND PAYMENT

4.1 No separate measurement and payment shall be made for this work. It shall be considered a subsidiary obligation of the Contract under other work to which it relates.

END OF SECTION 09900

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SECTION 10530 - BUS SHELTERS AND SITE FURNISHINGS

PART 1 - GENERAL

1.1 Description of the Work

A. Provide all labor, material and equipment to furnish and install, complete in place, the bus shelter unit and site furnishings in accordance with these specifications and to the lines, grades and dimensions shown on the approved plans.

1.2 Related Work Specified Elsewhere

A. Section 02611 - Concrete Walks and Concrete Driveway Entrance

B. Section 03100 - Concrete Formwork, Reinforcement and Materials

C. Warranty
1. Bus shelters and bus stop site furnishings shall include a standard manufacturer warranty.

PART 2 - PRODUCTS

2.1 Bus Shelter Unit

A. The bus shelter and shelter bench shall be either an Arlington County type or a Metro type bus passenger shelter and shelter bench as specified on the approved plans. The Metro type bus shelter and shelter bench shall be provided by Washington Metro Area Transit Authority (WMATA). The Arlington County bus shelter and shelter bench shall be furnished by the County, unless otherwise specified on the approved plans.

B. Bus shelters shall be Model Slimline in Brasco Bronze color, or Eclipse in powder coat White Aluminum RAL-9006 color as manufactured by Brasco International, Inc. or County approved equivalent. The shelter shall be as shown on the approved Plans. The shelter shall have bolt down type concrete footing/pad below specified. The contractor shall submit shop drawings for approval by the County prior to fabrication. All shelter mounting hardware shall be stainless steel.

C. Bus shelter benches shall be Model Curveline (Slimline shelter) in Brasco Bronze color, or Eclipse (Eclipse shelter) in powder coat White Aluminum RAL-9006 color as manufactured by Brasco International, Inc. or County approved equivalent. The shelter bench shall be as shown on the approved Plans. The contractor shall submit shop drawings for approval by the County prior to fabrication. All shelter bench mounting hardware shall be stainless steel.

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2.2 Freestanding Steel Bench

A. Type: RB-28 6' length with center armrest in black color from the Steelsites™ RB Series by Victor Stanley. The freestanding steel bench shall be as shown on the approved Plans. The bench shall have bolt down type concrete footing/pad as shown on the approved Plans and shall be stainless steel. Alternate Manufacturers:
   1. Carnival Series by Thomas Steele a division of Graber Manufacturing
   2. Tolar Manufacturing Company

2.3 Leaning Rail

A. Type: Model LE-CO-4 4' length in powder coat White Aluminum RAL-9006 color from the Contour® Series by Brasco International. The lean rail shall be as shown on the approved Plans. The lean rail shall have bolt down type concrete footing/pad as shown on the approved Plans and shall be stainless steel. Alternate Manufacturers:
   1. Tolar Manufacturing Company

2.4 Litter Receptacle

A. Type: Model S-42 with high density plastic liner and optional domed lid in black color from the Ironsites® Series by Victor Stanley Alternate Manufacturers:
   1. Carnival Series by Thomas Steele a division of Graber Manufacturing
   2. Tolar Manufacturing Company

2.5 Recycling Receptacle

A. Type: Model S-42 with high density plastic liner, Arlington County logo and recycling decals, and optional domed lid in blue color from the Ironsites® Series by Victor Stanley. Alternate Manufacturers:
   1. Carnival Series by Thomas Steele a division of Graber Manufacturing
   2. Tolar Manufacturing Company

2.6 Bicycle Rack

A. Type: BRWS-101 in black color from the Cycle Sentry™ Series by Victor Stanley. Bicycle rack shall be Standard in-ground or Flanged surface mounting as specified on the approved plans. Ground anchors shall be per the manufacturer's recommendation and shall be stainless steel. Alternate Manufacturers:
   1. Hoop Rack by Dero
   2. MadRax Series by Thomas Steele a division of Graber Manufacturing

2.7 News Rack Corrals

A. News Corrals shall be Model SFNR in powder coat White Aluminum RAL-9006 color as manufactured by Tolar Manufacturing Company or County approved equivalent. The corral shall

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be as shown on the approved Plans. The corral shall have bolt down type concrete footing/pad below specified. The contractor shall submit shop drawings for approval by the County prior to fabrication. Ground anchors shall be per the manufacturer's recommendation and shall be stainless steel. Alternate Manufacturers:

1. Brasco International
2. Landscapeforms

2.8 Concrete Pad

A. The concrete pad and aggregate base shall be in conformance with Section 02611 of these specifications and drawing details.

2.9 Light Fixtures for Bus Shelters

A. Solar Lighting Package with Rigid Solar Panel, Battery, Solar Controller, Vented Enclosure, and LED Lighting by Brasco International. Lighting package shall be matched to appropriate bus shelter. Bus shelters shall be fabricated at the factory to accept light fixture mounting hardware.

B. LED light fixtures shall be minimum 20 Watt LED Brasco Model No. EA048 by Brasco International or County approved equal. Light fixtures shall include all mounting hardware. Bus shelters shall be fabricated at the factory to accept light fixture mounting hardware. Lighting package shall be matched to appropriate bus shelter.

2.10 Underground Conduits

A. Future electrical conduits shall be undergrounded as shown on the approved Plans. Conduits serving Arlington County equipment shall be Schedule 40 PVC or per materials specified under NEC for intended purpose as indicated on the approved Plans. Conduits serving WMATA equipment shall be schedule 80 PVC or other WMATA specified material as directed by the WMATA engineer.

PART 3 - EXECUTION

3.1 The Contractor is responsible for the pick-up, delivery, and rigging of the bus stop shelter units and site furnishings from the Arlington County's Bus Shelter Storage warehouse located at 2633 Shirlington Road Arlington VA 22206 or elsewhere within the County limits. Contractor shall schedule the pick-up with assigned County staff at least forty-eight (48) hours in advance.

3.2 The bus shelter unit is to be mounted on a 6-inch thick reinforced concrete pad on a - 4inch compacted aggregate base. Construct concrete pad in accordance with Section 02611 and drawing details. Match elevation of concrete pad with adjacent sidewalk and provide 1/4-inch/ft positive drainage to street.

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3.3 Install bus shelter units and furnishings in accordance with the approved plans and the details provided in these specifications and the shelter and furnishings manufacturer's installation instructions.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Bus shelters shall be measured as each. Payment shall be at the unit price stated in the bid proposal and shall include all materials, labor and incidentals necessary for a complete installation of the bus shelter unit and the supporting concrete pad. Contractor pick-up from County designated facility, delivery to the project site, and rigging of County furnished bus shelter units shall also be included for payment.

4.2 Site furnishings (Benches, litter and recycling receptacles, newspaper corrals, leaning rails, bicycle racks, and other amenities) shall be measured as each. Payment shall be at the unit price stated in the bid proposal and shall include all materials, labor and incidentals necessary for a complete installation of the site furnishings and the supporting concrete pad where required. Contractor pick-up from County designated facility, delivery to the project site, and rigging of County furnished bus shelters and benches shall also be included for payment.

END OF SECTION 10530

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SECTION 311300 - TREE PROTECTION AND ROOT PRUNING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Protection of existing trees to remain:
      a. Tree Protection Fencing
      b. Pruning of existing trees roots that are affected by execution of the work, whether temporary or permanent construction.
      c. Aeration and Root Protection Matting
      d. Trunk protection

1.2 Provide all labor, materials, tool and equipment as required to have tree protection applied on all areas called for on the approved plans (or in the Contract Documents).

1.3 In addition to the specifications contained herein, work shall be performed in accordance with the standards laid out in ANSI A300 (Part 5) for Tree Care Operations – Tree, Shrub, and Other Woody Plant Management – Standard Practices (Management of Trees and Shrubs During Site Planning, Site Development, and Construction).

1.4 Related Work Specified Elsewhere:

A. 01500 Erosion and Sediment Control and Pollution Prevention

B. 02100 Clearing and Grubbing

C. 02200 Earthwork

D. 329100 Planting Preparation

E. 329200 Seeding and Sodding

F. 329300 Exterior Plants

1.5 Applicable References

A. ANSI A300 Tree Care Operations: Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance, Part 1 Pruning

B. Arlington County Stormwater Management Ordinance Guidance Manual

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1.6 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Tree Protection Area: Areas outside of the limits of disturbance or protected from disturbance by root matting or other techniques, defined to protect trees inside and outside of the project limits.

C. Reforestation Area: Areas intended for reforestation by trees and other vegetation.

D. ISA: International Society of Arboriculture

E. CBAY: Chesapeake Bay, typically referring to CBAY watershed.

F. Urban Forester/County Urban Forester: Refers to the Arlington County Urban Forester

G. Landscape Architect: Refers to an Arlington County Landscape Architect or their designee.

1.7 SUBMITTALS

A. Product Data: For each type of product indicated in Section 2.0. List products to be used including qualifications to perform work.

B. Certification: Contractor's arborist shall certify that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged. Contractor shall submit a letter with a certified arborist seal.

C. Maintenance Requirements: Contractor's arborist shall submit requirements for the care and protection trees affected by construction during and after completing the work.

D. Contract arborist Qualifications: Contractor shall submit a copy of valid ISA certification to the Project Officer for approval with confirmation by Urban Forester.

E. Provide schedules for performance of work.

1.8 QUALITY ASSURANCE

A. Contractor shall ensure that tree and plant protection methods are implemented by an arborist certified by the International Society of Arboriculture (ISA) to provide for the care of the trees and plants impacted by construction activities.

B. The Contractor shall identify to the Project Officer at least one authorized on-site Point of Contact (POC) who is, by training or experience, familiar with the policies, regulations and standards applicable to the work being performed. The POC and the certified arborist may be the same individual.

C. Crews shall be directly supervised by an ISA certified arborist.

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D. All workers, through related training and on the job experience, shall be familiar with the technical aspects of arboricultural work and equipment used in such operations.

E. Trucks and mechanized equipment shall not enter Tree Protection Areas, unless approved by the Project Officer as authorized by Urban Forester.

F. No stump grinding shall be performed within the Tree Protection Areas, unless approved by the Project Officer as authorized by Urban Forester.

G. Where stump grinding is authorized, it shall be with small machines specifically designed for that purpose. No stumps shall be excavated except as described herein. Stumps shall be ground not more than 8” below grade and care must be taken to minimize damage to root of the trees to remain.

H. All work in or near Tree Protection Areas shall be carefully performed by Contractor in order to avoid damage to tree trunks, branches, root system, and other existing plant materials and soils that are to remain.

I. Silt shall not be allowed to collect in Tree Protection or Reforestation Areas. Silt accumulating in such areas shall constitute damage and shall require remedial activity. All silt shall be removed from Tree Protection Areas within 24 hours of siltation. The methods and procedures for silt removal within Tree Protection and Reforestation Areas shall be approved by the Project Officer as authorized by the Urban Forester.

J. Pruning shall conform to the techniques and standards specified in the current edition of ANSI A300 (Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices) Part 1 (Pruning)."
   1. Pruning shall remove only dead, dying, damaged or broken limbs greater than 1” – 1.5” in diameter.
   2. Pruning for clearance shall be reviewed and approved by Project Officer as authorized by the Urban Forester.

K. Urban Forester Notification: The Contractor shall notify the Project Officer 72 hours prior to the following events, so that the County’s Urban Forester can be notified and be present at a pre-construction site meeting (refer to Section 3) and to observe work:
   1. Tree protection fencing installation
   2. Other tree protection operations
   3. Work within Tree Protection Areas.
   4. Tree planting.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Temporary Tree Protection Fence: Unless otherwise indicated in approved plans, tree protection fence shall be two-inch wire mesh fabric measuring 72 inches in height mounted on 1.9” O.D. steel pipes driven 24 inches into the ground, placed 120 inches on-center maximum. Refer to Arlington County DPR standard detail on approved plans.

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B. Tree Protection Signs: Shall be of heavy-duty sheet aluminum or weatherproof plastic material measuring 12 inches by 18 inches. Signs shall state "NO ENTRY, TREE PROTECTION AREA, CALL 703-228-6557 TO REPORT VIOLATIONS" in both English and Spanish. Signs shall be mounted on fence every 50 feet maximum.

C. Topsoil: Refer to Section 329100 – Plant Preparation.

D. Bark Mulch: Refer to Section 329100 –Plant Preparation

E. Temporary Root Protection Matting: If required in approved plans, temporary root protection matting shall be a double-sided geocomposite, geonet core with non-woven covering with high flow rate and compressive strength. Four to six (6) inches of wood chip mulch shall be applied to area to receive root protection matting prior to installation. Matting shall be installed in a single layer. See DPR Standard Detail, 'Temporary Root Protection Matting within CRZ'.

F. Trunk and limb protection wrap: Trunk and limb protection wrap shall be double side geocomposite, geonet core with non-woven covering.

G. Landscape nails: When required, spikes shall be 12" as indicated on the drawings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prior to the construction activities, the Contractor and Certified Arborist shall meet on-site with the Project Officer and Urban Forester to review the exact location of Tree Protection Areas and the protective measures required.

B. Temporary Tree Protection Fencing: Install temporary tree protection fencing and signs around tree protection zones to protect indicated trees and vegetation from construction damage. Maintain Tree Protection fence and remove when construction is complete and after approval by Project Officer as authorized by the County Urban Forester.

C. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

D. No personnel, vehicles, equipment, construction materials, or construction debris shall be allowed inside the tree protection areas at any time during demolition and construction without the written consent of the Project Officer and as authorized by the Urban Forester. If a violation is observed, the Contractor shall be notified by the Project Officer and shall immediately rectify the situation. Continued and subsequent violations shall result in a fine of $500 per day of violation.

E. Special Demolition Procedures:
   1. Demolition of walks and hardscape within tree protection areas shall be directly supervised by an ISA certified arborist.
   2. Mechanized equipment shall not enter tree protection areas (TPAs) or reforestation areas.

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3. Backfill of voids created by demolition within the TPAs and reforestation areas shall be loosely placed approved topsoil (refer to Section 329100, Plant Preparation). Only the amount of topsoil necessary to fill the void without spreading over existing grades shall be allowed.

3.2 EXCAVATION

A. Install shoring or other protective support systems to minimize sloping or benching of excavations as approved by the Project Officer and authorized by County Urban Forester.

B. Do not excavate within Tree Protection Areas, unless otherwise indicated.

C. Where utility trenches are required within Tree Protection Areas, Contractor shall perform root pruning in accordance with Section 3.3 of this Specification prior to the utility trenching, unless otherwise directed by the Project Officer as authorized by the County Urban Forester.

D. Where excavation is proposed within the critical root zone of protected trees, the Contractor shall perform root pruning in accordance with Section 3.3 of this Specification and as indicated in approved plans prior to excavation, unless otherwise directed by the Project Officer as authorized by the County Urban Forester.

E. Where new finish grade is indicated below existing grade around trees, Contractor shall slope grade outside of tree protection zones. Maintain existing grades within tree protection zones.

3.3 ROOT PRUNING:

A. When required, root pruning locations shall be indicated on the approved plans. Exact location and depth shall be confirmed on site with Project Officer and Urban Forester during the pre-construction meeting.

B. Root pruning shall take place on the tree side of the tree protection fence.

C. Root Pruning shall be done with a trencher or vibratory plow to a depth of 12 inches. A root pruning trench shall be no more than 6 inches wide.

D. If excavation is for the installation of underground utilities, leave the root intact and thread the lines underneath. Refer to Arlington County Department of Parks & Recreation Design Standards Detail, ‘Root Protection in Utility Trench’.

E. Roots over 1.5” in diameter shall have a clean cut made by a clean saw on the surface of the root, which is still attached to the tree. Do not break or chop.

F. Do not paint the cut root end.

G. Backfill the root pruning trench with approved loose topsoil (per Specification 329100) and top with 3-4” bark mulch and mark location for future reference.

H. Do not unnecessarily cut tree roots extending into grading limits. When roots are exposed by the work, cut them back cleanly with sharp hand pruning shears, lopping shears or hand saws, and backfill with approved topsoil immediately. Backfill around tree roots immediately after

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completion of construction in vicinity of the trees. Backfill around trees and roots shall be compacted to no more than 80% unless otherwise directed by the Project Officer.

I. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities, unless authorized by Urban Forester. Cut roots with clean, sharp pruning instruments; do not break or chop, following ANSI A300 standards. All root pruning shall be performed by an ISA certified arborist. Refer to Arlington County Department of Parks & Recreation, Design Standards Detail, Root Pruning', as shown on plans and available online at: http://parks.arlingtonva.us/design-standards/

3.4 TREE REPAIR AND REPLACEMENT

A. Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots as approved by Project Officer and per directions and authorization of Arlington County Urban Forester or contract arborist's written instructions.

B. The Contractor shall be responsible for any damage to trees within the Tree Protection Area caused by the Contractor's personnel, vehicles, or equipment at the site. Any damage to a tree to remain shall result in a payment by the Contractor to the Project Officer for the amount of damage based on the latest edition of the Council of Tree and Landscape Appraisers Guide for Plant Appraisal published by the International Society of Arboriculture (ISA). All trees are to be valued as landscape trees.

3.5 DISPOSAL OF WASTE MATERIALS

A. Burning is not permitted.

B. Disposal: Remove excess excavated material and displaced trees from Owner's property and legally dispose.

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PART 4 - MEASUREMENT AND PAYMENT

4.1 Payment for Tree Protection and Root Pruning shall be considered a subsidiary to Erosion and Sediment Control and Pollution Prevention or Landscaping. No separate payment will be made for Tree Protection and Root Pruning required as a part of the Work. Additional Tree Protection and Root Pruning measures will only be paid for when approved by the Project Officer.

4.2 The measurement of TREE PROTECTION FENCE shall be for LINEAR FOOT of fence including all appurtenances as delivered to the site, furnished, installed, maintained and removed at project completion in accordance with the plans and specifications.

4.3 The unit price for TREE PROTECTION FENCE shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work, including typical signage.

4.4 The measurement of ROOT PRUNING shall be for LINEAR FOOT of root pruning performed on the project in accordance with the plans and specifications.

4.5 The unit price for ROOT PRUNING shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work.

4.6 The measurement of ROOT PROTECTION MATTING shall be for SQUARE FOOT of matting as delivered to the site, furnished, installed, maintained and removed at project completion in accordance with the plans and specifications.

4.7 The unit price for ROOT PROTECTION MATTING shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work including anchor/landscaping nails, in accordance with the approved plans and specifications. Unless otherwise specified on the approved plan, excavation for ROOT Protection Matting installation is considered incidental to the work and shall not be paid separately.

4.8 The measurement of TRUNK AND LIMB PROTECTION WRAP to be paid for under this item shall be the number of EACH to be furnished and installed at individual trees in accordance with the approved plans and specifications.

4.9 The unit price for TRUNK AND LIMB PROTECTION WRAP shall include the cost of all labor, materials, and other expenses necessary to complete the work in accordance with the approved plans and specifications.

END OF SECTION 311300

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SECTION 329100 - PLANTING PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes erosion control materials, soil amendments, mulching and topsoil.

B. Provide all labor, materials, tools and equipment as required to have topsoil, planting soil mix, soil stabilization, amendments, and mulch applied per the specifications on all areas disturbed by construction to receive plant materials as indicated in the approved plans.

C. Related Work Specified Elsewhere:
1. Section 01500 Erosion and Sediment Control and Pollution Prevention
2. Section 02200 Earthwork
3. Section 02100 Clearing and Grubbing
4. Section 311300 Tree Protection and Root Pruning
5. Section 329200 Seeding and Sodding
6. Section 329300 Exterior Plants and Exterior Plant Details 329300.1 through 329300.11C

D. Applicable Standards and Specifications
1. Arlington County Stormwater Management Ordinance Guidance Manual
2. Virginia DEQ Stormwater Design Specification No. 9
3. Virginia Agricultural Liming Materials Act, Code of Virginia Section 3.1-126.1
4. Specification for Restoration of Graded and Compacted Soils that will be Vegetated (Full Version), Virginia Polytechnic University.

E. In addition to the specifications contained herein, work shall be performed in accordance with the:
1. Drawings and general provisions of the contract, including general and supplementary conditions
2. Arlington County Department of Parks & Recreation Design Standards as shown on the plans and available online at: http://parks.arlingtonva.us/design-standards/

1.2 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Existing Topsoil: Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation period and stockpiled.

C. Imported Topsoil: Soil obtained off-site that meets the specifications herein for topsoil and is suitable for use in planting soil mix/backfill soil mixture when existing topsoil quantities are insufficient.

D. Planting Soil Mix/Backfill Soil Mixture: Existing topsoil modified as specified to be suitable for planting.

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E. Bioretention Media: Specialized soil mixture used in bioretention per the Virginia DEQ Stormwater Design Specification No. 9: Bioretention, Version 2.0, January 1, 2013 and the latest edition of the Arlington County Stormwater Management Ordinance Guidance Manual.

F. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing topsoil or planting soil mix.

G. .

H. Urban Forester/County Urban Forester: Refers to the Arlington County Urban Forester

I. Landscape Architect: Refers to an Arlington County Landscape Architect or their designee.

J. Soil Profile Rebuilding: Refers to a technique to re-build topsoil by mixing organic matter into native soil developed by Virginia Polytechnic University.

1.3 SUBMITTALS

A. Samples of all materials specified shall be submitted to the Project Officer for approval and authorization by the Landscape Architect and Urban Forester. All approvals shall be in writing.

B. Samples:
1. Existing Topsoil: Provide 1-pound sample of existing topsoil with the following soil test reports.
   a. Fertility: pH, nitrate nitrogen, ammonia nitrogen, phosphate phosphorous, potassium, calcium, magnesium, zinc, iron, manganese.
   b. Suitability: total salinity, boron, sodium, potassium, calcium, magnesium, chloride, sulfate.
   c. Physical properties including organic content and particle size distribution.
2. Imported Topsoil: If imported topsoil is required, Contractor shall provide a 1-pound sample of the imported topsoil with the soil test reports as noted above for “Existing Topsoil.”
3. Bioretention Media : The Contractor shall submit a 1-pound soil sample with soil test reports indicating compliance with DEQ’s Stormwater Design Specification No. 9: Bioretention, Arlington County’s Stormwater Management Ordinance Guidance Manual, and the approved plans. In lieu of providing a sample and soil test results, the contractor may purchase Bioretention Media from a vendor who has been pre-approved by the Office of Sustainability and Environmental Management (OSEM). The list of vendors can be found on the Stormwater Management – Notices to Industry page of Arlington County’s web site at https://building.arlingtonva.us/codes-ordinances/stormwater-management/notices-to-industry/ (listed under Bioretention).
4. Mulches and Organic Matter/Compost: Sample of mulch and organic matter/compost may be requested in lieu of inspection.
5. Product certificates: Contractor shall submit for each type of manufactured product, to be approved by the Project Officer as authorized by the Landscape Architect and Urban Forester and complying with the following:
   a. Manufacturer’s certified analysis for standard products.
6. Geotextile/Soil Stabilization/Erosion Control Fabric: Sample

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1.4 QUALITY ASSURANCE TESTING

A. Contractor shall have all existing and imported topsoil to be used for seeding and sodding and for planting areas tested by a state laboratory or recognized commercial soil-testing laboratory in order to determine recommendations for the types and quantities of soil amendments. The results of this test shall determine the rates and types of fertilizers, lime, soil conditioners, and other amendments, if necessary.
   1. Soil tests shall use a representative sample of on-site soils. If existing soil has been undisturbed and is suitable as determined by the soil test, no additional amendments are required.
   2. Adjustments should be made based on soil test results.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials shall conform to those stipulated below, unless otherwise approved in writing by the Project Officer as authorized by the Landscape Architect and County Urban Forester.

B. Specified materials to be applied in amounts and methods herein stipulated.

C. Delivery tickets indicating date, weight, analysis and vendor's name, to be submitted to Project Officer.

2.2 SOIL AMENDMENTS

A. Lime: Application rates for liming materials and lime material type chosen shall be determined by required soil tests and approved by the Project Officer as authorized by the Landscape Architect and Urban Forester.
   1. When required and unless test results indicate otherwise, lime material shall be dry and free flowing pulverized limestone, hydrate lime or burnt lime that contains at least 50% total oxides (calcium oxide plus magnesium oxide). Ground limestone shall be ground to such fineness that at a minimum of 50% shall pass through a 100 mesh sieve and 98% - 100% shall pass through a 20 mesh sieve. Lime material shall meet the Virginia Agricultural Liming Materials Act, Code of Virginia Section 3.1-126.1.
   2. Contractor shall spread lime with approved equipment.

B. Fertilizer: Fertilizer type and application rate shall be determined by results of required soil tests and approved by the Project Officer as authorized by the Landscape Architect and Urban Forester:
   1. When required and unless test results indicate otherwise, commercial-grade complete fertilizer shall be of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
      a. Composition: 10 percent nitrogen, 20 percent phosphorous, and 10 percent potassium, by weight.
   2. All fertilizers shall be uniform in composition, free flowing, and suitable for application with approved equipment.

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3. Fertilizers shall be delivered to the site fully labeled according to applicable state fertilizer laws and shall bear the name, trade name, or trademark and warranty of the product.
4. Delay mixing fertilizer with planting soil if planting shall not proceed within 2 days.
5. Contractor shall spread fertilizer with approved equipment.

C. Organic Matter/Compost

Well-composted, trash-free, stable, and weed-free organic matter such as composted bark, leaf mold or other plant debris material that has been composted to a point of decay and is mature.

1. pH ranges of 5.5 to 8; moisture content 35 to 55 percent by weight
2. 100 percent passing through 1-inch sieve
3. Peat moss shall not be used.
4. Organic amendments shall be commercially prepared and shall comply with the U.S. Compost Council Seal of Testing Assurance Program's Test Methods for the Examination of Composting and Compost (STA/TMECC) criteria, or as modified in approved plan documents.
5. See Section 2.4 (Planting Soil Mix/Backfill Mixture) and 2.5 (Imported Topsoil) for requirements for organic matter amendment.

2.3 EXISTING TOPSOIL

A. Existing topsoil is to be used to extent possible for lawn areas and is to be amended per the specifications to become the Planting Soil Mix/Backfill Soil Mixture for use in planting pits and bed areas.

B. Contractor shall verify suitability of stockpiled soil to produce or to be amended to produce viable soil for lawns and planting soil mix/backfill soil mixture for planting beds as described herein.

C. Prior to use for lawn areas or in planting soil mix/backfill soil mixture, Contractor shall remove from existing topsoil all stones, roots, plants, sod, clods, and clay lumps larger than 1/2 –inch in any direction, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris and other extraneous materials that are harmful to plant growth.

D. After removal of debris and extraneous materials noted above, the Contractor shall obtain soil tests for the existing soil per the requirements in section 1.4 "Quality Assurance Testing."

E. Contractor shall supplement the existing topsoil as recommended in soil test results to achieve a viable planting soil for lawns,planting beds and/or pits. Contractor shall supplement with imported topsoil per the specifications from off-site sources when quantities of approved, existing topsoil are insufficient for lawns,planting beds and/or pits.

F. Contractor shall submit a sample of the topsoil that has been amended based on soil test results for approval by the Project Officer as authorized by Landscape Architect and Urban Forester prior to use in lawn areas,planting beds and/or pits.

G. Topsoil installed on grade shall attempt to match existing soil texture, except for situations where clay subsoil exists. In the event that clay subsoil exists, use loam or silt loam topsoil.

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2.4 PLANTING SOIL MIX/BACKFILL SOIL MIXTURE

A. The planting soil mix/backfill soil mixture shall be composed of ¾ approved existing topsoil and ¼ approved organic matter (See Section 2.2 “Soil Amendments”) as described in the Arlington County DPR Standard planting details, unless otherwise indicated by the Project Officer as authorized by the Landscape Architect and Urban Forester.

2.5 IMPORTED TOPSOIL

A. Contractor shall add imported topsoil when required on the drawings, when quantity of existing topsoil is insufficient or when determined to be necessary due to soil testing results.

B. Imported topsoil shall be natural, original surface soil infriable condition meeting the following criteria:
   1. The soil shall be a sandy loam consisting of at least 5 but not more than 20% clay, at least 10 but not more than 80% sand
   2. Imported topsoil shall contain 5% or more organic matter
   3. Soluble salts (salinity) shall not exceed 500 ppm
   4. Soil pH between 5.5 to 6.5
   5. Soil fertility shall be “High” in natural nutrients based on the coordinated ratings in pounds per acre as established by the National Soil and Fertilizer Research Committee.

C. The imported topsoil shall also contain less than 3 percent subsoil, hardpan material, stones and clods larger than 1/2 inch in diameter in any direction. It shall also be free of sticks, tree or shrub roots, debris and other material undesirable for plant growth. The area and the imported topsoil shall be free of undesirable plant such as, but not limited to, Bermuda grass, nut sedge, mugwort or noxious weeds as set forth in the Federal Seed Act.

D. Imported topsoil which has been manufactured by blending materials which individually do not meet the requirements of this specification shall not be accepted even though the resulting blend meets the organic matter, mechanical analysis, pH and soluble salts requirements. Agricultural limestone at not more than 5 pounds per cubic yard of topsoil any be used to adjust the pH provided it is well mixed in a manner which does not destroy the structure of the soil.

2.6 BIORETENTION MEDIA

A. Bioretention Media shall comply with Virginia DEQ Stormwater Design Specification No. 9: Bioretention, Version 2.0, January 1, 2013 and Arlington County’s Stormwater Management Ordinance Guidance Manual. The contractor may purchase Bioretention Media from a vendor who has been pre-approved by the Office of Sustainability and Environmental Management (OSEM). The list of vendors can be found on the Stormwater Management – Notices to Industry page of Arlington County’s website: https://building.arlingtonva.us/codes-ordinances/stormwater-management/notices-to-industry/ (listed under Bioretention).

2.7 MULCHES

A. Straw Mulch for Seeded Areas: Provide air-dry, clean, mildew and seed-free, salt hay or threshed straw of wheat, rye, oats or barley.

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B. Wood Chip Bark Mulch for Planted Areas: Wood Chip Bark Mulch shall be double-shredded hardwood bark mulch, uniform in size and free of stones, clods, non-organic debris or other foreign material and aged for at least 6 months from an approved source. Insufficiently or improperly aged mulch containing high bacterial counts or high levels of bark or other materials resistant to decomposition shall not be used. Mulch shall not contain the trunk of trees. Mulch shall not be obtained from recycled waste yard.

C. Compost Mulch: Shall be in compliance with Section 2.2.C "Organic Matter/Compost" herein.

2.8 SOIL STABILIZATION/EROSION CONTROL FABRIC

A. Temporary Erosion Control Blankets: Biodegradable wood excelsior, straw, jute or coconut-fiber sewn with biodegradable thread.
   1. ECS-2B Double New Straw Biodegradable Rolled Erosion Control Product, or an approved equal, shall be used in all planting beds and for natural areas unless otherwise specified on the approved plans.
      a. Shall meet Type 2.D specification requirements established by the Erosion Control Technology Council and the Federal Highway Administration's FP-03 Section 713.17
   2. Overlap sections 12" and secure with manufacturer's recommended steel wire staples, 6 inches long.
   3. Synthetic or plastic material or components are not permitted.

B. Erosion Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches.

C. Permanent Erosion Control Mats: Cellular, non-biodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped grades, of 3-inch nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.
   1. Products: Subject to compliance with requirements and plan documents, the products below, or an approved equivalent, be used:
      a. Invisible Structures, Inc.; Slopetame 2
      b. Tenax Corporation – USA; Tenweb.

PART 3 - EXECUTION

3.1 PREPARATION

A. Unless otherwise identified on the approved plans, all identified areas within the project limits shall have approved topsoil spread on them and be prepared for seeding and sodding by bringing ground surfaces to grades shown on the drawings. Planting pits and bed areas identified on the approved plans shall be prepared in accordance with the applicable DPR Landscape Standard details.
   1. No seeding shall be done on frozen ground or when the temperature is 32F or lower. Refer to specification 329200, "Seeding and Sodding." Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties, sidewalks and areas.

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2. Rototilling shall not be performed within the critical root zone of trees to be preserved.
3. The soil shall not be tilled or amended when the soil's moisture capacity is above field capacity or when the soil is frozen.
4. Contractor shall identify utilities, existing irrigation and underground utilities. All areas on either side of the utility marking shall be amended by hand.
5. Contractor shall verify that no foreign or deleterious material or liquid has been deposited in soil within a planting area.
6. Contractor shall proceed with installation only after both unsatisfactory conditions have been corrected and rough grading has been completed and approved by the Project Officer as authorized by the Landscape Architect and Urban Forester.
7. Contractor shall protect structures, utilities, sidewalks, pavements and other facilities, trees, shrubs and plantings from damage caused by planting operations.
    a. Protect adjacent and adjoining areas from hydro-seeding and hydro-mulching overspray.
    b. Protect grade stakes set by others until directed to move them.
8. Surfaces shall conform to finish grade and free of water retaining depressions.
9. Soil shall be friable, free of clay and of uniformly firm texture.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches. Remove stones larger than 1/2 inch in any direction and sticks, roots, rubbish, and other extraneous matter including grass vegetation and turf, and legally dispose of them off of Arlington County property. Do not mix into surface soil.
    1. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix. Delay mixing amendments with soil if planting shall not proceed within 2 days.
    2. Loosen surface soil to a depth of at least of 6 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture.
    3. Spread planting soil mix to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

C. Soil Profile Rebuilding: remediate existing soils, where specified, using Soil Profile Rebuilding, in accordance with the Specification for Restoration of Graded and Compacted Soils that will be Vegetated (Full Version), Virginia Polytechnic University (available at https://www.urbanforestry.frec.vt.edu/SRES/).

D. Natural Areas/Specialty Seeding: Rototilling or loosening of existing soil shall be minimized to prevent germination of invasive plant species in the soil seed bank. Unless otherwise approved by the Project Officer, as authorized by the Landscape Architect and Urban Forester, existing topsoil shall be applied uniformly to a depth of 5 to 8 inches and lightly compacted to achieve a minimum depth of 4 inches only where the following conditions apply:
    1. The slope is flatter than 2:1
    2. The texture of the exposed subsoil/parent material is not adequate to produce vegetative growth.
    3. The soil material is so shallow that the rooting zone is not deep enough to support plants or furnish continuing supplies of moisture and plant nutrients.
    4. The original soil to be vegetated contains material toxic to plant growth.
    5. The soil is so acidic that treatment with limestone is not feasible.

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The final surface shall be ready to accept seed without any additional preparation and shall be free of depressions and irregularities. Do not spread if topsoil or subsoil is frozen, muddy or excessively wet.

E. Tree Pits and Tree Planting Strips:
1. The contractor shall excavate and prepare tree pits and/or the planting strips to the length, width and depth specified in the construction plans and corresponding DPR planting detail.
2. Individual tree pits shall be photo documented using a rigid tape measure. The photograph shall clearly show the depth of each tree pit. Each photograph shall be identified by location using the file name.
3. The contractor shall email the photographs to the Project Officer, who will circulate them to the Landscape Architect and Urban Forester.
4. The contractor must obtain written approval from the Project Officer, as authorized by the Landscape Architect or Urban Forester before proceeding_to fill the tree pits with approved planting soil mix/backfill soil mixture.
5. The County reserves the right to request the contractor verify the depth of any tree pits at no additional project cost.

F. Unchanged Subgrades: If lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare surface soil as follows:
1. Remove stones larger than 1/2 inch in any dimension and sticks, roots, trash, and other extraneous matter. Legally dispose of them off of Arlington County property. Do not mix into surface soil
2. Loosen surface soil to a depth of at least 6 inches, apply soil amendments and fertilizers according to the planting soil mix proportion and mix thoroughly into the top 4 inches of soil.

G. Finish Grading: Grade landscape areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Adjust for the thickness of sod, where applicable. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.

H. The Contractor shall construct bioretentionin accordance with the approved plans.

I. Contractor shall avoid unnecessary compaction of the soil during grading.

J. Contractor shall ensure appropriate slopes of the swales, berms and final grades.

K. Immediately following each day's work, contractor shall clean all dirt, excess soil, debris and trash from the site. Contractor shall protect and store additional soils in stockpiles protected from saturation, erosion, weed growth and contamination with plastic sheeting or tarps.

L. Amendments for seeding and sodding areas shall be applied after determining by soils test as follows:
1. Lime as specified shall be spread uniformly over designated area. Rate depends on soil tests. Soil tests shall be made before lime application at 8 to 10 plugs per acre taken by the method prescribed the United States Department of Agriculture.
2. Fertilizer shall be spread after the lime has been applied. Rate shall be as recommended per the soil tests.

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3. Fertilizer shall be spread with approved equipment and at an even rate over the area to be seeded or sodded.
4. Work lime and fertilizer into top 4 inches of topsoil and grade to smooth surface ready for seeding.

M. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

N. Prepared lawns and planting areas shall be inspected and approved by Project Officer as authorized by the Landscape Architect prior to seeding, sodding or planting.

O. If the graded areas develop volunteer weed growth, the growth shall be eliminated at the expense of the Contractor.

3.2 SOIL STABILIZATION/EROSION CONTROL FABRIC

A. Prepare planting area as specified.

B. Moisten prepared planting area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

C. Install Soil Stabilization/Erosion Control Fabric from top of slope, overlapping joints by 12 inches, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

D. Plant shrubs, trees and perennials through Soil Stabilization fabric by carefully separating fabric layers to allow space for planting.

E. Remove non-biodegradable stabilization materials after plant establishment.

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PART 4 - MEASUREMENT AND PAYMENT

4.1 The measurement of PLANTING SOIL MIX/BACKFILL MIXTURE to be paid for shall be per CUBIC YARD of planting mix in accordance with the plans, specifications and to the satisfaction of the Project Officer.

4.2 The unit price for PLANTING SOIL MIX/BACKFILL MIXTURE shall include the cost of furnishing all labor, materials, equipment and incidental expenses, including but not limited to soil amendments, organic matter, and soil stabilization materials, necessary to complete the work, all in accordance with the plans, specifications and approval of the Project Officer.

4.3 The measurement of IMPORTED TOPSOIL to be paid for shall be per CUBIC YARD of imported topsoil in accordance with the plans, specifications and to the satisfaction of the Project Officer.

4.4 The unit price for IMPORTED TOPSOIL shall include the cost of furnishing all labor, materials, equipment and incidental expenses, necessary to complete the work, all in accordance with the plans, specifications and approval of the Project Officer.

4.5 The measurement of BIORETENTION MEDIA to be paid for shall be per CUBIC YARD in accordance with the plans, specifications and to the satisfaction of the Project Officer.

4.6 The unit price for BIORETENTIONMEDIA shall include the cost of furnishing all labor, materials, equipment and incidental expenses, including but not limited to soil amendments, organic matter, and soil stabilization materials, necessary to complete the work, all in accordance with the plans, specifications and approval of the Project Officer.

4.7 The measurement of WOOD CHIP BARK MULCH to be paid for shall be per CUBIC YARD of Mulch in accordance with the plans, specifications and to the satisfaction of the Project Officer.

4.8 The unit price for WOOD CHIP BARK MULCH shall include the cost of furnishing all labor, materials, equipment and incidental expenses necessary to complete the work, all in accordance with the plans, specifications and approval of the Project Officer.

4.9 Unless otherwise specified on the project drawings, supplemental specifications or special conditions, excavation is considered incidental to the work and therefore no separate payments shall be made for excavation.

END OF SECTION 329100

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SECTION 329200 - SEEDING AND SODDING

PART 1 - GENERAL

1.1 SUMMARY

A. The work includes, but is not limited to the provision of all material, services, labor, and equipment necessary to perform the following as required per the plans for the establishment of turf, meadow (grassland/wildflower) and other natural areas:
   1. Seeding
   2. Sodding
   3. Hydro-seeding

B. Related Work Specified Elsewhere:
   1. Section 01500 – Erosion and Sediment Control and Pollution Prevention
   2. Section 02200 – Earthwork
   3. Section 329100 – Planting Preparation
   4. Section 311300 – Tree Protection and Root Pruning
   5. Section 329300 – Exterior Plants

C. In addition to the specifications contained herein, Work shall be performed in accordance with the:
   1. Drawings and general provisions of the contract, including general and supplementary conditions.
   2. Arlington County Department of Parks & Recreation (DPR) Design Standards as shown on the plans and available online at: http://parks.arlingtonva.us/design-standards/.

1.2 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Existing Topsoil: Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation period and stockpiled.

C. Imported Topsoil: Soil obtained off-site that meets the specifications herein for topsoil and is suitable for use in planting soil/backfill soil mixture when existing soil quantities are insufficient. Refer to Section 329100 “Planting Preparation.”

D. Planting Soil Mix/Backfill Soil Mixture: Existing soil modified as specified to be suitable for planting. Refer to Section 329100 “Planting Preparation.”

E. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

F. Turfgrass: narrow-leaved grass species that form a uniform, long-lived ground cover that can tolerate traffic and low mowing heights

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G. VCIA: Virginia Crop Improvement Association, The official Seed Certifying Agency in the Commonwealth of Virginia; a nonprofit organization of seed growers duly chartered under the laws of Virginia

H. Landscape Architect: Refers to an Arlington County Landscape Architect or their designee.

1.3 SUBMITTALS

A. Samples of all materials shall be submitted to the Project Officer for approval as authorized by the Landscape Architect prior to delivery to site.

B. Contractor shall submit qualifications per section 1.44 “Quality Assurance” to Project Officer for approval.

C. Samples:
1. Turfgrass Seed Mix: Provide 1-pound sample and certification of grass seed including the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and the date of packaging.
2. Sod: Sod grower's name, together with substantiating information as to field location from which sod is to be cut and species, percent purity and mixture of grass sod to be applied. Sod sample shall be submitted to and approved by Project Officer and authorized by the Landscape Architect before cutting. Sod placed on the job shall conform to the approved sample or shall be removed and replaced at the Contractor's expense Samples or photos of sod mix may be requested.

D. Special Seed Mixes: Contractor shall submit product data per Section 2.4 “Specialty Seed”.

1.4 QUALITY ASSURANCE

A. Contractor qualifications:
1. Evidence of completion of at least three (3) projects of similar nature and scope to this project completed within the last five (5) years that have resulted in successful turf,meadow or other natural area establishment.
2. Contractor shall be a member in good standing of either the National Association of Landscape Professionals or the American Nursery and Landscape Association.
3. Experience: Three to Five years of relevant installation experience. .

B. Contractor shall maintain an experienced full-time supervisor on Project site when work is in progress.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials shall conform with this Section, unless otherwise approved in writing by the Project Officer as authorized by the Landscape Architect.

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B. Specified materials to be applied in amounts and methods herein stipulated.

C. Delivery tickets indicating date, weight, product data including all analyses for purity and other information as required herein, and vendor's name, to be submitted to Project Officer for approval.

2.2 TURFGRASS SEED

A. Turfgrass seed shall be fresh, clean, dry new crop seed complying with purity and germination requirements stipulated herein. All cultivars must be on the current "Virginia Turfgrass Variety Recommendations" or in the top 25 for transitional zone sites-overall of the latest National Turfgrass Evaluation Program (NTEP) as approved by Project Officer and as authorized by the Landscape Architect.

B. Unless otherwise specified on the approved plans, the Turf-type Tall Fescue component shall be comprised of a minimum of two cultivars with each cultivar comprising neither less than 30 percent nor more than 70 percent of the blend. The use of K-31 Tall Fescue or Common Kentucky Bluegrass in the mix is prohibited. The mix shall have 2.5 percent maximum inert matter, 0.5 percent maximum crop seed, and 0.1 percent maximum weed seed and 0.0 percent noxious weed. The mix shall comply with the current Virginia Seed Law and Virginia Seed Regulations and approximate the following:

Kind of Seed	**% by Weight**	**% Purity**	**% Germination**
Turf-type Tall Fescue	80	97	85
Bluegrass	10	97	80
Perennial Ryegrass	10	97	90

C. Substitution of seed type or percent only on approval of Project Officer as authorized by the Landscape Architect. Seed to be free of noxious weed seed.

2.3 SOD

A. Cultivated grass sod shall be certified and obtained from State Certified nurseries and have been grown on natural native mineral soils comparable to those afforded at the job site. Sod containing netting is not acceptable. Sod grower's information and sod information to be submitted for approval by Project Officer per section 1.3 "Submittals." The Contractor shall request inspection of the sod prior to installation. Sod shall be inspected by the Landscape Architect as arranged by the Project Officer, Failure to obtain advance approval or obtain required inspection shall constitute grounds for rejection of all sod delivered to the site. Invoices for all sod to clearly state point of origin and have attached to them a facsimile of the Grower's Nursery Certificate issued by the U.S. Department of Agriculture or Certified Delivery Ticket per truckload. All grass sod shall meet the following basic requirements.

1. Sod shall be free of disease and soil borne insects.
2. Sod shall be free of clover, broadleaf weeds and noxious weeds. Sod considered free of such weeds if less than 2 such plants are found per 100 square feet of area.
3. Sod shall be of uniform color and density and contain:

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Kind of Seed	**% by Weight**
Turf Type Tall Fescue	90
Kentucky Bluegrass	10

4. All cultivars must be on the current approved list of the Virginia Turfgrass Variety Recommendations from the Virginia Cooperative Extension and the sod shall be certified by the Virginia Sod Certification Program. Provide appropriate certifications at the time of installation.
5. Sod shall be free of netting.
6. Sod shall have been mowed prior to stripping and shall have been maintained for a minimum of three months.
7. Sod shall be relatively free of thatch. Thatch build up that significantly detracts from the appearance of the sod may be sufficient cause for rejection.
8. Sod shall be machine stripped at a uniform soil thickness of approximately ¾-inch. Measurement for thickness to exclude tip growth and thatch.
9. Individual pieces of sod shall be cut to supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be 5%. Broken pads, torn or uneven ends shall not be permitted.
10. Root development shall be such that standard size pieces shall support their own weight and retain their size and shape when suspended vertically from a firm grasp on uppermost 10% of the area.
11. Under moderate moisture conditions, weight shall not exceed 7 pounds per square foot. Minimum weight shall not be less than 4 lbs. per square foot.

2.4 SPECIALTY SEED (MEADOW AND OTHER NATURAL AREAS)

A. Specialty seed shall be as specified in the approved plans.
   1. Seed carrier: Inert material, sharp clean sand mixed with seed at a ratio of not less than two parts seed carrier to one part seed.

B. Contractor shall supply the germination test results and the percent purity of the seeds upon delivery to the site to the Project Officer. All seed shall be cleaned, processed, analyzed for purity, stored, and germination tested before being used. Every seed variety contains different germination rates and requirements.

2.5 SOILS & SOIL AMENDMENTS

A. Refer to Section 329100 Planting Preparation soils and soil amendment specifications.

2.6 MULCHES

A. Refer to Section 329100 Planting Preparation for mulch specifications.

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2.7 SOIL STABILIZATION/EROSION CONTROL FABRIC

A. Refer to Section 329100 Planting Preparation for specifications.

PART 3 - EXECUTION

3.1 PREPARATION

A. Refer to Section 329100 Planting Preparation for specifications.

3.2 SEEDING - TURFGRASS

A. All areas within the project limits that are not shown for paving, sodding, specialty seeding or other special treatment shall be seeded with the specified turfgrass seed mix.

B. Seeding shall take place between August 15th and October 15th or between March 15th and May 15th. Approval from Project Officer and authorization by the Landscape Architect shall be required before seeding is to begin.

C. Apply planting soil mix to areas to be seeded with turfgrass in accordance with Section 329100 Planting Preparation.

D. No seeding shall be done during windy weather (winds over 5 mph) or when ground is wet or otherwise non-tillable. No seed shall be done on frozen ground or when the temperature is 32 or lower.

E. Seed shall be uniformly distributed by hydro-seeding methods as specified:
   1. Slurry
      a. Seed as specified at a rate of 350 lbs./acre.
      b. Mulch: virgin wood fiber type applied at a rate of 1200 lbs./acre.
      c. Tackifier: Guar type or approved equal applied at a rate of 40 lbs./acre.
      d. Fertilizer: 19-19-19 granular applied at a rate of 500 lbs./acre.
      e. Lime: Flowable liquid lime at a rate of 5 gallons per acre.
      f. Dye: Slurry must be green with dye added if not included with the mulch.
      g. Application rate: 3000 gallons per acre. Agitation must be maintained throughout mixing and application.
      h. Slurry shall be applied within 8 hours of the start of mixing.
   2. In lieu of hydro-seeding, seed may be drilled or an alternate method may be used. If an alternate method is used, seeding shall have to be run in two directions. The second direction being at right angles to the first direction. Requests for using alternate methods shall be approved by the Project Officer prior to application of seed.
      a. Sow seed at the rate of 5 to 8 lb/1000 sq. ft.
      b. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray.
      c. Protect seeded areas with slopes not exceeding 6:1 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.

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d. Areas indicated on plan or exceeding 6:1 slope shall be protected with soil stabilization/erosion control fabric per Section 329100 Planting Preparation, installed according to manufacturer's written instruction, and/or as approved by the Project Officer.

3.3 SODDING

A. All sod shall be transplanted within 24 hours from the time it is harvested unless stacked at its destination in a manner satisfactory to the Project Officer. Do not lay down if dormant or if the ground is frozen or muddy.

B. All sod in stacks shall be kept moist and protected from exposure to air and sun and from freezing. Any sod permitted to dry out may be rejected whenever, in judgment of Project Officer, its survival after placing is doubtful. No payment shall be made for rejected sod. In any event, no more than forty-eight hours shall lapse between cutting and planting of sod is permitted.

C. Before placing or depositing sod upon any surfaces, all shaping and redressing of such surfaces as described in Section 329100 Planting Preparation shall be completed. The bed area for sod shall be dug out so that when the sod is installed the adjacent soil shall be flush with the top of the sod root mat. Areas shall be watered lightly before the placing of sod; sod shall not be placed on dry surfaces. Completed areas to be sodded shall be a smooth, uniform, well-tilled surface true to line and cross section. Any raking required shall be done immediately prior to placement of the sod at no additional cost to Owner.

D. No sod shall be placed at any time temperature is below 32 degrees Fahrenheit. No frozen sod shall be used and no sod shall be placed upon frozen, powder dry or excessively wet soil.

E. Apply planting soil mix to areas to be sodded in accordance with Section 329100 "Planting Preparation" Sod shall be lifted from trucks or storage piles by hand and placed with closed joints and no overlapping. All cracks, seams and voids shall be closed with small pieces of sod. After laying sod shall be sprinkled thoroughly and then tamped. "Tamping" consists of firmly closing seams between strips by use of hand tampers or approved rollers. All sod shall be thoroughly rolled after closing all seams. Correct any slipping of sod.

F. Adequate water and watering equipment must be on hand before sodding begins and sod shall be kept moist until root system adheres to original seed bed and becomes established and accepted by Project Officer.

G. Sod shall be laid with long edges parallel to contours, except in swales or ditches where it shall be placed perpendicular to the flow line. Only sod placed in swales or ditches shall be staked using 2 stakes per roll of sod. Stakes shall be wood wedges ½" x 1" x 12". Successive strips to be neatly matched and all joints staggered. Sod shall be laid in all areas indicated on landscape plans.

3.4 SPECIALTY SEEDING

A. Prepare planting area per Section 329100 Planting Preparation or in accordance with the approved plan.

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B. Process:
   1. Specialty seed mix shall be applied prior to installation of Erosion Control Fabric.
   2. Do not use wet seed or seed that is moldy or otherwise damaged.
   3. Do not seed against existing trees or vegetation to remain.
   4. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
   5. Brush or rake seed into top 1/8 inch of soil, roll lightly and water with fine spray.
   6. Protect seeded areas by applying compost mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch and roll surface smooth.
   7. Water newly planted areas and keep moist until established.
   8. Install erosion control fabric in accordance with Section 329100 Planting Preparation
   9. Plant shrubs, trees and perennials through erosion control fabric in accordance with Sections 329100 Planting Preparation and Section 329300 Exterior Plants.
   10. Specialty seed may also be applied in accordance with Section 3.2.E “Seeding - Turfgrass”, with the approval of the Project Officer and as authorized by the Landscape Architect.

C. Remove non-degradable erosion-control measures after seeding establishment.

3.5 PROTECTION

A. Install post and rope barriers around seeded areas. Tie cloth or ribbon to rope at 10’ intervals.

B. Install “KEEP OFF LAWN” signs at appropriate locations.

C. Remove non-biodegradable erosion control measures after plant establishment period.

3.6 MAINTENANCE FOR SEEDED OR SODDED TURFGRASS

A. Maintain surfaces and supply additional topsoil where necessary, including areas affected by erosion.

B. Water to ensure uniform seed germination and to keep surface of soil damp:
   1. Each watering shall consist of 1 gallon per 3 sq. yd. of seed or sod
   2. Apply water slowly so that surface of soil shall not puddle and crust

C. Cut lawn areas when grass reached height of 3”. Maintain minimum height of 2”. Do not cut more than 1/3 of blade at any one mowing.

D. After first mowing of lawn, water grass sufficiently to moisten soil from 3” to 5” deep.

E. Reseed damaged grass areas showing root growth failure, deterioration, bare or thin spots and erosion.

3.7 MAINTENANCE FOR SPECIALTY SEEDING AREAS

A. Repair eroded areas and reseed as needed to ensure site stabilization.

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B. Water to ensure uniform seed germination and to keep surface of soil damp:
   1. Each watering shall consist of 1 gallon per 3 sq. yd. of seed or sod
   2. Apply water slowly so that surface of soil shall not puddle and crust

C. Inspection and removal of invasive plant species shall be undertaken monthly during the growing season until final acceptance. Manual removal methods only shall be used, unless otherwise approved by the Project Officer, as authorized by the Landscape Architect.

3.8 GUARANTEE

A. The Contractor shall be responsible for maintaining all sodded and seeded areas in a healthy, vigorous condition in accordance with Section 3.6 “Maintenance for Seeded and Sodded Turfgrass” and Section 3.7 “Maintenance for Specialty Seeding Areas” as applicable at his/her own expense until all contracted work is completed, inspected and accepted by Project Officer as authorized by the Landscape Architect

B. The Contractor shall, at his own expense, replace any seed or sod which has died or been damaged during the establishment period.

C. Cost of seed and sod shall be withheld from final payment until final approval is given by Project Officer.

3.9 ACCEPTANCE

A. Seeded turfgrass areas shall be accepted when an even, healthy, close and uniform stand of turf, 3” tall, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10sq. ft. and bare spots not exceeding 4 by 4 inches is properly established. Bare spots in excess of 4” shall be re-seeded at a rate per section 3.22 of this specification.

B. Sodded areas shall be accepted provided all requirements, including maintenance, have been complied with and sod is well established in a healthy, vigorous growing condition. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

C. Specialty seeded areas shall be accepted when 1) post-installation coverage requirements have been met in accordance with the approved plan or 2) the site has achieved sufficient cover to be considered fully stabilized in the judgment of the Arlington County SWPPP Inspector.

D. Upon completion, all debris and waste material resulting from seeding/sodding/mulching activities shall be removed from the project area and legally disposed of. Any damaged areas shall be restored to their original condition.

E. Unless otherwise specified on the approved plans, upon acceptance by the Project Officer at Final Completion, Arlington County shall assume maintenance responsibilities.

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PART 4 - MEASUREMENT AND PAYMENT

4.1 The measurement of TURFGRASS SEEDING to be paid for shall be per SQUARE YARD of seeded turfgrass in accordance with the approved plans and specifications.

4.2 The unit price for TURFGRASS SEEDING shall include the cost of furnishing all labor, materials, equipment and incidental expenses necessary to complete the work, including but not limited to erosion control, topsoil, mulch, protection and maintenance, all in accordance with the approved plans and specifications.

4.3 The measurement of SPECIALTY SEEDING to be paid for shall be per SQUARE YARD of reforestation seed mix in accordance with the approved plans and specifications.

4.4 The unit price for SPECIALTY SEEDING shall include the cost of furnishing all labor, materials, equipment and incidental expenses necessary to complete the work, including but not limited to erosion control, topsoil, mulch, protection and maintenance, all in accordance with the approved plans and specifications.

4.5 The measurement of SOD to be paid for shall be per SQUARE YARD of sod installed in accordance with the approved plans and specifications.

4.6 The unit price for SOD shall include the cost of furnishing all labor, materials, equipment and incidental expenses necessary to complete the work, including but not limited to erosion control, protection and maintenance, all in accordance with the approved plans and specifications.

4.7 Unless otherwise specified on the project drawings, supplemental specifications or special conditions, excavation is considered incidental to the work and therefore no separate payments shall be made for excavation.

END OF SECTION 329200

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SECTION 329300 - EXTERIOR PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes trees, shrubs, groundcover, bulbs, and perennial plants.

B. Provide all labor, materials, tools and equipment as required to have plants, topsoil, amendments, and mulch applied on all areas called for on the approved plans.

C. Related Work Specified Elsewhere:
1. Section 01500 Erosion and Sediment Control and Pollution Prevention
2. Section 02200 Earthwork
3. Section 311300 Tree Protection and Root Pruning
4. Section 329100 Planting Preparation
5. Section 329200 Seeding and Sodding

D. Applicable Standards and Specifications
1. ANSI A300 Tree Care Operations: Standard Practices for Tree, Shrub, and Other Woody Plant Maintenances
2. American Standard for Nursery Stock (ANSI Z60.1) by the American Nursery & Landscape Association

E. In addition to the specifications contained herein, Work shall be performed in accordance with the:
1. Drawings and general provisions of the contract, including general and supplementary conditions
2. Arlington County Department of Parks & Recreation Design Standards as shown on the plans and available online at: http://parks.arlingtonva.us/design-standards/

1.2 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Existing Topsoil: Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation period and stockpiled.

C. Imported Topsoil: Soil obtained off-site that meets the specifications herein for topsoil and is suitable for use in planting soil/backfill soil mixture when existing soil quantities are insufficient. Refer to Section 329100 Planting Preparation.

D. Planting Soil Mix/Backfill Soil Mixture: Existing soil modified as specified to be suitable for planting. Refer to Section 329100 Planting Preparation.

E. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

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F. ISA: International Society of Arboriculture

G. CBAY: Chesapeake Bay, typically referring to CBAY watershed.

H. ANSI: American National Standards Institute

I. Urban Forester/County Urban Forester: Refers to the Arlington County Urban Forester

J. Landscape Architect: Refers to an Arlington County Landscape Architect or their designee.

1.3 SUBMITTALS

A. All submittals specified in Section 329100 Planting Preparation shall be provided to Project Officer for approval as authorized by the Landscape Architect and the Urban Forester. All approvals shall be in writing.

B. Product Certificates: Contractor shall submit for each type of manufactured product, to be approved by the Project Officer and complying with the following:

1. Manufacturer's certified analysis for standard products
2. Provide the provenance of the plant material. Provenance is the geographical origin of the seed or cutting used in propagation and can have a direct effect on plant vigor and survivability.

C. Refer to Section 329100 Planting Preparation for soil test requirements.

D. Contractor shall submit State Nursery inspection certificates to the Project Officer.

E. Contractor shall submit to Project Officer for verification the Landscape Industry Certified Technician and Landscape Industry Certified Officer certificates for those responsible for plant installation.

F. Planting Schedule: Contractor shall submit the planting schedule to the Project Officer for approval as authorized by the Landscape Architect and the Urban Forester The plant schedule shall indicate anticipated planting dates for exterior plants. Contractor shall be responsible for furnishing and installing all plant material shown on the drawings and plant list, as submitted with the contract. Contractor shall have investigated the sources of supply and satisfied himself/herself that he/she can supply all of the plants specified on the drawings in the size, variety, quantity and quality noted before submitting the bid. Failure to take this precaution shall not relieve the successful bidder from the responsibility of furnishing and installing all the plant material in strict accordance with the contract documents.

G. Substitutions:
1. The Contractor shall submit a written request for a substitute plant a minimum of thirty (30) calendar days prior to planting date if specific plants shall not be available in time for the scheduled planting. Contractor shall submit the request to the Project Officer for approval as authorized by the Landscape Architect and the Urban Forester.
2. Contractor shall be responsible for documenting any plant suitability or availability problems.

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3. If a substitute plant is offered to the County, it shall be of the same size, value and quality as the plant originally specified on the plan. Substitution shall be approved by the Project Officer as authorized by the Landscape Architect and the Urban Forester. If the County does not accept the substitute plant, the Contractor shall provide the type and size of plant material specified on the plans, or a substitute requested by the Project Officer as authorized by the Landscape Architect and the Urban Forester.

H. Plant Establishment Period Instructions: Contractor shall submit to the Project Officer recommended procedures for establishment of exterior plants during a calendar year. Submit before the beginning of the required establishment period.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:
1. The Contractor shall identify to the Project Officer at least one full-time on-site supervisor who is the Contractor's competent, qualified, and authorized person on the worksite and who is, by training or experience, familiar with the policies, regulations and standards applicable to the work being performed, and capable of sufficiently communicating with the Project Officer.
2. Or Contractor shall designate a project crew leader who possesses one or more of the following certifications:
   a. Certified by the National Association of Landscape Professionals (NALP) as a "Landscape Industry Certified Technician"
   b. Certified by the NALP as a "Landscape Industry Certified Officer"
3. Crew leader and supervisor may be the same individual.

B. Installer Qualifications for Natural Restoration Projects (including but not limited to stream restoration, wetland or meadow establishment or reforestation projects):
1. ISA Certified Arborist shall be on the worksite during forest planting or re-planting.
2. Demonstrate three to five years of relevant installation experience through:
   a. Project portfolio detailing a minimum of three (3) successfully completed projects similar in size and scope in the CBAY watershed area over the past five years.
3. The County shall, throughout the contract term, have the right of reasonable rejection and approval of staff or subcontractors assigned to the project by the Contractor. If the County reasonably rejects staff or subcontractors, the Contractor shall provide replacement staff or subcontractors satisfactory to the County in a timely manner and at no additional cost to the County. The day-to-day supervision and control of the Contractor's employees, and any employees of any of its subcontractors, shall be solely the responsibility of the Contractor.

C. Topsoil Analysis: Comply with requirements in Section 329100 Planting Preparation.

D. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in the most current version of ANSI Z60.1, "American Standard for Nursery Stock" (ANSI) published by the American Nursery and Landscape Association. Plants shall be nursery grown stock and conform to the requirements described therein. The Project Officer, as authorized by the Landscape Architect and Urban Forester, may reject any non-conforming stock and has the option to field-select plant materials prior to purchasing.

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E. Collected material may be used only when approved by Project Officer as authorized by the Landscape Architect, the Urban Forester and/or DPR PNR Natural Resource Manager.

F. Nomenclature shall be in accordance with *Hortus III*, by L.H. Bailey. All trees and shrubs shall be labeled with a securely attached, waterproof tag bearing legible designation of botanical and common name. Perennials and groundcovers shall be clearly identified with a waterproof tag bearing legible designation of botanical and common name within the container.

G. Pre-installation Conference: Conduct conference five (5) business days prior to installation at the Project site with Project Officer, Landscape Architect and Urban Forester.

H. Urban Forester Notification: Notify the Project Officer and the Urban Forester at least 72 hours prior to commencement of tree planting operations.

I. The Contractor shall provide a minimum of 72 hours notice to the Project Officer prior to installing the plant material (this is not the same as inspection notification).

J. Inspections:
1. Urban Forester may perform periodic inspections to check on tree plantings.
2. Contractor shall arrange a meeting on site with the Project Officer, Landscape Architect and the Urban Forester to perform final inspection of plantings. Refer to Section 3.5 Final Inspection.

1.5 WORKMANSHIP

A. Any tree pruning shall conform to the most current version of ANSI A-300 Standard Practices for Trees, Shrubs, and Other Woody Plant Maintenance. Do not prune trees and shrubs before delivery.

PART 2 - PRODUCTS

2.1 EXTERIOR PLANTS

A. Contractor shall select plants only from nurseries that have been inspected by state or federal agencies and shall have been grown in USDA Plant Hardiness Zones 4, 5, 6, or 7, and in one of the following states: Maryland, Virginia, Delaware, New Jersey, North Carolina or Pennsylvania.

B. Tree and Shrub Material: Furnish nursery-grown trees and shrubs complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sunscald, injuries, abrasions, and disfigurement.
1. Provide Balled and Burlapped, bare root or container-grown trees and shrubs, as indicated on the Drawings.
2. Balled and Burlapped plants shall be dug with firm root balls of earth and free of noxious weeds. There shall be no extra soil on top of the root ball or around the trunk. Balled and Burlapped trees shall be securely held in place by untreated burlap and stout rope. Nylon rope is NOT acceptable. Loose, broken or manufactured balls are unacceptable.
3. Ball sizes shall be in accordance with current ANSI standards.

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4. In size-grading B&B single stem trees, caliper shall take precedence over height. For multiple-trunk trees, height measurement shall take precedence over caliper.
5. Trees over 1" in caliper shall have a strong central leader (free and clear of branches or splits in the trunk) from the top of the root ball to a height of at least 6'-6". Only minimal bends in the trunk shall be acceptable. Co-dominant stems and V-crotches shall be cause for rejection.
6. The root system of container-grown plants shall be well developed and well distributed throughout the container.
7. All container-grown trees and shrubs that have circling and matted roots shall be rejected.
8. Perennials: Provide healthy, container grown plants with well-developed, fibrous root systems from a commercial nursery, of species, variety and size shown in the drawings. All container-grown plants shall be healthy, vigorous, well rooted and established in the container in which they are growing. A container-grown plant shall have a well-established root system reaching the sides of the container to maintain a firm root ball and shall not have excessive root growth outside the container.

C. Bulbs: Provide top size bulbs as indicated on plan in accordance with most current version of ANSI Z60.1 specification.

D. Field grown trees and shrubs shall be grown in soils of the Piedmont region, or west of that region in the above approved states and zones.

E. All plant materials shall be labeled by grower to identify genus, species, and cultivar, if applicable, in accordance with Section 1.4 Quality Assurance above.

F. Bare root plant materials: Bare root plants shall be dug with adequate fibrous roots. Do not root prune. Roots shall be protected during handling and planting to guard against drying out and damage.

G. Deep plug plant materials: Deep plug plants shall not be dormant at the time of planting and shall display a healthy, vigorous root system and viable top growth, unless otherwise approved by the Project Officer, as authorized by the Landscape Architect and the Urban Forester. Deep plug plants shall have a minimum root volume of 10 in^3 and a minimum rooting depth of four (4) inches.

H. Plant Materials for ecologically sensitive areas: Plant materials identified on planting plan as being located within an Arlington County Natural Resource Conservation Area (NCRA) shall be native species of local provenance.

I. Plant stock shall originate from a location within 150 miles of Arlington County.

2.2 OTHER MATERIALS

A. Refer to Section 329200 Seeding and Sodding for specifications for seeding, specialty seeding, sodding, and soil stabilization/erosion control fabric.

B. Refer to Section 329100 Planting Preparation for specifications for soils, mulch, soil amendments and other items related to planting preparation.

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PART 3 - EXECUTION

3.1 EXTERIOR PLANTING

A. Contractor shall install plant materials in accordance with the current Arlington County Standard Planting Details as published on the Arlington County website and as specified below.

B. Refer to Section 329100 Planting Preparation for specifications on soil amendments.

C. Bed Establishment:
   1. Planting beds shall be established in accordance with Specification 329100 Planting Preparation.
   2. Lawns, trees and shrubs shall be installed between 10/01 through 06/01. If a project completion is outside of this planting period, contact the Arlington County Urban Forester to obtain a deferral or approval for planting out of season.

D. Landscape Plantings (Trees, Shrubs, Ground Covers and Perennials)
   1. Contractor shall install plantings in accordance with Arlington County DPR standard details available at https://parks.arlingtonva.us/design-standards/. Refer to plans for appropriate planting details.
   2. Handling: Prepare pit and/or planting bed per Section 329100 Planting Preparation. Place plant in pit by carrying by the root ball (not by branches or trunk) and plant per ANSI Standards. Make sure the plant remains plumb during the backfilling procedure.

E. Tree and Shrub Pruning: Contractor shall conform to the most current version of ANSI A-300 Tree Pruning Standards. Do not cut tree leaders; remove only injured or dead branches from trees and shrubs, or those that pose a hazard to pedestrians. Make all cuts back to a lateral branch or bud. Cuts should be perpendicular above branch collar. Final pruning shall be done after the tree is in place. Do not prune into old wood on evergreens.

F. Plant Protection: Contractor shall protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged exterior planting. Injured roots shall be pruned per most current ANSI 300 specifications.
   1. Protect shrubs, groundcovers and perennials from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.
   2. Contractor shall remove all tags, labels, strings and wire from the plants, unless otherwise directed.
   3. Contractor shall remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Arlington County property.
   4. Refer to Section 3.4 Water Requirements.

3.2 STAKING & GUYING TREES

A. Contractor shall stake and guy trees only if required by Urban Forester.

B. If staking and guying is required, the Contractor shall provide and install stakes and guying in accordance with DPR standard staking details for deciduous and evergreen trees.

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3.3 WORKMANSHIP

A. Protect bark, branches, and root systems from sunscald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery. Plants shall not be bound with wire or rope at any time so as to damage the bark or break branches. Plants shall be handled from the bottom of the root ball only.

B. All plants in transit shall be tarped or covered and shall be kept from drying out. Desiccation damage shall be cause for rejection. Plants damaged in handling or transportation may be rejected by the Project Officer as authorized by the Landscape Architect and the Urban Forester. Any tree or shrub found to have wounds over 12.5% of the circumference of any limb or trunk, or over 1 inch in any direction, whichever is smaller, shall be rejected.

C. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants trees in shade, protect from weather and mechanical damage, and keep roots moist. Plants shall not remain unplanted for longer than a three-day period after delivery. Any plants not installed during this time period shall be rejected, unless Project Officer and contractor provide otherwise by written agreement. All plants kept on site for any period of time shall be secured, watered and cared for using ANSI A300 standards.

D. Plants shall be installed immediately following excavation of the hole. No holes shall remain open overnight. The Contractor shall cover and barricade any open holes to effectively prevent any danger of injury to pedestrians.

E. During delivery and installation, the landscape contractor shall perform in a professional manner, coordinating his/her activities so as not to interfere with the work of other trades, and leaving his/her work area(s) clean of litter and debris at the close of each workday.

F. During planting, all areas shall be kept neat and clean, and precautions shall be taken to avoid damage to existing plants, trees, turf and structures. Where existing trees are to be preserved, additional precautions shall be taken to avoid unnecessary accumulation of excavated materials, soil compaction, or root damage. The Contractor shall cover sidewalks or pavers with plywood, and cover turf with plywood, burlap or tarp during excavation.

G. Any damaged areas caused by the Contractor shall be restored to their original condition at no cost to the County. All debris and waste material, including small stones and clumps of clay or dirt exceeding 1” by 1” in any direction, resulting from planting operations shall be removed from the project, legally disposed, and the area cleaned up by the Contractor.

H. Plants with soil covering the root flare, if not removed by Contractor, shall be rejected by Project Officer as authorized by the Landscape Architect and the Urban Forester.

I. Contractor shall take full responsibility for any cost incurred due to damage of utilities by their operations.

J. The Contractor shall not be held responsible for uncommon concealed conditions such as concrete/asphalt/stone spoils encountered in excavation work which are not apparent at the time of bidding. Rocks, tree roots and hard clay are common elements of “urban” soils and shall frequently be encountered in the execution of the contract.

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K. No plants shall be planted in locations where drainage may, in the opinion of the Contractor, be unacceptable. Such situations shall be brought to the attention of the Project Officer before work continues and, if approved by the Project Officer as authorized by the Landscape Architect and Urban Forester, the plants shall be relocated or the contract shall be modified to allow for drainage correction at a negotiated cost. Any such modification shall be in writing and signed by both parties.

L. The Contractor shall layout plants according to the project landscape plan. The Project Officer shall approve the layout as authorized by the Landscape Architect and Urban Forester prior to plant installation. Plants installed without layout approval from the Project Officer as authorized by Landscape Architect and Urban Forester are subject to removal and replanting by the Contractor at no additional cost to Arlington County.

3.4 WATER REQUIREMENTS

A. Initial Waterings: The Contractor shall supply water for all plantings and shall water all plants at time of installation and 48 hours after installation, even if it is raining. Contractor shall then water plantings at least twice per week at amounts specified below until Final Acceptance of work unless specified otherwise in the contract documents.

B. Each watering shall consist of:
1. 20 gallons of water per individual tree, and
2. 4 gallons of water per individual shrub or plant of 5 gal size, and
3. 2 gallons per individual plant of 3 gallon size, and
4. 2 gallons of water per square yard of perennial bed of smaller sized plants
5. 1 gallon of water per 2 square yards of seed or sod

3.5 FINAL INSPECTION

A. Contractor shall schedule the final inspection with the Project Officer as authorized by the Landscape Architect and the Urban Forester.
1. Contractor shall provide Project Officer with a minimum of 72 hours notification. to arrange final inspection meeting with the Landscape Architect and Urban Forester.
2. Contractor shall conduct the final inspection of the landscape materials no less than three months after the installation of the plants or substantial completion of construction work, whichever comes last, and in the presence of the Project Officer, the Landscape Architect and Urban Forester.
3. The landscaping inspection shall review all landscape work under the contract.
4. All plants shall be alive and in good health at the time of final inspection.
5. Any plant material that is 25% dead or more shall be considered dead and shall be replaced at no charge to the County. A tree shall be considered dead when the main leader has died back, or 25% of the crown is dead.
6. It shall be the Contractor’s responsibility to provide in writing the results of the final inspection. The Project Officer shall provide agreement with the written results prior to acceptance.
7. The Contractor shall make replacements during the next planting period unless the County specifies an earlier date.

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8. Contractor is responsible for maintenance and watering of replacement material per Section 3.4 after planting and until the replacement plantings are finally accepted by Project Officer.
9. A replacement plant shall be of the same size as the original plant with no additional soil additives to be used.
10. The Contractor shall not be responsible for plants that have been damaged by vandalism, fire, removal or other activities beyond the control of the Contractor.

3.6 MAINTENANCE

A. Trees, Shrubs, Perennials, Bulbs & Groundcovers: Contractor shall maintain plantings at his/her own expense until final acceptance of the plantings per Section 3.5.

B. Maintenance shall include pruning, mulching, cultivating, watering, weeding, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. For natural areas, maintenance shall be limited to pruning, watering, resetting to proper grades or vertical position, and invasive plant control.

C. Pruning: Remove all sucker growth, dead or broken branches at initial planting and as needed during the warranty period. Pruning shall conform to ANSI-300 Tree Pruning Standards.

D. Fertilizing: No plants shall be fertilized without prior approval of Project Officer for approval as authorized by the Landscape Architect and the Urban Forester.

E. Mulching: Contractor shall re-mulch areas to a depth of two to three inches prior to final acceptance if the time between planting and final acceptance extends beyond six months. Mulch shall be of the same quality as mulch provided at the time of planting. Keep mulch six inches away from trunks of trees and shrubs.

F. Weeding: Contractor shall perform weeding until final acceptance to keep the planting area as free of weeds as possible. A minimum of one weeding per month from April through October is required if time between planting and final acceptance extends through any months of the growing season.

G. Stakes and Guy Supports: If installed, Contractor shall monitor and adjust all stakes and guy supports until final acceptance.

H. Invasive Plant Control: Contractor shall inspect the planting area monthly for invasive plants and control plants using manual methods as needed to maintain healthy and viable plantings. Use of chemical control methods may occur with the approval of the Project Officer for approval as authorized by the Landscape Architect and the Urban Forester.

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PART 4 - MEASUREMENT AND PAYMENT

4.1 The measurement of PLANT to be paid for under this item shall be the number of EACH type of furnished and installed plant in accordance with the approved plans and specifications.

4.2 The unit price for each PLANT shall include the cost of all labor, materials, and other expenses necessary to complete the work, including but not limited to required waterings (at time of planting and second watering for each plant 48 hours after installation), and maintenance and watering necessary to keep plants healthy until final acceptance as described herein, in accordance with the approved plans and specifications.

4.3 When explicitly specified in plans, the measurement of STAKING AND GUYING to be paid for under this item shall be the number of EACH to furnished and installed at individual trees in accordance with the approved plans and specifications.

4.4 The unit price for STAKING AND GUYING shall include the cost of all labor, materials, and other expenses necessary to complete the work in accordance with the approved plans and specifications.

4.5 Unless otherwise specified on the project drawings, supplemental specifications or special conditions, excavation is considered incidental to the work and therefore no separate payments shall be made for excavation.

END OF SECTION 329300

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COMMONWEALTH of VIRGINIA
DEPARTMENT OF LABOR AND INDUSTRY

Gary G. Pan
COMMISSIONER

Main Street Centre
600 East Main Street, Suite 207
Richmond, Virginia 23219
PHONE (804) 371-2327
FAX (804) 371-6524

Virginia Department of Labor and Industry Wage Determination Decision

Project Name	Northside Salt Storage Facility Construction
State Project Code	22-DES-ITB-618
DOLI Project Number	ARLC-22-0001 UPDATE
County or Independent City	Arlington County
Publication Date	05/03/2022
Construction Type	Highway

Wage Determinations	Wage	Fringe
Carpenter, Includes Form Work	$20.97	
Cement Mason/Concrete Finisher	$20.70	$8.03
Electrician, Includes Traffic Signalization	$28.35	15.95% + $7.00
Fence Erector	$15.28	
Ironworker, Reinforcing	$34.18	
Ironworker, Structural	$34.18	
Laborer: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$19.06	$1.75
Laborer: Common or General	$20.90	$7.90
Laborer: Grade Checker	$14.88	
Laborer: Pipelayer	$20.48	
Laborer: Power Tool Operator	$15.69	
Operator: Asphalt Spreader and Distributor	$20.58	$2.31

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Wage Determinations	Wage	Fringe
Operator: Backhoe/Excavator/Trackhoe	$23.93	
Operator: Bobcat/Skid Steer/Skid Loader	$19.00	$3.49
Operator: Broom/Sweeper	$17.40	$2.01
Operator: Bulldozer, Including Utility	$20.64	
Operator: Crane	$29.46	
Operator: Drill	$24.89	
Operator: Gradall	$19.26	
Operator: Grader/Blade	$23.21	
Operator: Hydroseeder	$16.64	
Operator: Loader	$18.92	
Operator: Mechanic	$22.84	
Operator: Milling Machine	$23.19	$2.94
Operator: Pavement Planer	$21.14	
Operator: Pavement Planer Groundsmen	$19.75	
Operator: Paver (Asphalt, Aggregate, and Concrete)	$20.33	$2.81
Operator: Piledriver	$21.83	$4.08
Operator: Roller	$18.92	
Operator: Roller (Finishing)	$18.73	$3.23
Operator: Screed	$22.13	$4.89
Pavement Marking Operator	$22.16	
Pavement Marking Truck Driver	$18.78	
Traffic Control: Flagger	$13.64	
Truck Driver: 1/Single Axle Truck	$19.35	
Truck Driver: Fuel and Lubricant Service	$18.25	
Truck Driver: Heavy 7CY & Under	$15.53	
Truck Driver: Heavy Over 7CY	$18.05	
Truck Driver: Multi Axle	$20.34	$2.89

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Additional Notes

All wage rates to be used on a contract will be set at the time the contract is awarded. While DOLI maintains a list of wage determinations online for reference purposes, only the wage determinations made in an official Wage Determination Decision, sent by DOLI to the contracting agency, can be used to ascertain the exact rates to be paid for a specific contract.

All rates are determined by DOLI and any appeals of specific classifications may be made through the Wage Determination Appeal form available at http://www.doli.virginia.gov/wp-content/uploads/2021/04/Appeal-for-Wage-Determination-Clarification.pdf
Any additional classifications may be requested through the Additional Wage Classification form available at http://www.doli.virginia.gov/wp-content/uploads/2021/04/Request-for-Additional-Wage-Classification.pdf
Understand your duties as a contractor under Virginia law by referencing our Contractor Responsibilities information sheet available at http://www.doli.virginia.gov/wp-content/uploads/2021/04/PREVAILING-WAGE-CONTRACTOR-RESPONSIBILITIES.pdf

Your employees have specific rights, which can be found on our List of Employee Rights information sheet available at http://www.doli.virginia.gov/wp-content/uploads/2021/04/PREVAILING-WAGE-EMPLOYEE-RIGHTS.pdf
Any further questions should be directed to PrevailingWage@doli.virginia.gov

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CONSTRUCTION COST ESTIMATE DETAIL

PREPARED BY: _____

THE UNDERSIGNED CERTIFIES THAT (CONTRACTOR NAME)Sagres Construction Corporation
IS CURRENTLY REGISTERED WITH THE VIRGINIA STATE BOARD OF CONTRACTORS AS REQUIRED BY THE CODE OF VIRGINIA. CERTIFICATE NUMBER 27050602349 Class A WAS ISSUED ON THE 31st DAY OF, 2001. THE UNDERSIGNED FURTHER CERTIFIES THAT THE REGISTRATION FEE AND ALL RENEWAL FEES REQUIRED UNDER LAW HAVE BEEN PAID. THE CONTRACTOR AGREES TO FURNISH ALL NECESSARY LABOR, EQUIPMENT, MATERIALS, AND ALL THINGS NECESSARY TO PERFORM THE WORK AS SET FORTH IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS. THE CONTRACTOR AGREES TO PERFORM RELATED WORK FOR THE FOLLOWING ITEMS AT THE FOLLOWING STIPULATED PRICES: (ALL PRICES INCLUDE PROVISION AND INSTALLATION).

CHECKED BY: _____

MASTER ITEM #	DESCRIPTION	QTY	UNIT		TOTAL
C1	#REF!				
MASTER ITEM #	**DESCRIPTION**	**QTY**	**UNIT**	**UNIT PRICE**	**TOTAL**
02200-C1-00070	Geotextile Drainage Fabric In Place (VDOT Section 245.03.c)	600	SY	$5.00	$3,000.00
02200-C1-00130	Aggregate, VDOT #21-A (Compacted in Place per VDOT standards & Specs)	100	CY	$50.00	$5,000.00
				SUBTOTAL	**$8,000.00**

C2	#REF!				
MASTER ITEM #	**DESCRIPTION**	**QTY**	**UNIT**	**UNIT PRICE**	**TOTAL**
02750-C2-00060	Concrete Curb & Gutter, Standard C-2 and C-2R (Arlington County Detail R-2.0), includes curb & gutter for aprons, ramps, etc.	16	LF	$95.00	$1,520.00
03100-C2-SP290	8" Thick Continuously Reinforced Concrete Pavement (Steel Bar Reinforcement, VDOT PR-3)	385	SY	$125.00	$48,125.00
				SUBTOTAL	**$49,645.00**

C3	#REF!				
MASTER ITEM #	**DESCRIPTION**	**QTY**	**UNIT**	**UNIT PRICE**	**TOTAL**
02600-C3-00010	Asphalt Concrete, Planing or Milling (1/2" to 3" Depth)	710	SY	$10.00	$7,100.00
02600-C3-00030	Asphalt Concrete, Base Course (VDOT BM-25.0A)	10	TON	$250.00	$2,500.00
02600-C3-00060	Asphalt Concrete, Surface Course (VDOT SM-9.5A)	5	TON	$300.00	$1,500.00
				SUBTOTAL	**$11,100.00**

C4	#REF!				
MASTER ITEM #	**DESCRIPTION**	**QTY**	**UNIT**	**UNIT PRICE**	**TOTAL**
02500-C4-00650	18" Pipe, RCP Class III, In Place 6' to 9' Deep	70	LF	$145.00	$10,150.00
02500-C4-02000	15" Polypropylene Pipe,In Place Up to 6' Deep	475	LF	$135.00	$64,125.00
02500-C4-02040	18" Polypropylene Pipe,In Place 6' to 10' Deep	165	LF	$150.00	$24,750.00
02505-C4-00010	Storm Manhole MH-1 (Arlington County Detail D-3.0), In Place, DEPTH 8'	3	EA	$7,750.00	$23,250.00
02505-C4-00100	CB-2A or CB-2B (throat lengths from 8'-6" up to 16'-0"), In Place Up to 6' Deep, Arlington County Standards.	1	EA	$8,000.00	$8,000.00

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CHECKED BY: _____

MASTER ITEM #	DESCRIPTION	QTY	UNIT		TOTAL
02505-C4-00380	Yard Inlet (Arlington County Detail D-1.10), In Place Up to 6' Deep	1	EA	$7,500.00	$7,500.00
02505-C4-00430	Grate Inlet Non-roadway Shallow (Arlington County Detail D-1.9), In Place Up to 6' Deep	2	EA	$7,500.00	$15,000.00
02505-C4-SP450	Nyloplast or approved equal inlets / drain basins	7	EA	$5,750.00	$40,250.00
02505-C4-00600	Storm Manhole, Catch Basin, Drop Inlet, Yard Inlet, or Grate Inlet, Remove	4	EA	$1,000.00	$4,000.00
				SUBTOTAL	**$197,025.00**

C5 **#REF!**

MASTER ITEM #	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
				SUBTOTAL	

C6 **#REF!**

MASTER ITEM #	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
02550-C6-00200	Connect To Existing 8-Inch Water Main	1	EA	$3,500.00	$3,500.00
02550-C6-00700	Service Taps - 1 1/2-inch and 2-inch PER ADDITIONAL LINEAR FOOT OVER 10 FT.	65	LF	$95.00	$6,175.00
				SUBTOTAL	**$9,675.00**

C7 **#REF!**

MASTER ITEM #	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
				SUBTOTAL	

C8 **#REF!**

MASTER ITEM #	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
				SUBTOTAL	

C9 **#REF!**

MASTER ITEM #	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
				SUBTOTAL	

C10 **#REF!**

MASTER ITEM #	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
02900-C10-00120	Six (6) Inch Longitudinal Solid Line	600	LF	$7.50	$4,500.00
				SUBTOTAL	**$4,500.00**

C11 **#REF!**

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CONSTRUCTION COST ESTIMATE DETAIL

PREPARED BY: _____

THE UNDERSIGNED CERTIFIES THAT (CONTRACTOR NAME)Sagres Construction Corporation
IS CURRENTLY REGISTERED WITH THE VIRGINIA STATE BOARD OF CONTRACTORS AS REQUIRED BY THE CODE OF VIRGINIA. CERTIFICATE NUMBER 27050602349 Class A WAS ISSUED ON THE 31st DAY OF, 2001. THE UNDERSIGNED FURTHER CERTIFIES THAT THE REGISTRATION FEE AND ALL RENEWAL FEES REQUIRED UNDER LAW HAVE BEEN PAID. THE CONTRACTOR AGREES TO FURNISH ALL NECESSARY LABOR, EQUIPMENT, MATERIALS, AND ALL THINGS NECESSARY TO PERFORM THE WORK AS SET FORTH IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS. THE CONTRACTOR AGREES TO PERFORM RELATED WORK FOR THE FOLLOWING ITEMS AT THE FOLLOWING STIPULATED PRICES: (ALL PRICES INCLUDE PROVISION AND INSTALLATION).

CHECKED BY: _____

MASTER ITEM #	DESCRIPTION	QTY	UNIT		TOTAL
MASTER ITEM #	**DESCRIPTION**	**QTY**	**UNIT**	**UNIT PRICE**	**TOTAL**
02800-C11-00500	Tree/Stump Removal - Class A. Remove and Dispose, Up to 6" DBH to 12" DBH (Diameter at Breast Height)	5	EA	$900.00	$4,500.00
02800-C11-00603	Trees, Deciduous - 2.0 to 2.5" caliper	4	EA	$600.00	$2,400.00
02800-C11-00611	Trees, Evergreen - 6.0 to 7.0' in height	1	EA	$600.00	$600.00
311300-C11-00082	Tree Pruning	6	EA	$750.00	$4,500.00
02800-C11-00200	Chain Link Fence, Height Less Than or Equal to 6'	60	LF	$65.00	$3,900.00
02800-C11-00210	Chain Link Fence, Height Greater Than 6' Up to 8'	80	LF	$75.00	$6,000.00
02800-C11-00240	Chain Link Fence - Remove & Dispose, Height Less Than or equal to 6'	60	LF	$12.50	$750.00
02800-C11-00250	Chain Link Fence - Remove & Dispose, Height Greater Than 6' Up to 8'	40	LF	$15.00	$600.00
02800-C11-00270	Landscape/Retaining Wall, Excluding Foundation (Segmental Non-Reinforced Interlocking Concrete Wall), Height Less Than 3' Exposed Face (Versa-Lok, or County Approved Alternate System)	100	SF	$80.00	$8,000.00
02800-C11-00280	Landscape/Retaining Wall (Block, Brick, Segmental, or Similar), Height Less Than or Equal to 3' Exposed Face, Remove and Dispose (Foundation Removal Paid Separately under Rock Excavation)	100	SF	$80.00	$8,000.00
				SUBTOTAL	**$39,250.00**

C12 **#REF!**

MASTER ITEM #	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
				SUBTOTAL	

C13 **#REF!**

MASTER ITEM #	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
01500-C13-10000	Temporary Erosion and Sediment Controls	1	LS	$17,000.00	$17,000.00
				SUBTOTAL	**$17,000.00**

C15 **#REF!**

MASTER ITEM #	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
01000-C15-SP005	Removal and Fill of Existing Gravel SWM Ditches	122	CY	$45.00	$5,490.00

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CONSTRUCTION COST ESTIMATE DETAIL

PREPARED BY: _____

THE UNDERSIGNED CERTIFIES THAT (CONTRACTOR NAME)Sagres Construction Corporation
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CHECKED BY: _____

MASTER ITEM #	DESCRIPTION	QTY	UNIT		TOTAL
				SUBTOTAL	**$5,490.00**

C16 **#REF!**

MASTER ITEM #	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
				SUBTOTAL	

C17 **#REF!**

MASTER ITEM #	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
ACSWM-C17-02541	Manufactured Filtering Device	1	EA	$125,000.00	$125,000.00
ACSWM-C17-02542	Stormwater Detention System	1	EA	$242,500.00	$242,500.00
				SUBTOTAL	**$367,500.00**

C18 **#REF!**

MASTER ITEM #	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
02580-C18-00010	Electrical Service for Brine Machine	1	LS	$5,000.00	$5,000.00
				SUBTOTAL	**$5,000.00**

CONTRACT TOTAL (EXCLUDING PERCENTAGE ITEMS)	**$714,185.00**

PCT **#REF!**

MASTER ITEM #	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
01500-C13-10000	Temporary Erosion and Sediment Controls	NA	%	0.00%	**$0.00**
01000-C16-00010	Maintenance of Traffic (MOT)	NA	%	1.00%	**$7,141.85**
01000-C16-00020	Re-Mobilization (For On-Call Contracts Only)	NA	%		**$0.00**
01000-C16-00030	Mobilization and De-Mobilization	NA	%	4.00%	**$28,567.40**
01500-SA-00200	SWPPP Administration	NA	%	1.00%	**$7,141.85**
				PERCENTAGE LINE ITEMS SUBTOTAL	**$42,851.10**

PROJECT TOTAL :	**$757,036.10**

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SECTION 02541 – MANUFACTURED STORMWATER FILTERING DEVICE

PART 1 - GENERAL

1.1 Description of Work

This work shall consist of furnishing and installing a manufactured stormwater filtering device as defined by the Virginia Department of Environmental Quality (DEQ) Stormwater Design Practice 17: Filtering Devices, and in accordance with the requirements of the contract documents.

1.2 Related Work Specified Elsewhere

A. Section 01330 – Submittal Procedures

B. Section 01500 - Temporary Sediment and Erosion Control

C. Section 02100 - Clearing and Grubbing

D. Section 02200 - Earthwork

E. Section 329200 - Seeding and Sodding

F. Section 02500 - Gravity Sewers and Appurtenances

G. Section 02505 - Storm Sewers and Appurtenance

H. Section 03400 – Precast Concrete

1.3 American Society for Testing and Materials (ASTM) Reference Specifications

A. ASTM C857: Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

B. ASTM C858: Standard Specification of Underground Precast Concrete Utility Structures

C. ASTM C478: Standard Specification for Circular Precast Reinforced Concrete Manhole Sections

D. ASTM C497: Standard Test Methods for Concrete Pipe, Manhole Sections or Tile

E. ASTM C109: Standard Test Method for Compressive Strength of Hydraulic Cement Mortars

F. ASTM A615/A615M: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

G. ASTM D698: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort

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H. ASTM F628: Standard Specification for ABS Schedule 40 Plastic Drain, Waste and Vent Pipe with a Cellular Core

I. ASTM D1785: Standard Specification for PVC Plastic Pipe, Schedules 40, 80 & 120

J. ASTM D2466: Standard Specification for PVC Plastic Pipe Fittings, Schedule 40

K. ASTM A36: Standard Specification for Carbon Structural Steel

L. ASTM A48: Standard Specification for Gray Iron Castings

M. ASTM D4101: Standard Specification for Polypropylene Injection and Extrusion Materials

1.4 American Association of State Highway and Transportation Officials (AASHTO) Reference Specifications

A. AASHTO M199: Standard Specification for Precast Reinforced Concrete Manhole Sections

1.5 Applicable Standards and Specifications

A. Erosion and Sediment Control (Chapter 57 of the Arlington County Code)

B. Utilities (Chapter 26 of the Arlington County Code)

C. Stormwater Management (Chapter 60 of the Arlington County Code)

D. Chesapeake Bay Preservation Ordinance (Chapter 61 of the Arlington County Code)

E. Virginia Erosion and Sediment Control Handbook

F. Virginia Department of Environmental Quality Stormwater Design Practice 17: Filtering Devices

G. Arlington County Stormwater Management Ordinance Guidance Manual

H. Arlington County Planning and Field Guide for Erosion and Sediment Control

I. Arlington County Pre-Storm Erosion and Sediment Control Checklist

J. Arlington County Planning & Field Guide for Pollution Prevention (P2)

K. Arlington County Department of Parks and Recreation Design Standards

1.6 Submittals

A. Contractor shall submit to the Project Officer shop drawings for the Stormwater filtration system structure, filter cartridges and accessory equipment. Drawings shall include principal dimensions, filter placement, location of piping and unit foundation.

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B. Contractor shall submit Manufacture's Installation Instructions to the Project Officer.

C. Contractor shall submit the manufacturer's Operation and Maintenance Manual to the Project Officer

D. Contractor must photo-document construction phases; Contractor must submit a clear, scanned copy of all material receipts and certifications; Contractor must schedule all required inspections.

E. The Contractor shall submit the following documentation electronically to the project officer with each progress payment request and within 30 business days of the post-construction meeting.
   1. Receipts and deliverables - the contractor shall submit materials delivery tickets for each material used in the manufactured stormwater filtering device construction. The tickets must be legible and if submitted electronically, scanned copies must be of at least 300 dpi resolution.
   2. Documentation - installation of each element (precast concrete vault, filters, pipe connections, etc.) shall be photographed and the corresponding elevation of each installed element shall be provided in the Final Topographic Survey. Photographs shall be of sufficient resolution and quality to clearly depict the intended subject. Photos shall be a minimum size of 300 dpi and 900 x 600 pixels in size. The following below-grade bmp elements shall be documented at a minimum:
      a. Excavation extent
      b. Installation of stone layer prior to vault placement
      c. Installation of precast concrete vault including interior
      d. Installation of each grade control structure (weir wall)
      e. All pipe connections
      f. Installation of filters (if removed and stored during construction) and/or removal of plugs and/or bypass systems.

F. Final Topographic Survey - at the end of construction, the contractor shall submit a field run topographic survey prepared by a licensed professional surveyor in electronic CAD file format. The survey shall include the following at a minimum:
   1. Inflow (inlets, curb cuts, etc.) elevations and locations
   2. All inlets and outlets.
   3. Grade control structure (such as weirs) elevations
   4. Associated storm structures and pipe connections
   5. Surface grading of the vault

1.7 Substitutions: Any proposed equal alternative product substitution to this specification must be submitted for review and approved by the Project Officer 10 days prior to bid opening. Review package should include maintenance instructions and third party reviewed performance data for both flow rate and pollutant removal. The system must be a manufactured stormwater filtering device awarded 50% TP removal efficiency by the Virginia Department of Environmental Quality (DEQ) and listed as such under Stormwater Design Practice 17: Filtering Devices in theVirginia Stormwater BMP Clearinghouse. https://swbmp.vwrrc.vt.edu/

1.8 Permits

For street right of way construction the Contractor shall obtain all necessary permits prior toinitiating construction. The Contractor must implement the traffic control/maintenance of traffic (MOT) plan and pedestrian safety plan to include temporary pedestrian access and traffic controldevices to include flag

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persons, signage, keeping pathways clear of vehicles and equipment, etc.All must be in accordance with the US Department of Transportation Federal Highway Administration's “Manual on Uniform Traffic Control Devices” or the Virginia Department of Transportation's “Virginia Work Area Protection Manual.”

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PART 2 - PRODUCTS

2.1 Media Cartridge Filtration System

A. Subject to compliance with requirements, provide products by the following or approved equivalent:
   1. Contech Stormfilter with Phosphosorb Media
      https://www.conteches.com/

B. The Stormwater filtration system shall be of a type that has been installed and in use for a minimum of five (5) consecutive years preceding the date of installation of the system. The manufacturer shall have been, during the same consecutive five (5) year period, engaged in the engineering, design, and production of systems deployed for the treatment of storm water runoff and which have a history of successful production, acceptable to the Project Officer and the assigned maintenance staff.

C. The entire system and each filter cartridge shall have the capacity to be inspected during dry weather to determine if replacement is necessary by the following indicators:
   1. Sediment loading on the vault floor.
      a. If >4" of accumulated sediment, maintenance is required.
   2. Sediment loading on top of the cartridge.
      a. If >1/4" of accumulation, maintenance is required.
   3. Submerged cartridges.
      a. If >4" of static water above cartridge bottom for more than 24 hours after end of rain event, maintenance is required. (Catch basins have standing water in the cartridge bay.)
   4. Plugged media.
      a. While not required in all cases, inspection of the media within the cartridge may provide valuable additional information.
      b. If pore space between media granules is absent, maintenance is required.
   5. Pronounced scum line.
      a. If pronounced scum line (≥ 1/4" thick) is present above top cap, maintenance is required.

D. Each rechargeable, media-filled, filter cartridge shall incorporate a protective hood over the media cartridge and a siphon-actuated surface self-cleaning mechanism to increase the effective life of the filter media and to reduce the accumulation of material on the cartridge/media interface.

E. Media filter cartridges shall operate at a predetermined flow rate through the use of an integrated flow control orifice located within each filter cartridge outlet manifold.

F. The media-filled cartridges shall trap particulates (TSS) and have the capacity to adsorb pollutants such as dissolved metals, nutrients and hydrocarbons.

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G. At the design flow rate the maximum filter hydraulic loading rate is not to exceed 2.1 gallons per minute per square foot of filter surface area and the average contact time shall be no less than 35 seconds.

H. The media cartridge filtration system shall consist of no less than 0.12 cubic feet of filter media for each 1-gallon per minute of water quality treatment flow.

I. Filter cartridges shall be of a design that has demonstrated a minimum sediment retention capacity of 22 pounds of silty loam per cartridge in laboratory tests without a reduction in hydraulic capacity. Laboratory data shall be corroborated with field observations and/or data demonstrating equivalent or improved longevity without impacting normal hydraulic performance.

J. The Filtration system shall be listed as having 50% TP removal efficiency on the Virginia Department of Environmental Quality (DEQ) Stormwater Design Practice 17: Filtering Devices in the Virginia Stormwater BMP Clearinghouse. https://swbmp.vwrrc.vt.edu/

2.2 Media Cartridge Filtration System Internal Components

A. All internal components including ABS and PVC manifold piping, filter cartridge(s), filter media (as specified on the plans or by the Project Officer) shall be provided by the manufacturer. This includes sump covers, flow spreaders, energy dissipaters and outlet risers with scum baffles where appropriate.

B. ABS manifold pipe shall meet ASTM F628. PVC manifold pipe shall meet ASTM D1785 and PVC fittings shall meet ASTM D2466.

C. Filter cartridge bottom pan, inner ring, and hood shall be constructed from linear low-density polyethylene (LLDPE) or ABS. Filter cartridge screen shall consist of 1” x ½” welded wire fabric (16 gauge minimum) with a bonded PVC coating. Internal parts shall consist of ABS or PVC material. Siphon-priming float shall be constructed from high-density polyethylene (HDPE). All miscellaneous nuts, bolts, screws, and other fasteners shall be stainless steel or aluminum.

D. An orifice plate shall be supplied with each cartridge to restrict flow rate to a maximum of 22.5 gpm at system design head or as specified on drawings.

E. If a sump cover/overflow, baffle/inlet, sump/outlet, sump/inlet, tower/outlet overflow is provided, they shall be constructed of ABS and sealed to the interior vault walls and floor with a polyurethane construction sealant rated for use below the waterline, SikaFlex 1a or approved equivalent. Contractor to provide sealant material and installation unless completed prior to shipment

F. Where an Underdrain Design is provided, the size of the underdrain will provide a minimum of 0.067 in2 of underdrain cross sectional area per 1 gpm of design flow rate. (example: 105 gpm maximum design flow rate will require an underdrain with 7.035 in2 of cross-sectional area, which is equal to one 3” diameter pipe).

G. Filter media shall be provided by the same manufacturer as the Stormwater filtration system or an approved alternate source. Filter media shall consist of the following:

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1. Media shall be made from Perlite pellets with activated alumina bound to the surface. The media pellets shall be granular and have a bulk density from 18 to 25 lb/ft3. The pellet size should range from that passing through a U.S. Standard ¼ inch sieve and retained on a #8 sieve.
2. Perlite: Perlite shall be made of natural siliceous volcanic rock free of any debris or foreign matter. The perlite shall have a bulk density ranging from 6.5 to 8.5 lb/ft3 and particle sizes ranging from that passing through a 0.50 inch screen and retained on a U.S. Standard #8 sieve.

H. Overflow Assembly (Where Provided):
1. Flow spreader shall be constructed of Linear Low-Density Polyethylene (LLDPE). Contractor to provide sealant material and installation unless completed prior to shipment.
2. Energy dissipater shall be constructed of polyolefins. Contractor to provide sealant material and installation unless completed prior to shipment.
3. Outlet riser with scum baffle shall be constructed of HDPE. Outlet riser shall have an outlet stub outside dimension (O.D.) of 12-inch diameter PVC, SDR 26 and a secondary outlet stub O.D. of 8-inch diameter PVC, SDR 26.

2.1 Steel Catch Basin & Roof Drain Components:

A. Basin shall be all welded steel construction, fabricated from ASTM A36 ¼-inch steel and shall be designed to withstand AASHTO H-20 wheel loads when placed below ground in a location that could receive direct loading.

B. Basin Grate: Grating shall be ductile iron construction and shall meet AASHTO H-20 loading requirements, and shall be provided according to ASTM A48.

C. Basin Solid Lid (below ground system design): Solid lid shall be gray cast iron, treated with nonslip surfacing, and shall meet AASHTO H-20 loading requirements, and shall be provided according to ASTM A48.

D. Basin Solid Lid (above ground system design): Solid lids shall be PVC plate with pick holes. Covers to be cut as required for top inlet roof drain pipes.

2.3. Precast Concrete Structure Components:

A. Precast concrete vault shall be provided according to ASTM C857 and C858. Precast concrete manhole shall be provided according to ASTM C478.

B. Vault and manhole joint sealant shall be Conseal CS-101 or approved equivalent.

C. If interior concrete baffle walls are provided, baffle walls shall be sealed to the interior vault walls and floor with a polyurethane construction sealant rated for use below the waterline, SikaFlex 1a or approved equivalent. Contractor to provide sealant material and installation unless completed prior to shipment.

D. Frames and covers shall be gray cast iron and shall meet AASHTO H-20 loading requirements and shall be provided according to ASTM A48.

E. Doors shall have hot-dipped galvanized frame and covers. Covers shall have diamond plate finish. Each door to be equipped with a recessed lift handle. Doors shall meet H-20 loading

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requirements for incidental traffic, at a minimum, or per project specific traffic loading requirements.

F. Steps shall be constructed of copolymer polypropylene conforming to ASTM D4101. Steps shall be driven into preformed or drilled holes once concrete is cured. Steps shall meet the requirements of ASTM C478 and AASHTO M199. The ½" Grade 60 deformed reinforcing bar shall meet ASTM A615, where required.

G. Ladders shall be constructed of aluminum and steel reinforced copolymer polypropylene conforming to ASTM D4101. Ladder shall bolt in place. Ladder shall meet all ASTM C497 load requirements. Ladders provided upon request or where required, and shall not conflict with the operation and accessibility to perform maintenance of the Stormwater filtration system.

2.4. Contractor Provided Components (below ground installation):

A. All contractor-provided components shall meet the requirements of this section, the plans specifications and contract documents. In the case of conflict, the more stringent specification shall apply.

B. Sub-base: Crushed rock base material shall be six-inch minimum layer of ¾-inch minus rock. Compact undisturbed sub-grade materials to 95% of maximum density at +/-2% of optimum moisture content. Unsuitable material below sub-grade shall be replaced to Project Officer's approval.

C. In-situ concrete, if required, shall have an unconfined compressive strength at 28 days of at least 3000 psi, with ¾-inch round rock, a 4-inch slump maximum, and shall be placed within 90 minutes of initial mixing.

D. Silicone Sealant shall be pure RTV silicone conforming to Federal Specification Number TT S001543A or TT S00230C or Project Officer's approved.

E. Grout shall be non-shrink grout meeting the requirements of Corps of Engineers CRD-C588. Specimens molded, cured and tested in accordance with ASTM C109 shall have minimum compressive strength of 6,200 psi. Grout shall not exhibit visible bleeding.

F. For manhole systems, Contractor shall connect to 12-inch or 8-inch diameter outlet riser with Fernco flexible coupling or approved equal.

G. Rebar used on applicable Catch Basin & Roof Drain systems shall meet ASTM A615M Grade 420 (60 ksi) or as otherwise specified in the general technical specifications.

H. Backfill material shall be ¾-inch minus crushed rock or approved equivalent.

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3. PART 3 - EXECUTION

3.1 Construction

A. Contractor shall report any conditions encountered during construction that are considered detrimental to Stormwater Filtering Device function including but not limited to: high groundwater, off-site sediment, unsuitable soils and inadequate drainage.

B. Contractor shall secure the Stormwater Filtering Device from any runoff from the construction site or disturbed areas. Block curbs or inlets to divert upland drainage areas to prevent runoff from entering the excavated area prior to completion as determined by the project officer. Ensurethat no site runoff enters the facility before the drainage area has been stabilized.

C. Contractor shall ensure no sediment or debris be swept or blown into storm drains or Stormwater Filtering Device. Sediment or debris shall be swept up, bagged and disposed of offsite.

3.2 Suitable Weather

A. Construction shall be suspended during periods of rainfall or snowmelt. Construction shall remain suspended if ponded water is present or if there is residual soil moisture due to increased potential for soil compaction.

B. Secure the site from risk of precipitation damages in the event of rain (i.e., cover erodible surfaces such as slopes and edges); take action to divert stormwater away from the work area and temporarily cover all exposed soils with filter fabric or impermeable sheeting; cover all staged material in the event of rain and at the close of each work day.

3.3 Sequence of Construction

A. Pre-Construction Meeting – the Project Officer shall schedule a Stormwater Filtering Device specific pre-construction meeting at the site. Contractor attendance is required.

B. Precast Concrete Structure:
   1. Set precast structure on crushed rock base material that has been placed in maximum 6-inch lifts, loose thickness, and compacted to at least 95-percent of the maximum dry density as determined by the standard Proctor compaction test, ASTM D698, at moisture content of +/-2% of optimum water content.
   2. Structure floor shall slope 1/4 inch maximum across the width and slope downstream 1 inch per 12 foot of length. For manholes “Length” is defined by a line running from the invert of the outlet through the center of the manhole and “width” is the perpendicular to the “length”. Structure top finish grade shall be even with surrounding finish grade surface unless otherwise noted on plans.
   3. Inlet and outlet pipes shall be stubbed in and connected to precast concrete structure according to requirements and specifications. All connections to be watertight. If grout is used, Contractor to grout all inlet and outlet pipes flush with or protruding up to 2 inches into interior of structure.

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4. When required by the manufactures design, ballast shall be placed to the dimensions specified.. Ballast shall not encase the inlet and/or outlet piping. Provide 12” clearance from outside diameter of pipes.

C. Steel Catch Basin:
1. Catch basin floor shall slope 1/4 inch maximum across the width and slope downstream 1 inch per 12 foot of length. Catch basin top finish grade shall be even with surrounding finish grade surface unless otherwise noted on plans.
2. Contractor shall prevent sediment and debris from entering the filter unit during construction.
3. If necessary, the inlet chamber may be filled with clean water to assist in preventing flotation during construction until the structure is backfilled and the concrete collar is poured.
4. Catch basin outlet shall be connected to downstream (and upstream, if applicable) piping using a flexible-type coupling.
5. Concrete perimeter slab shall be constructed 1 foot wide and 6 inches thick. Slab shall include two #4 rebar hoops with minimum 6-inch overlap at closure. Allow 2-inch vertical spacing between hoops and minimum 2-inch clearance from concrete surfaces, or as directed by the Project Officer.

D. Clean Up:
1. Remove all excess materials, rocks, roots, or foreign material, leaving the site in a clean, complete condition approved by the Project Officer. The project site shall be clean and free of dirt and debris and the inlet/outlet chamber(s) and filter chamber(s) shall be free of construction debris and sediment before the allowing runoff to enter and place the system in operation. All filter components shall be free of any foreign materials including concrete and excess sealant.
2. Where applicable, Contractor shall remove the temporary filter fabric around the inlet grate to place the system in operation.
3. Where required, the 4-inch cleanout plug in the overflow weir wall shall remain in place for proper operation of the system.

E. Filter Cartridges:
1. Filter cartridges shall be delivered installed in the structure, unless otherwise agreed upon with the manufacturer. Contractor shall take appropriate action to protect the cartridges from sediment and other debris during construction. The method ultimately selected shall be at Contractor’s discretion and Contractor’s risk. Methods for protecting the cartridges include, but are not limited to:
   a. Remove cartridges from the structure and store appropriately. Cartridges shall be reinstalled to operate according to number 2 below.
   b. If structure is equipped with underdrain bypass piping, Contractor may leave cartridges in the vault and allow stormwater entering collection system to bypass filter bay through underdrain bypass piping.
   c. Leave cartridges in the structure and plug inlet and outlet pipe to prevent stormwater from entering the vault and provide means for stormwater to bypass the Stormwater filtration system.
2. Filter cartridges shall not be placed in operation until the structure is clean and the project site is clean and stabilized (construction erosion control measures no longer required). The project site includes any surface that contributes storm drainage to the Stormwater filtration system. All impermeable surfaces shall be clean and free of dirt and debris. All catch basins, manholes and pipes shall be free of dirt and sediments. Contact the manufacturer

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to assist with system activation and/or inspect the system for proper installation once site is clean and stabilized.

3. Contractor to install filter cartridges.
   a. Filter Cartridges with ¼-Turn Connector Fittings: Tape shall be cleanly and completely removed from manifold fitting openings. ¼-turn connects shall be glued and inserted into all manifold fittings to be equipped with a filter cartridge. Filter cartridges shall be turned onto the connector until they reach the hard stop on the connector – approximately ¼ revolution, with care to not "over turn" the cartridge, or turn with such force to damage the hard stop mechanism. Plugs shall be inserted without glue in all manifold fittings not equipped with a filter cartridge.

3.4 Final Topographic Survey and Photo Documentation

A. The Contractor shall provide a Final Topographic Survey and photographs per submittals section.

3.5 Construction Inspection

A. The contractor shall be required to have the Project Officer inspect the project at critical stages of the construction of the facility. The contractor shall notify the project officer at least 48 hours in advance of the necessary inspection. The required inspections are:
   1. Following the excavation of the facility (prior to placement of the precast structure)
   2. Following the installation of the precast structure
   3. Prior to putting the system online (installation of the filters if removed and stored during construction and/or removing plugs and/or bypass system).

3.6 Certification Letter

A. The contractor shall submit a Certification Letter for Proprietary BMP. The format of this letter shall follow the template of the most recent version of the Arlington County Stormwater Management Ordinance Guidance Manual.

3.7 Maintenance

A. Maintenance and Inspection shall be performed in accordance with the manufacturer's recommendations for maintenance and inspection in conjunction with Arlington County's requirements for maintenance of manufactured stormwater filtering devices and DEQ requirements.

B. Surface access for personnel and equipment for inspection and maintenance activities shall be provided.

1. PART 4 - MEASUREMENT AND PAYMENT

A. Measurement of Manufactured Stormwater Filtering Device shall be lump sum. Payment shall include concrete vault and furnishing of all parts, components and equipment listed

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in part 2 above, all excavation, compaction, and installation of the device complete and in place in accordance with manufacturers requirements.

4.2 Connection of the Manufactured Stormwater Filtering Device to the proposed storm sewer system on site shall be considered incidental to the installation of the device.

END OF SECTION 02541

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SECTION 02542 – UNDERGROUND STORMWATER DETENTION PIPE SYSTEM

PART 1 - GENERAL

1.1 Description of Work

This work shall consist of furnishing and installing an Underground Stormwater Detention Pipe System for use in gravity-flow storm drainage in accordance with the requirements of the contract documents

1.2 Related Work Specified Elsewhere

A. Section 01330 – Submittal Procedures

B. Section 01500 – Erosion and Sediment Control and Pollution Prevention

C. Section 02100 – Clearing and Grubbing

D. Section 02200 – Earthwork

E. Section 02202 – Rock Excavation

F. Section 02500 – Gravity Sewers and Appurtenances

G. Section 02505 – Storm Sewers and Appurtenances

1.3 American Society for Testing and Materials (ASTM) Reference Specifications

A. ASTM A536: Standard Specification for Ductile Iron Castings

B. ASTM F2881: Standard Specification for 12 to 60 in. [300 to 1500 mm] Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications

C. ASTM D3212: Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

D. ASTM F477: Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

E. ASTM F1417: Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air

F. ASTM F2487: Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Corrugated High Density Polyethylene and Polypropylene Pipelines

G. ASTM D2321: Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

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1.4 American Association of State Highway and Transportation Officials (AASHTO) Reference Specifications

A. AASHTO M330: Standard Specification for Polypropylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter

1.5 Applicable Standards and Specifications

A. Erosion and Sediment Control (Chapter 57 of the Arlington County Code)

B. Utilities (Chapter 26 of the Arlington County Code)

C. Stormwater Management (Chapter 60 of the Arlington County Code)

D. Virginia Erosion and Sediment Control Handbook

E. Arlington County Stormwater Management Ordinance Guidance Manual

F. Arlington County Pre-Storm Erosion and Sediment Control Checklist

G. Arlington County Planning & Field Guide for Pollution Prevention (P2)

H. Arlington County Department of Parks and Recreation Design Standards

1.6 Submittals

A. Contractor shall submit to the Project Officer shop drawings for the Underground Stormwater Detention Pipe System, including pipes, joints, fittings, tees, bends, risers, and other accessory equipment. Drawings shall include principal dimensions, location of piping and unit foundation.

B. Contractor shall submit Manufacturer’s Installation Instructions to the Project Officer.

C. Contractor shall submit the manufacturer’s Operation and Maintenance Manual to the Project Officer.

D. Contractor must photo-document construction phases; contractor must submit a clear, scanned copy of all material receipts and certifications; contractor must schedule all required inspections.

E. The Contractor shall submit the following documentation electronically to the project officer with each progress payment request and within 30 business days of the post-construction meeting.
   1. Receipts and deliverables - the contractor shall submit materials delivery tickets for each material used in the Underground Stormwater Detention Pipe System construction. The tickets must be legible and if submitted electronically, scanned copies must be of at least 300 dpi resolution.
   2. Documentation - installation of each element (bedding layer, pipe connections, etc.) shall be photographed and the corresponding elevation of each installed element shall be provided in the Final Topographic Survey. Photographs shall be of sufficient resolution and quality to clearly depict the intended subject. Photos shall be a minimum size of 300

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dpi and 900 x 600 pixels in size. The following below-grade bmp elements shall be documented at a minimum:

a. Ripping of the bottom excavation
b. Excavation extent
c. Installation of bedding layer
d. Installation of impermeable liner and geotextile fabric
e. Installation of maintenance risers
f. Installation of each grade control structure (weir wall)
g. Installation of Class I or II material, placed and compacted in accordance with ASTM D2321 in pipe zone
h. Installation of all pipe connections

F. Final Topographic Survey - at the end of construction, the contractor shall submit a field run topographic survey prepared by a licensed professional surveyor in electronic CAD file format. The survey shall include the following at a minimum:

1. Inflow (inlets, curb cuts, etc.) elevations and locations
2. All inlets and outlets
3. Grade control structure (such as weirs) elevations
4. Associated storm structures and pipe connections
5. Surface grading of the Underground Stormwater Detention Pipe System

1.7 Substitutions: Any proposed equal alternative product substitution to this specification must be submitted for review and approved by the Project Officer 10 days prior to bid opening. Review package should include maintenance instructions. The system must be an Underground Stormwater Detention Pipe System and contain 12- through 60-inch (300 to 1500 mm) pipes which shall meet ASTM F2881 or AASHTO M330.

1.8 Permits

A. For street right of way construction the contractor shall obtain all necessary permits prior to initiating construction. The contractor must implement the traffic control/maintenance of traffic (MOT) plan and pedestrian safety plan to include temporary pedestrian access and traffic control devices to include flag persons, signage, keeping pathways clear of vehicles and equipment, etc. All must be in accordance with the US Department of Transportation Federal Highway Administration's “Manual on Uniform Traffic Control Devices” or the Virginia Department of Transportation's “Virginia Work Area Protection Manual.”

PART 2 - PRODUCTS

2.1 Stormwater Pipes:

A. Subject to compliance with requirements, provide products by the following or approved equivalent:

1. ADS HP Storm 48” Pipes, or approved equal

B. Polypropylene compound for pipe and fitting production shall be impact modified copolymer meeting the material requirements of ASTM F2881, Section 5 and AASHTO M330, Section 6.1.

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C. The Stormwater pipes shall be of a type that has been installed and in use for a minimum of five (5) consecutive years preceding the date of installation of the system. The manufacturer shall have been, during the same consecutive five (5) year period, engaged in the engineering, design, and production of systems deployed for the detention of storm water runoff and which have a history of successful production, acceptable to the Project Officer and the assigned maintenance staff.

D. Stormwater pipe requirements:
   1. The Stormwater pipes pipe shall have a smooth interior and annular exterior corrugations.
   2. 12- through 60-inch (300 to 1500 mm) pipe shall meet ASTM F2881 or AASHTO M330.
   3. Manning's "n" value for use in design shall be 0.012.

2.2 Stormwater Pipe – Joints:

A. Pipe shall be joined using a bell & spigot joint meeting the requirements of ASTM F2881 or AASHTO M330. The joint shall be watertight according to the requirements of ASTM D3212. Gaskets shall meet the requirements of ASTM F477. Gasket shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly. 12- through 60-inch (300 to 1500 mm) diameters shall have an exterior bell wrap installed by the manufacturer.

2.3 Stormwater Pipe – Fittings:

A. Fittings shall conform to ASTM F2881 or AASHTO M330. Bell and spigot connections shall utilize a welded or integral bell and valley or inline gaskets meeting the watertight joint performance requirements of ASTM D3212.

2.4 Maintenance Risers:

A. Subject to compliance with requirements, provide products by the following or approved equivalent:
   1. Nyloplast Inline Drain, or approved equal

B. Solid Covers and Frames shall be ductile iron per ASTM A536 Grade 70-50-05.

C. Concrete slab min. 18" around Solid Covers shall be AASHTO H-20 (8") min. thickness.

D. Drainage connection stub joint tightness shall conform to ASTM D3212 for corrugated HDPE & SDR 35 PVC.

2.5 Contractor Provided Components (below ground installation):

A. All contractor-provided components shall meet the requirements of this section, the plans specifications and contract documents. In the case of conflict, the more stringent specification shall apply.

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B. Foundation: Where the trench bottom is unstable, the Contractor shall excavate to a depth required by the Project Officer and replace with suitable material as specified by the Project Officer. As an alternative and at the discretion of the Project Engineer, the trench bottom may be stabilized using a geotextile material (as applicable).

C. Bedding: Suitable material shall be Class I or II per ASTM D2321. The Contractor shall provide documentation for material specification to the Project Officer. Minimum bedding thickness shall be 6” (152 mm) min.

D. Initial backfill: Suitable material shall be Class I or II in the pipe zone extending not less than 6” (152 mm) above crown of pipe. The Contractor shall provide documentation for material specification to the Project Officer. Material shall be installed as required in ASTM D2321, latest addition.

E. Cover: Minimum cover over all detention systems is 24" (610 mm) of cover for 42-60" (1050-1500 mm) diameter pipe, measured from top of pipe to bottom of flexible pavement or to top of rigid pavement. Maximum fill height limited to 8 ft (2.4 m) over fittings for standard installations.

PART 3 - EXECUTION

3.1 Construction

A. Contractor shall report any conditions encountered during construction that are considered detrimental to Underground Stormwater Detention Pipe System function including but not limited to: high groundwater, off-site sediment, unsuitable soils and inadequate drainage.

B. Contractor shall secure the Underground Stormwater Detention Pipe System from any runoff from the construction site or disturbed areas. Block curbs or inlets to divert upland drainage areas to prevent runoff from entering the excavated area prior to completion as determined by the project officer. Ensure that no site runoff enters the facility before the drainage area has been stabilized.

C. Contractor shall ensure no sediment or debris be swept or blown into storm drains or the Underground Stormwater Detention Pipe System. Sediment or debris shall be swept up, bagged and disposed of offsite.

3.2 Suitable Weather

A. Construction shall be suspended during periods of rainfall or snowmelt. Construction shall remain suspended if ponded water is present or if there is residual soil moisture due to increased potential for soil compaction.

B. Secure the site from risk of precipitation damages in the event of rain (i.e., cover erodible surfaces such as slopes and edges); take action to divert stormwater away from the work area and temporarily cover all exposed soils with filter fabric or impermeable sheeting; cover all staged material in the event of rain and at the close of each work day.

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3.3 Sequence of Construction

A. Pre-Construction Meeting – the Project Officer shall schedule an Underground Stormwater Detention Pipe System specific pre-construction meeting at the site. Contractor attendance is required.

B. Pipe System:
1. The Underground Stormwater Detention Pipe System shall sit on bedding no less than 6”, of which the material is Class I or II.
2. The initial backfill shall be material Class I or II, not less than 6” above the crown of pipe.
3. Inlet and outlet pipes, bends, tees, stubs, and risers to be connected according to requirements and specifications. All connections to be watertight.

C. Clean Up:
1. Remove all excess materials, rocks, roots, or foreign material, leaving the site in a clean, complete condition approved by the Project Officer. The project site shall be clean and free of dirt and debris and the Underground Stormwater Detention Pipe System shall be free of construction debris and sediment before the allowing runoff to enter and place the system in operation. All components shall be free of any foreign materials including concrete and excess sealant.

3.4 Final Topographic Survey and Photo Documentation

A. The Contractor shall provide a Final Topographic Survey and photographs per submittals section.

3.5 Construction Inspection

A. The contractor shall be required to have the Project Officer inspect the project at critical stages of the construction of the system. The contractor shall notify the project officer at least 48 hours in advance of the necessary inspection. The required inspections are:
1. Following the excavation of the system
2. Following the installation of the pipe system
3. Prior to putting the system online

3.6 Maintenance

A. Maintenance and Inspection shall be performed in accordance with the manufacturer’s recommendations for maintenance and inspection.

B. Surface access for personnel and equipment for inspection and maintenance activities shall be provided.

PART 4 - MEASUREMENT AND PAYMENT

A. Payment for Measurement for the Underground Stormwater Detention Pipe System shall be lump sum. Payment shall include concrete vault and furnishing of all parts, components and equipment

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listed in part 2 above, all excavation, compaction, and installation of the device complete and in place in accordance with manufacturers requirements.

B. Connection of the Underground Stormwater Detention Pipe System to the proposed storm sewer system on site shall be considered incidental to the installation of the device.

END OF SECTION 02542

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Arlington County, VA Materials Testing Specification Reference (September 2020)

MATERIAL AND TEST (*REF. - VDOT TEST METHODS MANUAL)*	VDOT ROAD AND BRIDGE SPECIFICATION 2002 (*Or Latest Version)*	MINIMUM RATE OF SAMPLING (*REF. - VDOT MANUAL OF INSTRUCTIONS)*	LOCATION OF SAMPLING	REMARKS
SOILS AND AGGREGATES				
1. Embankments				
(a) Density, Any Method	303.04(h)	One (1) test per 2500 yd3 or less plus: (a) for fills less than 500 ft. length one (1) test on every other 6-in. layer bottom to top of fill starting with the second lift; (b) for fills from 500-2000 ft. length, two (2) tests per 6-in. layer within top five (5) ft. of fill; (c) for fills greater than 2000 ft length, break into equal segments not to exceed 2000 ft. and use same frequency for each section as for fills 500 to 2000 ft. in length.	Roadway	When tests are not run due to gravel, muck, rock, etc. give station and depth on report in lieu of test, with reason. For nuclear test, use Direct Transmission Method, VTM-10. See Notes 1 and 2.
2. Finished Sub-grade (Both Cut and Fill Sections)				
(a) Density, Any Method	305.03	One (1) test per 2000 continuous linear ft. of roadway and one test minimum per intersection per construction location	Roadway (24 ft.)	For nuclear test, use Direct Transmission Method, VTM-10. See Notes 1 and 2.

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MATERIAL AND TEST (*REF. - VDOT TEST METHODS MANUAL)*	VDOT ROAD AND BRIDGE SPECIFICATION 2002 (*Or Latest Version)*	MINIMUM RATE OF SAMPLING (*REF. - VDOT MANUAL OF INSTRUCTIONS)*	LOCATION OF SAMPLING	REMARKS
(b) Density, Any Method	305.03	One (1) test per continuous section/block/or intersection	Curb, Comb. Curb and Gutter	For nuclear test, use Direct Transmission Method, VTM-10. See Notes 1 and 2.
(c) Density, Any Method	305.03	One (1) test per continuous section/block/or intersection	Sidewalk	For nuclear test, use Direct Transmission Method, VTM-10. See Notes 1 and 2.
3. Central Mix Aggregate (Treated or Un-treated) Base, Subbase, and Select Material				
(a) Density, Any Method	305.03, 308.03, & 309.05,	One (1) test per 1/2 mile or less per continuous lane application width per layer. If testing by nuclear method, each test shall consist of average of five (5) readings.	Roadway. Location of five (5) nuclear readings at randomly selected sites.	For nuclear tests, use Backscatter, Control Strip Method, VTM-10. With nuclear method, set up roller pattern and control strip for each layer or lift placed. See Notes 1 and 2.
(b) Density, Any Method	305.03, 308.03, & 309.05,	One (1) test per continuous section/block/or intersection	Curb, Comb. Curb and Gutter	For nuclear test, use Direct Transmission Method, VTM-10. See Notes 1 and 2.
(c) Density, Any Method	305.03, 308.03, & 309.05,	One (1) test per continuous section/block/or intersection	Sidewalk	For nuclear test, use Direct Transmission Method, VTM-10. See Notes 1 and 2.

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4. Backfill for Pipes and Box Culverts	302.03, 303.04(g), 401.03(i)	Minimum one test per lift on alternating sides of pipe for each 300 feet of pipe or portion thereof. Test pattern is to begin after first 4" compacted layer above the structures bedding and continue to 1' above top of pipe or box culvert structure. For rate of testing greater than 1' above top of pipe refer to contract documents and Rate of Sampling for embankments.	Alternating sides of structure	For nuclear test, use Direct Transmission Methods, VTM-10. See Notes 1 and 2. Backfill lifts shall be compacted in horizontal layers not more than 6 inches in thickness, loose measurement. (Or as Specified by the Contract Documents)
5. Backfill for Drop Inlets	302.03, 303.04(g)	Minimum one test every other lift around the perimeter beginning after the first 4" compacted layer above the bedding and continue to top of the structure. Stagger tests to ensure consistent compaction effort has been achieved.	Perimeter of structure	To include drop inlets, junction boxes, etc. For nuclear test, use Direct Transmission Methods, VTM-10. See Notes 1 and 2. Backfill lifts shall be compacted in horizontal layers not more than 6 inches in thickness, loose measurement. (Or as Specified by the Contract Documents)
6. Backfill for Manholes	302.03, 303.04(g)		Perimeter of structure	For nuclear test, use Direct Transmission Methods, VTM-10. See Notes 1 and 2. Backfill lifts shall be compacted in horizontal layers not more than 6 inches in thickness, loose measurement. (Or as Specified by the Contract Documents)

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Arlington County, VA Materials Testing Specification Reference (September 2020)

MATERIAL AND TEST (*REF. - VDOT TEST METHODS MANUAL)*	VDOT ROAD AND BRIDGE SPECIFICATION 2002 (*Or Latest Version)*	MINIMUM RATE OF SAMPLING (*REF. - VDOT MANUAL OF INSTRUCTIONS)*	LOCATION OF SAMPLING	REMARKS
HYDRAULIC CEMENT CONCRETE				
1. Sidewalk, Curb, Comb. Curb and Gutter				
(a) Temperature Measurements	217	One test per batch (truck), and when making compressive specimens.	At job site, and prior to placing concrete in forms.	If test on any batch fails, recheck batch immediately before rejecting. Enter results of tests in project records.
(b) Air Content	217	One test per batch (truck), and when making compressive specimens	At job site, and prior to placing concrete in forms	Any of 3 approved methods may be used for this test. However, with any test method used, with readings indicating concrete to be outside of specification must be confirmed first with test by Pressure Method before rejection of concrete. Enter results in project records.
(c) Consistency (Slump Test).	217	One test per batch (truck), and when making compressive specimens.	At job site, and prior to placing concrete in forms.	If test on any batch fails, recheck batch immediately before rejecting. Enter results in project records.

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(d) Compressive Strength...	217	For <u>miscellaneous concrete,</u> one set of 3 cylinders shall be made for each 250 cubic yards, with a minimum of one set of 3 per day. Any one set to be made from same batch. For <u>structural concrete,</u> one set of 3 cylinders shall be made for each 100 cubic yards of concrete placed, with a minimum of 2 sets of 3 cylinders each per structure per class of concrete. Any one set to be made from same batch.	At job site.	<u>Molding and Curing</u> Molds shall be placed on a rigid horizontal surface free from vibration and other disturbances during the first 24 hours, all test specimens shall be stored under conditions that maintain the temperature immediately adjacent to the specimens in the range of 60℉ to 80℉, and prevent loss of moisture. <u>Testing</u> Except when high-early strength concrete is specified, compressive strength testing will be performed at 28 days.

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MATERIAL AND TEST (***REF. - VDOT TEST METHODS MANUAL)***	**VDOT ROAD AND BRIDGE SPECIFICATION 2002** (***Or Latest Version)***	**MINIMUM RATE OF SAMPLING** (***REF. - VDOT MANUAL OF INSTRUCTIONS)***	**LOCATION OF SAMPLING**	**REMARKS**
ASPHALT PAVEMENT				
(a) In-Place Pavement Density by Nuclear Method (Roller Pattern)/ (Control Strip) (Asphalt Pavement)	Roads and Bridges Section 315.05 VTM-76 AASHTO T-166	Establish Roller pattern and Control Strip according to VTM-76. Ten (10) stratified random sample to establish target density. Verify minimum density achieved with cores per VTM-76. **QC technician shall be certified and pass State proficiency**	Field	Contractor/Asphalt Producer shall provide Certified Asphalt Paving Technician for density testing
(b) In-place Pavement Density by Nuclear Method and/or VDOT cores Test Section) (Asphalt Pavement)	Roads and Bridges Section 315.05 VTM-76 AASHTO T-166	Test Section- Lot Size: 5000 ft. per Lane width. Ten (10) stratified random samples per lot for nuclear gauge and/or five(5) stratified random plug/cores per lot **QC technician shall be certified and pass State proficiency**	Field	Contractor/Asphalt Producer shall provide Certified Asphalt Paving Technician for density testing
(c) Temperature Measurements	Roads and Bridges 211.08	One temperature measurement initially on first and fifth loads, each type mix each production day, and thereafter minimum of one per hour of production time for each mix type, by Producer's Certified Asphalt	QC - Processing or mixing plant from back of truck **QA – Field**	The Contractor should take and record temperature measurements of the asphalt concrete at the beginning of paving operations and thereafter at a rate of not less than one measurement every hour. The

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Arlington County, VA Materials Testing Specification Reference (September 2020)

MATERIAL AND TEST (*REF. - VDOT TEST METHODS MANUAL)*	VDOT ROAD AND BRIDGE SPECIFICATION 2002 (*Or Latest Version)*	MINIMUM RATE OF SAMPLING (*REF. - VDOT MANUAL OF INSTRUCTIONS)*	LOCATION OF SAMPLING	REMARKS
		Concrete Technician. If any test outside of tolerance, minimum of 3 additional tests made in different points of the load, and 4 tests averaged and average used as temperature of load or batch.		Project Officer may increase the frequency of temperature measurements at any time. The temperature should be checked using an appropriate heat-sensing device (i.e. probe thermometer, infrared thermometer, etc.).

Note 1. Density tests are reported on Forms TL-53, TL-54, TL-55, TL-124, TL-125 (Sand Cone Method), and TL-125A (One-Point Proctor Method).

Note 2. If there is a breakdown in the nuclear testing equipment, then density testing shall continue using other approved methods.

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State & Federal Roads in Arlington County, VA

State Routes

- Interstate 66: Custis Memorial Parkway
- Interstate 395: Henry G. Shirley Memorial Highway
- U.S. Route 1: Jefferson Davis Highway
- State Route 27: Washington Boulevard (Memorial Bridge to U.S. Route 50)
- U.S. Route 29: Lee Highway
- U.S. Route 50: Arlington Boulevard
- State Route 110: Jefferson Davis Highway (Rosslyn to Crystal City)
- State Route 120: Glebe Road
- State Route 123: Chain Bridge Road
- State Route 124: Spout Run Parkway (Lee Highway to Lorcom Lane)
- State Route 233: Airport Viaduct
- State Route 237: Washington Boulevard (North Glebe Road to Lee Highway)
- State Route 237: Fairfax Drive (Kirkwood Road to North Glebe Road)
- State Route 237: 10th Street North (U.S. Route 50 to Kirkwood Road)
- State Route 309: Old Dominion Drive

Federal Routes

- Arlington Hall Street
- Boundary Channel Drive
- George Washington Memorial Parkway
- Fort Myer streets, including Arlington National Cemetery
- Marshall Drive (North Meade Street to U.S. Route 110)
- Memorial Avenue
- Pentagon Street
- Spout Run Parkway (Lorcom Lane to George Washington Memorial Parkway)

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ARLINGTON COUNTY, VA
REQUEST FOR INFORMATION FORM

PROJECT: **RFI NUMBER:** _____
PROJECT NO.:

FOR CONTRACTOR ROUTING:
Contractor: _____ Transmittal No.: _____
Work Category: Date:

TO
☐ **(County Project Officer)** ☐ Action ☐ Faxed to _____ ☐ Emailed ☐ Mailed Pages ___
☐ **(Consultant)** ☐ Action ☐ Faxed to _____ ☐ Emailed ☐ Mailed Pages ___
☐ **(Other)** ☐ Action ☐ Faxed to _____ ☐ Emailed Pages ___

REGARDING: _____
SPEC. SECTION: _____ **DWG. NO.:** _____

EXPLANATION OF ISSUE: (Provide complete description of request with sketches or photos if necessary, and present status of work)

RECOMMENDATION / SUGGESTED SOLUTION:

RESPONSE PRIORITY: ☐ EARLIEST CONVENIENCE ☐ RUSH (WORK IN PROGRESS)
REASON FOR REQUEST: ☐ Existing Condition ☐ Non-conformance ☐ Clarification / Interpretation ☐ Agency Generated ☐ Other

CONTRACTOR : _____
BY: _____ **DATE**: _____ Dist: _____

ARCHITECT'S/ENGINEER'S ROUTING: (for A/E use only)
To: _____ Date: _____ Return to: _____ Date _____

TO: **(contractor)** ☐ Faxed to _____ ☐ Emailed ☐ Mailed ☐ Hand delivered

RESPONSE:

☐ The above is considered a change. The following document will be used for processing: _____
☐ The above is consistent with the intent of and reasonably inferable from Contract Documents, or makes minor changes in the Work without change in Contract Sum or Contract Time. If Contractor does not agree, submit written notice within twenty (20) days substantiating claim in accordance with Contract Documents for approval.
☐ This RFI is returned without response for the following reason: ☐ Incomplete or lack of detailed information. ☐ Related to "means & methods". ☐ Lack of adequate Coordination Drawings. ☐ Is a "Substitution Request". ☐ Response required by others.

_____
FROM: _____
BY: _____ **DATE:** _____ Dist: ☐ _____ ☐ File

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