

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

NOTICE OF CONTRACT AWARD

TO: MCN Build, Inc. 1214 28th Street NW Washington, DC 20007	DATE ISSUED:	October 23, 2019
	CONTRACT NO:	19-219-RFP
	CONTRACT TITLE:	CMAR Fire Station No. 8 - Rebuild

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

Your firm is awarded the above referenced contract in accordance with the response submitted by you on June 17, 2019. The contract term covered by this Notice of Award is effective immediately and expires on December 30, 2022.

The contract documents consist of the terms and conditions of Arlington County Agreement 19-219-RFP, including any exhibits, attachments or amendments thereto.

CONTRACT PRICING:

1. REFER TO ARLINGTON COUNTY AGREEMENT NO. 19-219-RFP,

ATTACHMENT/S:

1. ARLINGTON COUNTY AGREEMENT NO. 19-219-RFP

EMPLOYEES NOT TO BENEFIT:

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

VENDOR CONTACT: Joseph Khoury

TELEPHONE NO: (202) 333-3424

EMAIL ADDRESS: joseph@mcnbuild.com

COUNTY CONTACT: Richard Pinskey

TELEPHONE NO: (703) 228-3988

EMAIL ADDRESS: Rpinskey@arlingtonva.us

Purchasing Division Authorization

Sharon Lewis Title Purchasing Agent Date October 23, 2019

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

AGREEMENT NO. 19-219-RFP

THIS AGREEMENT is made, on the date of execution by the County, between MCN Build, Inc., 1214 28th Street NW, Washington, DC 20007 (“Contractor”) a District of Columbia corporation authorized to do business in the Commonwealth of Virginia, and the County Board of Arlington County, Virginia. The County and the Contractor, for the consideration hereinafter specified, agree as follows:

1. CONTRACT DOCUMENTS

The Contract Documents consist of:

- Agreement No. 19-219-RFP and all modifications properly incorporated into the Agreement
- Exhibit A – Scope of Work
- Exhibit B – Contractor’s Pricing for Preconstruction Services
- Exhibit C – Arlington County Construction General Conditions
- Exhibit D –Guaranteed Maximum Price (GMP) Amendment, once executed, to include Drawings, Specifications and Construction Notes (initially the Permit/GMP Set and subsequently the final Construction Documents
- Exhibit E – Arlington County Department of Environmental Services Construction and Standards and Specifications, Current Edition,
- Exhibit F – Arlington County Department of Environmental Services Infrastructure Design Standards, Current Edition

Where the terms and provisions of this Agreement vary from the terms and provisions of the other Contract Documents, the order of precedence of the Contract Documents shall be as follows:

Exhibits A, C, D, E and F are considered complementary documents, what is in one shall be considered as in all; where the terms of these Contract Documents vary the most stringent shall apply; and Exhibits A, C, D, E and F, shall prevail over Attachment B.

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”.

2. PROJECT OFFICER

The performance of the Contractor is subject to the review and approval of the County Project Officer who will be appointed by the Director of the Arlington County department or agency requesting the work under the Contract.

The County has authorized the consultant identified below to act as the County representative for specific purposes to perform specified duties and responsibilities, and to have the rights and authorities as assigned in connection with completion of the Work in accordance with the Contract Documents until

such time as the County may notify the Contractor otherwise:
Lemay, Erickson and Wilcox Architects, PC. (the "Architect")

The County will notify the Contractor after contract award of the specific roles and responsibilities of the Consultant(s).

3. SCOPE OF WORK

The Project shall proceed in two phases: The Preconstruction Phase and the Construction Phase.

During the Preconstruction Phase, the Contractor shall provide the preconstruction services that are necessary to properly advance the Project, including, but not limited to those preconstruction services outlined in Exhibit A (Scope of Services) with the goal of developing an acceptable Guaranteed Maximum Price Proposal for the Project.

During the Construction Phase, if awarded in the form of the GMP contract amendment, the Contractor will furnish all labor, materials, supervision, equipment and other services necessary for the construction of the new Fire Station 8 in Arlington, Virginia (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.

4. STANDARD OF CARE

The Contractor shall perform all services under this Agreement at a level, and as judged by a standard of care, that is consistent with the standards and quality prevailing among construction management and general contracting firms of superior knowledge, skill and experience engaged in projects of similar size and complexity. The Contractor shall carry out and complete the services in an efficient, economical and timely manner, as expeditiously as is consistent with the level of skill and care required hereby and in the interests of the County.

5. TIME FOR COMPLETION

The PRE-CONSTRUCTION - PHASE 1 shall run currently with the design of the temporary and permanent station of the Project and has an expected duration of *three hundred and twenty-six days (326)*. At no additional cost to the County, the County may, in its sole discretion, increase the duration of the Preconstruction Phase by up to One Hundred Eighty (180) days by giving written notice to the Contractor of such election. The County may exercise such extension in one or more notices provided the total of all such extensions does not exceed 180 days.

Work under Construction Phase shall achieve Substantial Completion no later than eight hundred and twenty-four (824) calendar days from the date of completion of The PRE-CONSTRUCTION - PHASE 1 or acceptance of GMP Amendment 1, whichever is earlier. Final Completion of the Work shall be achieved by the Contractor 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.

6. CONTRACT AMOUNT

The Construction Management Fee and a General Conditions Fee for Construction Services are set forth in Attachment B (Contractor's Pricing) and are premised on the Project Budget of \$14,000,000 million dollars, which budget is inclusive of Cost of the Work as well as the Contractor's Construction Management Fee and General Conditions Fee, and on the schedule set forth in paragraph 5. above.

The Contractor's compensation for the Preconstruction Phase services shall be 10% of the Construction Management Fee, which is set forth in Attachment B. During the Preconstruction Phase the Contractor shall develop GMP Proposals for the Project as contemplated in Attachment A (Scope of Services). The County and the Contractor shall negotiate the terms of such GMP Proposals, and, upon approval by the County of the GMP, the parties will sign an amendment hereto in substantially the form of Attachment D (Form of GMP Amendment). The Guaranteed Maximum Price for the Project shall be the maximum amount payable to the Contractor to achieve Final 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, and shall include the Construction Management Fee, the General Conditions Fee and the Cost of the Work, as defined in Attachment A (Scope of Services). The County is not obligated to accept the GMP. If the County does not accept the GMP, the Contract will be terminated at the end of Preconstruction Phase.

The County will pay the Contractor for its services under this Agreement in accordance with the terms of the Progress Payments and Retainage and Payment Terms sections below.

7. PROGRESS PAYMENTS AND RETAINAGE

The County will make progress or partial payments to the Contractor in accordance with the contract documents. However, 5% of each progress payment will be retained by the County until Final Completion and acceptance of all Work covered by the Agreement. Other than the Construction Management Fee, retainage shall apply to all aspects of all requests for progress payments.

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 Final Acceptance.

8. 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 within forty-five (45) days after approval of an invoice for 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.

9. REIMBURSABLE EXPENSES

The County will not reimburse the Contractor for any expenses under this Contract. The amount in Attachment B includes all costs and expenses of providing the services described in this Contract.

10. 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.

11. 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.

12. SELF-PERFORMANCE BY THE CONTRACTOR

The Contractor shall not perform work with its own forces unless the Project Officer provides written authorization for the Contractor to perform any portion of the Work as self-performed work; provided, however, that in no event shall the Contractor self-perform more than 10% of the construction work (measured by cost of the work). All work which the Contractor is not authorized to self-perform shall be performed by subcontractors of the Contractor which the Contractor shall procure by competitive sealed bidding or competitive negotiations as specified in the Contract Documents.

As used in this section, self-performed work shall mean trade work performed by employees of (1) the Contractor; (2) any entity comprising the Contractor; (3) any entity that controls, is controlled by or is under common control with the Contractor; or (4) any entity that controls, is controlled by, or is under common control with any entity that is part of the Contractor.

13. LIQUIDATED DAMAGES

Time is of the essence under this Contract. The Contractor acknowledges that the County is engaging the Contractor to provide an extensive level of preconstruction support services so as to minimize the potential for cost overruns, schedule delays or the need for extensive value engineering/re-design late in the Project and that the reports required during Preconstruction under this Agreement are key to realizing the value of such services. If the Contractor fails to deliver any of the reports required, the Contractor shall be subject to liquidated damages in an amount of \$957.00 per day after receiving written notice from the Project Officer of failure to submit such report. A list of such deliverables is included in Attachment A to the Agreement.

If contracted, the Construction Services 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

\$957.00 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 \$957.00 per day for each day beyond the time for Substantial Completion that the County determines Substantial Completion has not been 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 \$957.00 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 \$957.00 per day for each 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.

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 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 any subcontractor, or for the Contractor, which is to be used in the performance of the Contract. Upon County's request, the Contractor shall provide a bill of sale stating that the County is the owner of the materials and equipment purchased by the Contractor under this Contract.

16. 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, national origin, age or 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.

17. 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.

18. 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 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.

19. REPLACEMENT OF PERSONNEL AND SUBCONTRACTORS

The County has the right reasonably to 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 and its subcontractors' employees is the sole responsibility of the Contractor.

The Contractor may not replace key personnel or subcontractors identified in the Agreement without the County's written approval. The Contractor must submit any request to remove or replace key personnel or subcontractors to the County Project Officer at least 15 calendar days in advance of the proposed action. The request must contain a detailed justification, including identification of the proposed replacement and his or her qualifications.

If the approved Project Manager must be absent for an extended period, the Contractor must provide an interim Project Manager, subject to the County's written approval.

If the approved Project Manager resigns or is terminated by the Contractor, the Contractor will replace the Project Manager with an individual with similar qualifications and experience, subject to the County's written approval.

20. FAILURE TO DELIVER

If the Contractor fails to deliver the Work in accordance with the Contract terms and conditions, the County, after notice to the Contractor, may procure the Work 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.

21. 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.

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

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. 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 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.

23. 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.

The Contractor agrees to defend, indemnify, and hold harmless County from any and all damages, costs, claims, expenses, suits, losses, liabilities, or obligations of any kind including without limitation, environmental assessments, evaluations, remediations, fines, penalties, and clean-up costs which may be asserted against or imposed upon, or incurred by County arising from Contractor's discharge or disposal of any hazardous or toxic materials, trash, debris, refuse, waste or other materials ("Materials") related in any way to contractor's operations herein.

24. 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 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.

25. 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.

26. OWNERSHIP OF WORK PRODUCT

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

All work product, in any form, that results from this Contract is the 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 allow others to use the work product for any purpose other than performance of this Contract without the written consent of the County.

The work product is confidential, and the Contractor may neither release the work product nor share its contents. The Contractor will refer all inquiries regarding the status of any work product to the Project Officer or to his or her designee. At the County's request, the Contractor will deliver all work product, including hard copies of electronic files, to the Project Officer and will destroy all electronic files.

The Contractor must 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.

27. 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.

28. 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.

29. 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.

30. 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.

31. 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.

32. 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.

33. 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.

34. 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.

Whenever possible, reports 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)

35. AUDIT

The Contractor must provide to the County the complete findings and all components of an independent certified public accountant's audit of its finances and program operation within two months after the close of Contractor's fiscal year. If a management letter was not prepared with the audit, the Contractor must so certify in writing as part of the audit report to the County. The Contractor must allow the County to review its records as the County deems necessary for audit purposes within 15 calendar days of the County's receipt of the findings. All accounts of the Contractor are subject to audit.

The Contractor must retain all books, records and other documents related to this Contract for at least five years, 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 years after the final payment, 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.

36. 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.

37. AMENDMENTS

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

38. 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.

39. 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 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.

40. 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.

41. ARBITRATION

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

42. 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.

43. 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.

44. 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.

45. 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.

46. 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.

47. 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.

48. 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.

49. NOTICES

Unless otherwise provided in writing, all legal notices and other 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:

Joseph Khoury, LEED-AP, BD+C
MCN Build, Inc.
1214 28th Street NW
Washington, DC 20007
Email: joseph@mcnbuild.com

TO THE COUNTY:

Richard Pinsky, Project Officer
1400 N. Uhle Street, Suite 403
Arlington, VA 22201
Email: Rpinsky@arlingtonva.us

AND

Sharon T. Lewis, Purchasing Agent
Arlington County, Virginia
2100 Clarendon Boulevard, Suite 500
Arlington, Virginia 22201
Email: SLewis1@arlingtonva.us

50. NON-DISCRIMINATION NOTICE

Arlington County does not discriminate against faith-based organizations.

51. INSURANCE, PAYMENT AND PERFORMANCE BONDS

As a condition of executing the GMP Amendment, the Contractor will be required to furnish payment and performance bonds for 100% of the amount of the GMP. The Contractor shall maintain the required insurance coverage and payment and performance bonds through completion of the Contract, including all warranty and guarantee periods.

52. 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:

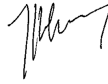
**THE COUNTY BOARD OF ARLINGTON
COUNTY, VIRGINIA**

AUTHORIZED
SIGNATURE: Sharon Lewis

NAME AND TITLE: SHARON T. LEWIS
PURCHASING AGENT

DATE: 11/8/2019

MCN BUILD, INC.

AUTHORIZED
SIGNATURE: 

NAME AND TITLE: Joseph Khoury, EVP of Preconstruction

DATE: 11/5/2019

EXHIBIT A
SCOPE OF SERVICES

A1. GENERAL INTENT

A1.1 Contractor's Duties. The Contractor's work shall be divided into two phases: (i) the Preconstruction Phase; and (ii) the Construction Phase. For both phases this work will include the permanent Fire Station 8 – Re-built Project (FS8R) and the Temporary Fire Station Project (FS8T). The Temporary Fire Station Project will consist of two main components. The First Component is 1) Dormitory Living and Work Facility and 2) Temporary Apparatus Bay Facility. The Dormitory Living and Work Facility will renovate the existing residential structure located at 2217 N. Culpeper Street (2217), Arlington VA 22207 to house the staff offices, dayroom and sleeping quarters and a new Temporary Apparatus Bay Facility located 2211 N. Culpeper Street (2211) and 2215 N. Culpeper Street (2215). The type of structure for the new Temporary Apparatus Bay Facility is yet to be determined but options include but are not limited to a frame supported membrane or a pre-manufactured metal building. The existing 2217 facility is approximately 3,500 SF +/- for the office/dayroom/sleeping quarters [two (2) stories + basement areas] and a new 1,700 SF +/- structure for the Temporary Apparatus Bay Facility (one (1) story on grade). The Project will require associated site work to include parking & new fuel island as well accommodations for compliance with accessibility guidelines.

Phase 1: Preconstruction Phase. During the Preconstruction Phase, the Contractor will be required to work with the County and the Architect (i) to advance the design for the Project in a manner consistent with the budget available for hard costs, construction management fees and general conditions (Design-to-Budget), and the schedule, programmatic and other requirements for the Project; and (ii) to develop a guaranteed maximum price ("GMP") proposal based on the Permit/GMP Set.

Phase 2: Construction Phase. If the County accepts the GMP proposals in the form of an amendment to the Contract, the Contractor shall provide all of the labor, materials, supervision, equipment and other services necessary to raze the existing Fire Station No. 8 and construct the approved design of the new permanent Fire Station 8 – Re-built Project (FS8R) and the Temporary Fire Station Project (FS8T), including performing all hazardous materials abatement and selective and bulk demolition necessary, in accordance with the Contract Documents, no later the end of the period of performance for Substantial Completion.

A1.2 Cost Plus Fixed Fee with Incentive Type Contract. It is the intent of the parties to establish each Guaranteed Maximum Price contract with certain incentives. As such, only those costs outlined in Section A5.1.1 shall be reimbursable as a Cost of the Work. It is understood that the cost of all items not included in the Cost of the Work shall be included in the Construction Management Fee, and the General Conditions Fee. The GMP's for both the Temporary Fire Station and Permanent Fire Station shall be developed as set forth in Article A3 herein.

A2. PRECONSTRUCTION PHASE SCOPE OF WORK

A2.1 Preconstruction Phase Scope of Work. During the Preconstruction Phase, the Contractor shall work with each Architect to develop a design for the Project. The County's objective is to develop a design for the Project that meets its programmatic needs, that is consistent with the Design-to-Budget and other requirements for the Project, and that can be constructed prior to the end of the Time for Completion. During the course of the Preconstruction Phase, the Contractor shall meet regularly with the County and their Architects. Each Architect will make interim submissions of the design in order for the County to review and provide input regarding the design. Such interim submissions shall also serve as the basis for periodic cost estimates and opportunities to review the design for constructability and schedule implications by the Contractor. In addition, the Contractor shall engage in value engineering as well as the other services detailed below.

A2.2 Baseline Schedule. Within 14 days after Preconstruction Notice to Proceed (NTP), the Contractor shall prepare and submit a baseline schedule for the Project (the "Baseline Schedule"). The Baseline Schedule shall be subject to review and approval by the Project Officer, and the Contractor shall incorporate any adjustments to the Baseline Schedule as may be reasonably requested by the Project Officer. The Baseline Schedule shall be prepared in a critical path method and be developed in a sufficient level of detail so as to permit the County, the Architect and the Contractor to properly plan the Project, and shall show: (i) key design milestones and bid packages; (ii) release dates for long lead items; (iii) release dates for key subcontractors; and (iv) substantial and final completion dates. The preliminary schedule must also be submitted in MS Project in native format and as a pdf and shall be updated by the Contractor, at a minimum, on a bi-weekly basis.

A2.6 Active Collaboration. The Contractor shall meet with each Architect at least twice a month to review and discuss the design for the Project and the status of their design efforts. Representatives from the County shall be invited to attend such meetings. The Architects will distribute meeting minutes associated with such meetings no later than three (3) business days after the conclusion of each such meeting.

A2.7 Schematic Design Review and Budget Estimate. Following the Architect's submission of the schematic design, while the schematic design submission is under review by the County, the Contractor shall also update the Preliminary Budget Estimate based on the schematic design submission (the "Schematic Design Budget Estimate"). The Schematic Design Budget Estimate shall be prepared in a format similar to the Preliminary Budget Estimate and shall show variances from the Preliminary Budget Estimate. The Schematic Design Budget Estimate shall be submitted within two (2) weeks of the submission of the initial schematic design submission. The Contractor shall attend a comment review meeting with the Project Officer and the Architect to review, discuss and resolve issues related to the schematic design documents. To the extent the Project Officer directs any changes to the initial schematic design, the Contractor shall update the Schematic Design Budget Estimate to reflect such changes in order that the updated Schematic Design Budget Estimate reflects the approved schematic design. (Applies to the Temporary Fire Station Project (FS8T) only. For the permanent Fire Station 8 – Re-built Project (FS8R), the schematic budget estimate is by others (LEWA) and shall be provided to the Contractor following the Notice to Proceed (NTP).

A2.9 Value Engineering – Schematic Design. To the extent that the Schematic Design Budget Estimate exceeds the available funding, or the Contractor believes that there are value engineering ideas that could materially reduce the Project's overall cost without adversely impacting the Project's intended functionality, the Contractor shall prepare and submit a memorandum that outlines

potential value engineering ideas. Such memorandum shall be submitted to the Project Officer no later than one (1) week after the Schematic Design Budget Estimate submission. If the value engineering ideas are insufficient to return the Project to budget, the Contractor shall provide suggestions as to program scope that could be reduced, the nature of each such reduction, and the likely savings associated with each such program reduction. The Contractor shall meet with the County and the Architect as necessary to reach agreement on which, if any, of the value engineering options should be pursued. To the extent the County directs the Contractor to proceed with one or more of the value engineering options, the Contractor shall revise its Schematic Design Budget Estimate to reflect the inclusion of such items. (Applies to the Temporary Fire Station Project (FS8T) only. For permanent Fire Station 8 – Re-built Project (FS8R) the schematic budget estimate is by others (LEWA)).

A2.10 Design Development Review – Design Development. The Architect will produce a set of design development documents and shall conduct an on-board progress review meeting with the County and Contractor to review the design and obtain feedback and input regarding its direction when such documents are approximately 90% complete. The Contractor shall conduct an “over the shoulder” review of such documents with the Architect. Within one (1) week after completing this review, the Contractor shall prepare and submit to the Project Officer a memorandum that outlines the results of the “over the shoulder” review. Such memorandum shall identify items of concern to the Contractor that represent departures from the approved scope of the schematic design or that could otherwise adversely impact the Project’s budget or schedule. (Applies to both the Temporary Fire Station Project (FS8T) and the permanent Fire Station 8 – Re-built Project (FS8R)).

A2.11 GMP Basis Document & Construction Administration Memorandum. During the Design Development Phase, the Contractor and the Architect shall meet and confer with the Project Officer as necessary regarding the level of detail required by the Contractor in the Permit/GMP Set in order to provide a GMP to the County without excessive contingencies due to lack of information. The parties shall agree upon the number of trade subcontractor bid packages that will be required and the specific contents of each. This deliverable shall be coordinated with the Contractor’s purchasing strategy for the trade subcontracts and shall be consistent with the then approved Project Baseline Schedule. In addition, the Architect, the County and the Contractor shall discuss the manner in which construction administration services shall be handled (the “Construction Administration Plan”). The Construction Administration Plan shall specifically address: (i) whether the Architect will be required to assign staff on-site; (ii) turn-around time for submittals; and (iii) such other matters as the Architect and the Contractor consider relevant to the orderly administration of the Project. The level of detail required in the Permit/GMP Set and the Construction Administration Plan shall be memorialized in a memorandum signed by the Architect and the Contractor (the “GMP Basis Document & CA Memo”) and must be submitted for approval by the Project Officer within 30 days from completion of the Schematic Design. (Applies to both the Temporary Fire Station Project (FS8T) and permanent Fire Station 8 – Re-built Project (FS8R)).

A2.12 Design Development Review and Budget Estimate. Following the Architect’s submission of the design development documents while the design development submission is under review by the County, the Contractor shall review the Schematic Design Budget Estimate based and prepare a detailed “(Design Development Budget Estimate)”. The Design Development Budget Estimate shall be prepared CSI format and shall show variances from the Schematic Design Budget Estimate. The Design Development Budget Estimate shall be submitted within two (2) weeks of the Architect’s submission of the initial design development documents. The Contractor shall attend a comment review meeting with the Project Officer and the Architect to review, discuss and resolve issues related to the design development documents. To the extent the Project Officer directs any changes to the design

development submission, the Contractor shall update the Design Development Budget Estimate to reflect such changes in order that the updated Design Development Budget Estimate reflects the approved design development documents. (Applies to both the Temporary Fire Station Project (FS8T) and permanent Fire Station 8 – Re-built Project (FS8R))

A.2.13 Updated Constructability/Single Manufacturer/Long-Lead Time Memorandum – Design Development. Concurrently with the Design Development Budget Estimate, the Contractor shall update the memorandum identifying key construction concerns related to the Project. Such memorandum shall: (i) assess the constructability issues related to the Project, including site logistics; identify any items where the design is predicated on a single manufacturer and, if so, identify at least two (2) comparable products; and (iii) identify any long-lead delivery items that could adversely affect the Baseline Schedule. To the extent any such long-lead items are identified, the memorandum shall make recommendations for addressing such items. (Applies to both the Temporary Fire Station Project (FS8T) and permanent Fire Station 8 – Re-built Project (FS8R)).

A2.14 Value Engineering – Design Development. To the extent that the Design Development Budget Estimate exceeds the available funding, or the Contractor believes that there are value engineering ideas that could materially reduce the Project’s overall cost without adversely impacting the Project’s intended functionality, the Contractor shall prepare and submit a memorandum that outlines potential value engineering ideas. Such memorandum shall be submitted to the Project Officer no later than one (1) week after the Design Development Budget Estimate submission. If the value engineering ideas are insufficient to return the Project to budget, the Contractor shall provide suggestions as to program scope that could be reduced, the nature of each such reduction, and the likely savings associated with each such program reduction. The Contractor shall meet with the County and the Architect as necessary to reach agreement on which, if any, of the value engineering options should be pursued. To the extent the County directs the Contractor to proceed with one or more of the value engineering options, the Contractor shall revise its Design Development Budget Estimate to reflect the inclusion of such items. (Applies to both the Temporary Fire Station Project (FS8T) and permanent Fire Station 8 – Re-built Project (FS8R)).

A2.15 Mid-Point Construction Document Review – Construction Documents. The Architect will prepare a set of construction documents based on the approved design development documents and any approved value engineering. The Contractor shall conduct an “over the shoulder” review with the Architect when the construction documents are approximately 50% complete. Representatives from the County shall be invited to participate in the “over the shoulder” review. Within one (1) week after completing this review, the Contractor shall prepare and submit to the Project Officer a memorandum that outlines the results of the “over the shoulder” review. Such memorandum shall identify items of concern to the Contractor that represent departures from the approved scope of the design development documents or that could otherwise adversely impact the Project’s budget or schedule. The Contractor shall also attempt to identify any conflicts or discrepancies between packages being prepared by other disciplines that are likely to have significant cost or schedule impact. Such “over the shoulder” reviews may need to be conducted more than once if multiple bid packages are required or if the design effort of the various disciplines are advanced at different rates (Applies to both the Temporary Fire Station Project (FS8T) and permanent Fire Station 8 – Re-built Project (FS8R)).

A2.16 Permit/GMP Set. The Architect shall produce a progress set of Construction Documents to be used for permitting as well as for the development of the GMP by the Contractor (such progress set, the “Permit/GMP Set”) as outlined in Article A3 below. The Permit/GMP Set shall be code compliant and permit ready and contain the level of detail established in the GMP Basis Document &

CA Memo. (Applies to both the Temporary Fire Station Project (FS8T) and permanent Fire Station 8 – Re-built Project (FS8R)).

A2.17 Completion of Construction Documents. Following the negotiation of the GMP for the Project and the receipt of comments from the permit review process, the Architect shall complete the Construction Documents. The Architect shall conduct an on-board design review meeting with the County and the Contractor two (2) weeks prior to submission of the final Construction Documents to the County. The Contractor shall review such set to ensure that any comments received from the permit review process as well as any value engineering strategies or other design changes that result from the GMP negotiations with the Contractor are incorporated into the construction documents.

A3. GMP FORMATION

A3.1 GMP Development. The Contractor will provide the County with a GMP Proposal based on the Permit/GMP Set. The Contractor will provide a GMP for the Temporary Station and a second GMP for the Permanent Fire Station, respectively, as defined above, and each GMP proposal shall be based on competitive trade subcontractor bids. Each GMP Proposal shall be developed as outlined in this Article A3 and applies to GMP for Temporary Fire Station Project (FS8T) and to GMP for the permanent Fire Station 8 – Re-built Project (FS8R).

A3.2 Guaranteed Maximum Price Components. The Guaranteed Maximum Price is comprised of the maximum amount payable by the County for:

- A.** the Cost of the Work for full and complete performance of the Work in strict accordance with the Contract Documents;
- B.** a Construction Management Fee for the Contractor; and
- C.** a General Conditions Fee.

(Applies to both the Temporary Fire Station Project (FS8T) and permanent Fire Station 8 – Re-built Project (FS8R)).

A3.3 Bidders List Development. Within 45 days after completion of Schematic Design, the Contractor shall submit to the Project Officer for its review and approval a written submission on the proposed subcontractor bidding procedures. These procedures shall include: (i) a list of proposed trade packages; (ii) a list of trade subcontractors that will be invited to bid on each such package; and a narrative description of the process. The work shall be awarded to the lowest responsive and responsible bidder, unless agreed by the County otherwise in advance. At least three (3) potential subcontractors shall be identified for each trade package. (Applies to both the Temporary Fire Station Project (FS8T) and permanent Fire Station 8 – Re-built Project (FS8R)).

A3.4 Management of the Bidding Process. The Contractor shall manage the trade bidding process in accordance with the approved bidding procedures and shall use commercially reasonable best efforts to obtain at least three (3) qualified and bona fide bids for each trade package in excess of \$100,000. The Contractor shall carefully document its procedures for making available bid packages to potential bidders, the contents of each bid package, discussions with bidders at any pre-bid meetings, bidders' compliance with bid requirements, all bids received, the Contractor's evaluations of all bids, and the basis for the Contractor's recommendation as to which bidders should be chosen.

The County shall be afforded access to all such records at all reasonable times so that, among other things, it may independently confirm the Contractor's adherence to all Contract requirements. (Applies to both the Temporary Fire Station Project (FS8T) and permanent Fire Station 8 – Re-built Project (FS8R)).

A3.5 Bid Tabs Preparation. The Contractor shall provide the Project Officer with an analysis of the bids received as well as a copy of each such bid. To the extent that the Contractor's award recommendation is based on scoping adjustments to the bids of the subcontractors, the Contractor shall clearly identify the scoping adjustment and the need for such adjustments. In general, the bid tab shall be presented in tabular format that compares the bids received and any other relevant information (i.e. exclusions, past performance history, etc.) and provide the basis for the Contractor's recommendation. (Applies to both the Temporary Fire Station Project (FS8T) and permanent Fire Station 8 – Re-built Project (FS8R)).

A3.6 Value Engineering. To the extent that the trade bids received by the Contractor indicate that the costs of constructing the Project will exceed the established budget, the Contractor shall work with the Architect to develop value engineering strategies in an effort to return the costs of constructing the Project to budget. The Contractor shall meet with the Architect and the County to review such strategies. Upon any approval by the Project Officer of any such value engineering strategies, the Contractor shall obtain revised pricing based on such approved value engineering strategies. The Contractor shall update the bid tabulations to reflect the value engineered costs and submit such updated bid tabulations to the Project Officer. (Applies to both the Temporary Fire Station Project (FS8T) and permanent Fire Station 8 – Re-built Project (FS8R)).

A3.7 Submission of GMP Proposal. Based on the trade bids received, the Contractor shall develop and submit a GMP Proposal. The GMP Proposal shall include the following elements:

- D. A list of Drawings, Specifications, addenda; and General, Supplementary and other Conditions on which the Guaranteed Maximum Price is based.
- E. A list of Unit Prices and Allowance items as well as a statement of their basis.
- F. A list of any assumptions and clarifications made in preparing the GMP, noting in particular any exclusions. The assumptions and clarifications shall take precedence over the drawings and specifications. The Contractor shall prepare a separate memorandum that highlights any differences between the then approved drawings and the modifications made in the assumptions and clarifications. Such memorandum shall specifically address any changes in the Project's aesthetics, functionality or performance.
- G. The proposed GMP, including a statement of the detailed cost estimate organized by trade categories, Allowances, Contractor's Contingency, and other items and the fee that comprise the GMP.
- H. An update to the Project's Baseline Schedule to which the Contractor will agree to be bound. This update shall be prepared in the same level of detail and in the same manner as the Baseline Schedule.
(Applies to both the Temporary Fire Station Project (FS8T) and permanent Fire Station 8 – Re-built Project (FS8R)).

A.3.8 Negotiation of GMP. The County and the Contractor shall meet to negotiate the terms of the GMP Proposal. Unless the County accepts the GMP Proposal in writing and so notifies the Contractor, the GMP Proposal shall not be deemed accepted by the County. The GMP shall be subject to review and approval by the County Board and shall not be effective until so approved. If accepted, the GMP shall be memorialized in the form of the amendment attached hereto as Attachment D (Form of GMP Amendment). (Applies to both the Temporary Fire Station Project (FS8T) and permanent Fire Station 8 – Re-built Project (FS8R)).

A.3.9 Failure to Execute GMP Amendment. In the event the County and the Contractor are unable to agree on a GMP for the Project, the Contractor shall forfeit one half of the Cost of Preconstruction Services. In the event the County elects not to proceed with construction of the Project for reasons other than failure to agree upon a GMP, the Contractor shall be paid the full amount of the Cost of Preconstruction Services provided all Preconstruction services have been timely and adequately performed. (Applies to both the Temporary Fire Station Project (FS8T) and permanent Fire Station 8 – Re-built Project (FS8R)).

A4. CONSTRUCTION PHASE SCOPE OF WORK

A.4.1 Construction Phase. Construction Phase of the Project shall commence upon execution by the County of the GMP Amendment, and the executed GMP Amendment shall serve as Notice to Proceed with the Construction Phase. (Applies to both the Temporary Fire Station Project (FS8T) and permanent Fire Station 8 – Re-built Project (FS8R)).

A.4.2 On Site Management. The Contractor shall provide on-site management and superintendence during all working hours. (Applies to both the Temporary Fire Station Project (FS8T) and permanent Fire Station 8 – Re-built Project (FS8R)).

A.4.2.1 Site Office. Throughout the Project, the Contractor shall provide and maintain a fully-equipped construction office on the Project site.

A.4.2.2 Supervision. Throughout the Project, the construction office shall be manned by personnel competent to oversee the work at all times while construction is underway. Such personnel shall maintain full-time, on-site construction supervision and provide daily inspections, quality control, monitoring, coordination of various trades, record drawings, and daily work log.

A.4.2.3 Bi-Weekly Progress Meetings. Throughout the Project, the Contractor shall conduct bi-weekly progress meetings following a Contractor-generated agenda with the County and key trade subcontractors. The Contractor shall draft and circulate meeting minutes within five (5) business days of such meetings.

A.4.3 Abatement & Raze. The Project includes the abatement and removal of any and all hazardous materials found within the existing building as well as razing the existing facility.

A.4.3.1 Abatement of Hazardous Materials. The County will provide to the Contractor a hazardous materials survey for the existing building prior to development of the GMP Amendment. In order to raze the existing facility, if any abatement will be required, the Contractor shall not commence any such abatement without authorization from the Project Officer. Further, the Contractor shall seek and obtain an authorization for any required abatement in a timely manner so as not to delay the Work. If any notices to governmental authorities are required, the

Contractor shall also give those notices at the appropriate times.

A4.3.2 Salvage Value. In general, the salvage value of construction material located in the existing building shall accrue to the Contractor and/or its subcontractor. However, the County shall be entitled to the value of any piece of equipment (such as chillers, computers, etc.) that remain in the existing building to the extent that such piece equipment has a salvage value of more than \$25,000.

A4.4 Site Safety Generally. The Contractor shall provide a safe and efficient site, with controlled access. As part of this obligation, the Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Project.

A4.4.1 Safety Plan. Prior to the start of construction activities, the Contractor shall prepare a safety plan for the Construction Phase conforming to OSHA 29 CFR 1926 (such plan, the "Safety Plan") and in accordance with Paragraph E.3 of Attachment C (DES Facilities Design and Construction Bureau Construction General Conditions). The Safety Plan shall be submitted to the Project Officer, and the Contractor shall incorporate such comments as the County may reasonably request. Once such plan has been approved, the Contractor shall comply with it at all times during construction.

A4.4.2 Safety Barriers/Fences. As part of its responsibility for Project safety, the Contractor shall install such fences and barriers as may be necessary to separate the construction areas of the site from adjacent areas.

A4.4.3 Site Security. The Contractor shall be responsible for site security and shall be required to provide such watchmen as are necessary to protect the site from unwanted intrusion.

A4.4.4 Exculpation. The right of the County to comment on the Safety Plan and the nature and location of the required fences and barriers shall in no way absolve the Contractor from their obligation to maintain a safe site or adhere to the Baseline Schedule.

A4.5 Workhours; Coordination with Fire Department and Community.

A4.5.1 Workhours. The Contractor shall comply with all applicable requirements regarding workhours generally, noise, and other requirements that may impose limitations regarding working hours, and neither it nor its subcontractors shall undertake work on the Project site other than at the times and sound level permitted by any applicable requirements, laws, or local ordinances.

A4.5.2 Parking. The Contractor shall organize its work in such a manner so as to minimize the impact of its operations on the surrounding community. To the extent that the number of workers on the site is likely to have an adverse impact on neighborhood parking, as determined by the County, the Contractor shall develop a parking plan for those individuals working on the site that is reasonably acceptable to the County. The delays in approving the parking plan shall in no way absolve the Contractor from their obligation to maintain a safe site or adhere to the Baseline Schedule.

A4.5.3 Wheel Washing Stations. The Contractor shall provide wheel washing stations on site so

as to prevent the accumulation of dirt and other refuse on the streets surrounding the Project site.

A4.5.4 Outreach Plan. The Contractor shall keep the County informed of the construction activities and their potential impact on the community. In addition, the Contractor shall, no later than 60 days prior to construction mobilization, submit a plan of outreach activities to the Project Officer informing the community of any impacts from the Project (the "Outreach Plan"). The Outreach Plan shall be submitted prior to its implementation and shall be subject to the County's review and approval.

A4.6 Quality Control.

A4.6.1 Quality Control Plan. Within 45 days after execution of the GMP Amendment, the Contractor shall develop a quality control plan for the Project (the "Quality Control Plan"). A draft of the Quality Control Plan shall be submitted to the Project Officer and shall be subject to the County's review and approval. The Quality Control Plan shall be tailored to the specific products/type of construction activities contemplated in the design development documents, and in general, shall include a table of contents, quality control team organization, duties/responsibilities of quality control personnel, submittal procedures, inspection procedures, deficiency correction procedures, documentation process, and a list of any other specific actions or procedures that will be required for key elements of the work.

A4.6.2 Implementation. During the Construction Phase, the Contractor shall perform regular quality control inspections and create reports based on such inspections. These quality control reports shall be provided to the Project Officer electronically on a monthly basis. The Contractor shall incorporate a quality control section in the progress meetings to discuss outstanding deficiencies, testing/inspections, and upcoming Work. The not less than monthly quality control report shall include a detailed summary of the steps that are being employed to provide quality construction and workmanship. The monthly report should specifically address issues raised during the month and outline the steps that are being used to address such issues.

A4.6.3 Corrective Action Plan. The County has the right to direct the Contractor to revise the provisions of its Quality Control Plan if, in the reasonable judgment of the County, the craftsmanship of the Work being installed fails to comply with generally applicable industry standards, requirements set forth in the Specifications that are reasonably related to the quality of craftsmanship, or any provisions set forth in the Contract Documents. In the event that the County determines that any of the events specified in the preceding sentence have occurred, the County shall provide the Contractor with written notice of such event and the Contractor shall be required to provide the County with a corrective action plan that is reasonably designed to address the concerns raised in such notice within three (3) days after receipt of such notice. If the County and the Contractor are unable to agree on the terms of such corrective action plan within five (5) days after the issuance of the notice (i.e. within 48 hours after the receipt of the proposed corrective action plan), the County shall have the right to direct such corrective action measures as the County, in its reasonable judgment, deems necessary. Such directive may include adjustments to the procedural provisions set forth in the Quality Control Plan and/or impose additional requirements on the manner in which Work is being installed. Provided the notice provisions of this Section are complied with, the cost of any such corrective action directed under this Section shall not justify an adjustment to the GMP or the period of performance for Substantial Completion.

A4.7 Final Completion & Project Close-Out. The Contractor shall achieve Final Completion of the Project, as defined in the General Conditions, within 30 days of the end of the period of performance for Substantial Completion.

A4.7.1 Punchlist. Promptly after the Project reaches Substantial Completion, the Architect shall develop a punch list. Once the punch list is prepared, the Contractor shall inspect the work along with representatives from the County. The punch list shall be revised to reflect additional work items that are discovered during such inspection. The Contractor shall correct all punch list items no later 30 days after substantial completion is achieved.

A4.7.2 Training. The Contractor shall provide training to County staff on all of the building systems. The Contractor shall be required to schedule such training sessions and shall use commercially reasonable efforts to ensure all such training occurs prior to the date of Substantial Completion.

A4.7.3 Warranties & Manuals. The Contractor shall prepare and submit the following documentation: (i) a complete set of product manuals (O&M), training videos, warranties, etc.; (ii) an equipment schedule; (iii) an equipment schedule; (iv) a proposed schedule of maintenance for the new building; (v) environmental, health and safety documents for the new building; (vi) all applicable inspection certificates/permits (boiler, elevator, emergency evacuation plans, health inspection, etc.) for the new building; and (vii) a complete set of the Contractor's Project files.

A4.7.4 Eleven Month Walk. The Contractor must schedule a joint inspection of the Project during the eleventh month after Substantial Completion is achieved. During such inspection, the Contractor and a representative of the County shall walk the Project to identify any necessary warranty work.

A4.7.5 Support for Initial Heating & Cooling Season. The Contractor and its mechanical subcontractor shall provide support to the County during system start-up and in initial operation for the first heating and cooling season after Substantial Completion is achieved.

A4.8 Administrative Matters.

A4.8.1 Monthly Report. The Contractor shall provide written reports to the Project Officer, on the progress of the entire Work at least monthly from Preconstruction NTP until Final Completion of the Project. The monthly report shall include: (i) an updated schedule analysis, including any plans to correct defective or deficient Work or recover delays; (ii) an updated cost report; (iii) a monthly review of cash flow; (iv) a quality control report; and (v) progress photos.

A4.8.2 Use of E-builder. The Contractor shall utilize E-builder for those functions directed by the Project Officer.

A5. COMPENSATION

A5.1 Other than the Construction Management Fee and the General Conditions Fee, the Contractor's sole compensation for the Work shall be reimbursement of the Cost of the Work, as defined in Section A5.1.1 herein, at cost and without mark-up of any kind. The County shall have no obligation to reimburse the Contractor for Cost of the Work that together with the Construction Management Fee and the General Conditions Fee exceed the GMP established in the GMP

Amendment.

A5.1.1 Cost of the Work. The Cost of the Work consists of the following, which shall be reimbursable at cost and without mark-up of any kind:

1. Payments made by the Contractor to subcontractors and suppliers, but only in accordance with the subcontracts and supply agreements;
2. All amounts due to the Contractor under the terms of the County's written authorization for the Contractor to perform any portion of the Work as self-performed work. If an authorization for the Contractor to engage in self-performed work is not on a fixed-price basis, then, as to that Work, the following costs shall be within the Cost of the Work:
 - a. **Labor.** Properly documented wages actually paid to Project foremen, construction workers, and other personnel in the direct employ of the Contractor, while engaged in approved self-performed work, together with contributions, assessments, payroll taxes, or fringe benefits required by law or applicable collective bargaining agreements.
 - b. **Incorporated Materials.** The cost, net of trade discounts, of all materials, products, supplies and equipment incorporated into the self-performed work, including, without limitation, costs of transportation and handling.
 - c. **Unincorporated Materials.** The cost of materials, products, supplies and equipment not actually installed or incorporated into the self-performed work, but required to provide a reasonable allowance for waste or spoilage, subject to the Contractor's agreement to turn unused excess materials over to the County at the completion of the Project or, at the County's option, to sell the material and pay the proceeds to the County or give the County a credit in the amount of the proceeds against the Cost of the Work.
3. Royalty and license fees paid for use of a design, process or product, if its use is required by this Contract or has been approved in advance by the County;
4. Fees for obtaining all required approvals or permits associated with the abatement, demolition, utilities abandonment, and utility relocation, as well as all trade permit and the building permit fee;
5. All fees and other costs necessarily incurred to carry out testing and inspections required by the Contract or applicable laws, or otherwise to maintain proper quality assurance. The costs the Contractor incurs to schedule and coordinate any additional testing and inspections the County may require shall be reimbursable unless the additional testing establishes that the Work tested was defective or otherwise failed to satisfy contract requirements, in which case the Contractor shall pay the costs, without reimbursement;
6. All bonds to jurisdictional agencies (utilities, storm water management, land disturbance, and grading); and
7. All performance and payment bonds and general liability insurance attributable to the

Project.

A5.1.2 Non-Reimbursable Costs. The following are some, but not all of, the costs that shall not be reimbursable:

- 1. General Conditions Costs.** The Contractor's general condition costs, including, but not limited to, the following, shall be included in the General Conditions Fee:
 - A.** The cost of Construction Staff. The term Construction Staff shall mean the Project Executive, project managers and superintendents assigned to the project, administrative staff assigned on a full-time basis to the Project site, and professional staff performing scheduling, cost estimating and accounting services;
 - B.** Fringe Benefits associated with Construction Staff;
 - C.** Payroll taxes and payroll insurance associated with Construction Staff;
 - D.** Staff costs associated with obtaining permits and approvals;
 - E.** Out-of-house consultants;
 - F.** The field office for the Contractor including but not limited to: (i) trailer purchase and/or rent; (ii) field office installation, relocation and removal; (iii) utility connections and charges during the Construction Services Phase; (iv) furniture; (v) office supplies; Office equipment including, but not limited to: (i) computer hardware and software; (ii) fax machines; (iii) copying machines; (iv) telephone installation, system and use charges; (v) job radios;
 - G.** Local delivery and overnight delivery costs; and
 - H.** First aid facility.
- 2.** Fees for any permits or licenses the Contractor requires to conduct its general business operations.
- 3.** Capital expenses and interest on capital employed for the Work.
- 4.** The cost of home or regional offices, it being understood that compensation for such costs is included in the Construction Management Fee.
- 5.** Sales or use taxes.
- 6.** Costs due to the errors or omissions of the Contractor or its subcontractors or suppliers at all tiers, negligent or otherwise.
- 7.** Costs due to breach of Contract by the Contractor or its subcontractors or material suppliers at all tiers, including, without limitation, costs arising from defective or damaged Work or its correction, disposal of materials or equipment erroneously supplied, and repairs

to property damaged by the Contractor or its subcontractors or material suppliers at all tiers.

8. Any costs incurred in performing work of any kind before Notice to Proceed, unless specifically authorized by the County.

A5.1.3 Cost of Preconstruction Services. The Cost of Preconstruction Services shall be paid at the conclusion of the Preconstruction Phase, which shall not be deemed complete unless and until the GMP Amendment is executed by the parties. In the event a GMP Amendment is not executed, the terms of Paragraph A3.8 of this Attachment A (Scope of Services) shall apply.

A5.1.4 General Conditions Fee. The Contractor's General Conditions Fee shall be paid in equal monthly installments over the period of performance for Substantial Completion and shall be subject to retainage as outlined in the Agreement. The General Conditions Fee shall not be increased or decreased as a result of Change Orders or Change Directive unless such Changes (i) extend the period of performance for Substantial Completion; and (ii) the Contractor can demonstrate to the satisfaction of the County that such additional Cost of General Conditions are reasonable, necessary, and not due to any fault of the Contractor, its Subcontractors, materialmen, consultants or anyone making claims thereunder.

A5.1.5 Construction Management Fee. The Contractor's Construction Management Fee shall be as set forth in Attachment B (Contractor's Pricing), and 10% of the Construction Management Fee shall be allocated to the Preconstruction Phase of the Project (such amount, the "Cost of Preconstruction Services"). The Contractor acknowledges and agrees that 40% of the Construction Management Fee (the "At Risk Portion") is at risk.

A5.1.5.1 At Risk Portion of Construction Management Fee.

1. If the County and the Contractor agree upon a GMP that is equal to or less than the Design-to-Budget amount that was established by the County after the Contractor's first budget estimate thirty days after the receipt of the GMP set., the Contractor shall earn 25% of the At-Risk Portion of the Construction Management Fee. In the event this milestone is achieved, then this portion of the At-Risk Portion shall be paid on a monthly basis in equal installments over the then-remaining life of the Project through Substantial Completion.
2. If the Contractor achieves Substantial Completion of the Project on or before the period of performance for Substantial Completion established in this Agreement and without regard to any modifications to such date that may be made in the GMP Amendment or thereafter, the Contractor shall earn 25% of the At-Risk Portion of the Construction Management Fee. The Contractor shall lose entitlement to such portion of the Construction Management Fee even if Substantial Completion is not achieved due to the fault of the Contractor, the Architect, the Code Official, events of force majeure or otherwise. In the event this milestone is achieved, then this portion of the At-Risk Portion shall be paid in the first progress payment that is due after Substantial Completion of the Project occurs.
3. The Contractor shall be eligible to earn up to 25% of the At Risk Portion of the Construction Management Fee based on the level of design quality that is incorporated in the GMP when measured relative to the original design intent desired by the County

(as such design intent was reflected in the concept design in terms of aesthetics, function and program elements) and the level of funding allocated to the Project (such amount the "Design Quality Incentive"). The portion of the Design Quality Incentive to which the Contractor shall be entitled shall be determined by the Project Officer based on his/her reasonable assessment of the extent to which the Contractor was able to incorporate the design intent in light of the level of funding allocated to the Project and then current market conditions. The Project Officer shall consider and discuss in good faith any comments provided by the Contractor with regard to the proposed determination. In the event the Project Officer and the Contractor cannot agree on the appropriate allocation of the Design Quality Incentive, the Project Officer's determination shall prevail. Any portion of the Design Quality Incentive to which the Project Officer determines that the Contractor is entitled shall be paid in equal monthly installments over the then-remaining life of the Project through Substantial Completion.

4. The Contractor shall be eligible to earn up to 25% of the At-Risk Portion of the Construction Management Fee based on the level of construction quality of the Project as (such amount the "Construction Quality Incentive"). Upon Final Completion of the Project, the portion of the Construction Quality Incentive to which the Contractor shall be entitled will be determined by the Project Officer based on his/her reasonable assessment of quality of the workmanship exhibited by the Work. The Project Officer shall share his/her proposed determination regarding the quality of the work with the Contractor. The Project Officer shall consider and discuss in good faith any comments provided by the Contractor with regard to the proposed determination. In the event the Project Officer and the Contractor cannot agree on the appropriate allocation of the Construction Quality Incentive, the Project Officer's determination shall prevail. At a minimum, the Project Officer's obligation to consult with the Contractor shall include the obligation to walk the Project with Contractor and, if the Contractor so desires, an independent construction professional engaged by the Contractor. Any portion of the Construction Quality Incentive to which the Project Officer determines that the Contractor is entitled shall be paid in the first progress payment that is due after Final Completion of the Project occurs.

In making the determinations set forth in this subparagraph 4 and subparagraph 3 above, the Project Officer shall award 100% of the available incentive if the Project Officer determines that the Contractor's efforts were very good or better, at least 67% of the available incentive if the Project Officer determines that the Contractor's efforts were good, at least 33% of the available incentive if the Project Officer determines that the Contractor's efforts were fair.

A5.1.5.2 Not At Risk Portion of Construction Management Fee. The Not At Risk portion of the Construction Management Fee is the 50% of the Construction Management Fee remaining after deduction of the Preconstruction Services Fee and the At Risk portion of the Construction Management Fee. The Not At Risk portion of Construction Management Fee will be paid proportionately with the progress of construction pursuant to Progress Payments paragraph.

A5.1.5.3 Changes to the Construction Management Fee. The Construction Management Fee shall not be increased or decreased as a result of Change Orders or Change Directives unless such Changes (i) extend the period of performance for Substantial Completion from that contemplated in the GMP Amendment; or (ii) the County makes additions to the scope

provided for in the GMP Amendment that either individually or in the aggregate cause the GMP to exceed the Project Budget by more than ten percent (10%).

A5.1.6 Progress Payments. The Contractor shall be paid its compensation in a series of progress payments and a final payment, for Work completed in accordance with the Contract, and for which proper Applications for Payment have been submitted and approved. The amount of each progress payment shall be as follows:

The Costs of Work Completed to Date			
Plus	(Cost of Work for Pay Period / Current approved estimated Cost of Work through completion)	x	(Not At-Risk Portion of the Construction Management Fee)
Plus	Any subset of the At-Risk Portion of the Construction Management Fee to which the County has determined the Contractor to be entitled		
Plus	the applicable portion of General Conditions Fee		
Minus	Applicable Retainage		
Minus	Amounts previously paid by the County		

In the event the Project schedule has been extended, the monthly portions of the General Conditions Fee and the Not At Risk Construction Management Fee will be recalculated so the then remaining unpaid portion of both fees are spread evenly over the then-remaining duration of the Construction Phase.

A6. DIVERSION OF KEY PERSONNEL

A6.1 Identification of Key Personnel. The following individuals shall be considered Key Personnel: (i) the Project Executive; (ii) the Preconstruction Services Manager; (iii) the lead Superintendent; (iv) the Project Manager(s) who will supervise the interior design, MEP, structural work, and the park and exterior improvements; and (vii) the Quality Control Manager. It is understood that in certain cases one individual may serve in more than one role and that the role of the Preconstruction Services Manager ends once the GMP has been negotiated and at that point the Preconstruction Services Manager shall cease to become Key Personnel.

A6.2 Liquidated Damages. If the Contractor removes or reassigns one of the Key Personnel (excluding, however, instances where such personnel become unavailable due to death, disability, or employee’s voluntary separation from the employment of the Contractor or any affiliate of the Contractor) the Contractor shall pay to the County the lump sum of \$ 25,000.00 as liquidated damages, to include instances when the County requests that a Key Personnel be removed for unsatisfactory performance. In addition, the County shall have the right, to be exercised in its sole discretion, to remove, replace or to reduce the scope of services of the Contractor in the event that a member of the Key Personnel has been removed or replaced by the Contractor.

The Contractor must submit any request to remove or replace Key Personnel to the County Project Officer at least 15 calendar days in advance of the proposed action. The request must contain a detailed justification, including identification of the proposed replacement and his or her qualifications.

If any of the Key Personnel must be absent for an extended period, the Contractor must provide an interim Key Personnel, subject to the County's written approval. If any of the approved Key Personnel resigns or is terminated by the Contractor, the Contractor will replace those Key Personnel with an individual with similar qualifications and experience, subject to the County's written approval.

The Key Personnel are identified below:

1. Project Executive – Bassem Boustany
2. Preconstruction Services Manager – Matt Byrne
3. Lead Superintendent – Ali Baires & Delvechio Cuthbertson
4. Project Manager(s) – Tom Nesmith & Edwin Liang
5. Quality Control Manager – Not listed
6. Cost Estimator – Walid Salhab

A7. DELIVERABLES (Applicable to both the Temporary Fire Station and the Permanent Fire Station, as outlined above)

A7.1 Preconstruction Deliverables

1. Concept Estimates (Section A2.1)
2. Baseline Project Schedule (Section A2.2)
3. Preliminary Budget Estimate (Section A2.3)
4. Value Engineering Memorandum – Concept Design (Section A2.4)
5. Constructability/Sole Source/Long-Lead Time Memorandum (Section A2.5)
6. Schematic Design Budget Estimate (Section A2.7)
7. Updated Constructability/Sole Source/Long-Lead Time Memorandum (Section A2.8)
8. Value Engineering Options (Section A2.9)
9. Memorandum on 50% Design Development Over the Shoulder Design Review (Section A2.10)
10. Construction Administration Plan (Section A2.11)
11. Design Development Budget Estimate (Section A2.12)
12. Updated Constructability/Sole Source/ Long-Lead Time Memorandum Design Development Constructability/Sole Source/Long Lead Time Memorandum (Section A2.13)
13. Design Development Value Engineering Options (Section A2.14)
14. Memorandum on 50% Construction Document Packages Over the Shoulder Design Review (Section A2.15)

A7.2 GMP Formation Deliverables

1. Bidders List (Section A3.3)
2. Bid Tabulation (Section A3.5)
3. Value Engineering Update (Section A3.6)
4. GMP Proposal (Section A3.7)

A7.3 Construction Phase Deliverables

1. Bi-Weekly Progress Meeting Minutes (Section A4.2.3)
2. Safety Plan (Section A4.4.1)
3. Outreach Plan (Section A4.5.4)
4. Quality Control Plan (Section A4.6.1)
5. Warranties and Manuals (Section A4.7.3)
6. Monthly Reports (Section A4.8.1)
7. Building systems training for County staff (Section A4.7.2)

EXHIBIT B
CONTRACTOR'S PRICING FOR PRECONSTRUCTION SERVICES

A. The Construction Management Fee is: \$ 420,000.00

The Offeror acknowledges and understands that the Construction Management Fee a firm, fixed price and other than as permitted in the Scope of Work will not be subject to further adjustment. The Offeror further acknowledges that ten percent (10%) of the Construction Management Fee shall be allocated to the Offeror's preconstruction phase scope of work. Further, the Offeror acknowledges that forty percent (40%) of the Construction Management Fee shall be at risk, and the Offeror shall only be entitled to such portion as set forth in the Scope of Work.

B. The General Conditions Fee is: \$ 1,030,000.00

The Offeror's General Conditions Fee is a firm, fixed price and consists of the following elements:

Cost of construction staff	\$ <u>940,000.00 GCs</u>
Fringe Benefits associated with field staff costs	\$ <u>Included</u>
Payroll taxes and payroll insurance associated with field staff costs	\$ <u>Included</u>
Staff costs associated with obtaining permits and approvals	\$ <u>10,000.00</u>
Out-of-house consultants*	\$ <u>16,000.00</u>
Travel, Living and Relocation expenses	\$ <u>N/A</u>
Job vehicles	\$ <u>10,000.00</u>
Field office for CM, including, but not limited to:	\$ <u>25,000.00</u>
• Trailer purchase and/or rental	
• Field office installation, relocation and removal	
• Utility connections and charges during the Construction Services phase	
• Furniture	
• Field offices for the Library and its Program Manager	
• Office supplies	
Office equipment including but not limited to:	\$ <u>12,000.00</u>
• Computer hardware and software	
• Copy machines	
• Telephone installation, system and uses charges	
Job radios	\$ <u>6,000.00</u>
Local delivery and overnight delivery costs	\$ <u>3,000.00</u>
Field computer network	\$ <u>4,500.00</u>
First aid facility	\$ <u>500.00</u>
Progress photos	\$ <u>By Staff</u>
Printing cost for drawings, bid packages, etc.	\$ <u>3,000.00</u>
Other (please itemize)	\$ <u>N/A</u>

**Out of house consultants may include: Legal, LEED assistance for MCN credits, QA/QC, expeditors, etc.*

EXHIBIT C
ARLINGTON COUNTY DES FACILITIES DESIGN AND CONSTRUCTION
CMAR CONSTRUCTION GENERAL CONDITIONS

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A. INTRODUCTION TO TERMS

- 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 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 "Final Acceptance" shall mean the date on which the County issues the final payment for the Work.
- 14) 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.
- 15) 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.
- 16) 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.
- 17) The term "Project" means the entire proposed construction to be executed as stipulated in the Contract Documents
- 18) 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.
- 19) 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.
- 20) 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. Responses to RFI's shall not be construed as authorization for a Change Order.
- 21) 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.
- 22) 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.

- 23) 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.
- 24) 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.
- 25) 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.
- 26) 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.
- 27) 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.
- 28) 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.
- 29) The term "Time for Completion" shall mean the time period set forth in the Agreement.
- 30) 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.

B. DRAWINGS, SPECIFICATIONS, RELATED DATA AND RECORDS KEEPING

1. INTENT OF THE DRAWINGS AND SPECIFICATIONS
- a. It is understood that, except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, water haulage, light power, transportation, superintendence, temporary construction of all kinds, and other services and facilities of every nature whatsoever that are necessary to execute and deliver the Work, complete and usable within the scope of the Contract with all parts in working order, and all connections properly made.

- b. The general character and scope of the Work are illustrated by the Drawings and listed in the Specifications. Any additional drawings and or other instructions deemed necessary by the Project Officer or designee will be furnished to the Contractor when required for the Work and shall be incorporated into the Contract Documents.
- c. Where “as shown”, “as indicated”, “as detailed”, or words of similar import are used, it shall be understood that direction, requirements, permission, or review of Project Officer or designee is intended unless stated otherwise. As used herein, “provide” shall be understood to mean “provide complete in place”, that is, “furnish and install.”
- d. Unless otherwise specifically noted, the word "similar" where it occurs in the Drawings, shall be interpreted in its general sense and not as meaning identical, and all details shall be worked out in relation to their locations and their connection with other parts of the Work.
- e. Materials or work described in words which, so applied, have a well- known technical, construction industry, or trade meaning, shall be held to refer to the recognized technical or trade meaning.
- f. The Contract Documents are complementary, and what is called for by any one document shall be as binding as if called for by all documents. In case of conflicting variance between the Contract Documents, the Order of Precedence stated in the Agreement shall govern. Figured dimensions on the plans shall be used; drawings shall not be scaled.

2. DISCREPANCIES AND ERRORS

If the Contractor discovers any discrepancies between the Drawings and Specifications and the site conditions or any errors or omissions in the Drawings or Specifications, the Contractor shall at once, but in no event later than three calendar days after discovery of the discrepancy or error, report them in writing to the Project Officer or designee. If the Contractor proceeds with any work that may be affected by such discrepancies, errors, or omissions, after their discovery, but before a clarification is provided, such work shall be at the Contractor's risk and expense. Issues affecting critical path activities shall be made known to the Project Officer or designee within one business day after discovery.

3. DIFFERING SITE CONDITIONS

The Contractor shall immediately, and before the conditions are further disturbed, give notice to the Project Officer of subsurface or latent physical conditions at the site which differ materially from those indicated in this Contract, or previously unknown physical conditions discovered at the site of an unusual nature and which differ materially from those ordinarily expected to be encountered at the site. Such notice shall be followed by a written notice provided within 48 hours of discovery.

The Project Officer will investigate the site conditions promptly after receiving the notice. If the conditions do materially differ to the extent that an increase or decrease would result in the Contractor's cost of the Work, or the time required for performing any part

of the Work under the contract, an equitable adjustment may be made under this clause and the Contract modified in writing accordingly.

No request by the Contractor for an adjustment to the Contract under this clause shall be allowed, unless the Contractor has given the written notice required. If the Contractor proceeds with any work that may be affected by such differing site conditions before giving notice to the Project Officer as set forth herein, such work shall be at the Contractor's sole risk and expense.

No request by the Contractor for an adjustment to the contract for differing site conditions shall be allowed if made after Final Payment under the Contract.

4. COPIES FURNISHED

Except as provided for otherwise, copies of the Drawings and Specifications reasonably necessary for the execution of the Work will be furnished to the Contractor. One electronic copy of the Contract Drawings and Specifications will be provided by the Project Officer or designee to the Contractor.

5. USE OF CADD FILES

The Contractor may request Electronic CADD files related to the Work or the Project. The CADD files will be provided by the County only if the Contractor completes the Arlington County Electronic CADD Drawing Release Form, which form is then incorporated by reference into this Contract. Use of CADD files is at the Contractor's own risk and in no way alleviates Contractor's responsibility for the Work to conform to the Plans and Specifications.

6. DOCUMENTS ON THE JOBSITE

The Contractor shall keep on the site of the Project a copy of the Drawings and Specifications updated to include all authorized revisions and RFI responses and shall at all times give the County and its authorized representatives access thereto. The Contractor shall mark up the Drawings on a daily basis in red. The drawings shall be submitted to the County at Substantial Completion as the Record marked up set.

7. OWNERSHIP OF DRAWINGS AND SPECIFICATIONS

All Drawings and Specifications and copies thereof furnished by the County are the property of the County and shall not be used on other projects. All copies of the Drawings and Specifications except the signed Contract sets shall be returned to the Project Officer or designee at Final Completion.

8. SUBMITTALS

a. The term "submittals", as used herein, shall include fabrications, erection and setting drawings, manufacturers' standard drawings, schedules, descriptive literature, catalogs, brochures, performance and test data, wiring and control diagrams, and other descriptive data pertaining to the materials and equipment as required to demonstrate compliance with the Contract requirements.

b. Unless other specified in the Specifications the Contractor shall submit for the review of the Project Officer or designee a listing of all submittals required by the

Specifications or requested by the Project Officer or designee within fifteen (15) calendar days after receipt of the Notice to Proceed. This listing shall include due dates for each required submittal, coordinated with the project schedule such that adequate time is allotted for review and potential resubmittals, fabrication and delivery without causing delay. The Contractor bears all risk for delay associated with submittals not received in a timely manner.

- c. Submittals shall be submitted in such number of copies as established in the Specifications. Each submission 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. All submittals shall be clearly labeled with the name of the project and such information as may be necessary to enable their complete review by the Project Officer or designee. Catalog plates and other similar material that cannot be so labeled conveniently shall be bound in suitable covers bearing the identifying data.
- d. Submittals shall be accompanied by all required certifications and other such supporting material and shall be submitted in sequence or groups that all related items can be checked together. When submittals cannot be checked because a submission is not complete, or because submittals on related items have not been received by the Project Officer or designee, then such submittals will be returned without action or will be held, not checked, until the missing material is received. Incomplete or defective submittals shall not be considered to have been submitted. Failure to deliver submittals within the specified time will not be grounds for additional time or compensation.
- e. Submittals shall have been reviewed by the Contractor and coordinated with all other related or affected work before they are submitted for review and acceptance and shall bear the Contractor's certification that the Contractor has checked and approved them as complying with all relevant information in the Contract Documents. Submittals submitted without such certification and coordination will be returned to the Contractor without action and will not be considered as a formal submission.
- f. If shop drawings show variations from the Drawings and Specifications because of standard shop practice or other reasons, the Contractor shall make specific mention of such variation in the Contractor's letter of transmittal in order that, if acceptable, suitable action may be taken for proper adjustment; otherwise the Contractor will not be relieved of the responsibility for executing the work in accordance with the Drawings and Specifications even though shop drawings have been accepted.
- g. The Project Officer or designee shall review the shop drawings with reasonable promptness. Review and/or acceptance of shop drawings will be general for conformance with the design concept of the Project and compliance with the information given in the Contract Documents, and will not include quantities, detailed dimensions, nor adjustments of dimensions to actual field conditions. Acceptance shall not be construed as permitting any departure from Contract

requirements, as authorization of any increase in price nor as relieving the Contractor of the responsibility for any error in details, dimensions or otherwise that may exist. Review is not intended to relieve the contractor of full responsibility for the accuracy and completeness of the plans and calculations, or for the complete compliance with the contract documents. Contractor is solely responsible for the means and methods of the construction, including temporary items proposed for use.

9. SAMPLES

The Contractor shall submit to the Project Officer or designee, all samples required by the Specifications or requested by the Project Officer or designee. Samples shall be submitted in single units only, unless the Contractor desires additional units for the Contractor's own use. Each sample shall bear a label indicating what the material represented, the name of the producer and the title of the Project. Acceptance of a sample shall be only for conformance with the design concept of the Project and compliance with the information given in the Contract Documents, and only for the characteristics or use named in such acceptance. Such acceptance shall not be construed to change or modify any Contract requirements or the Contract Price. Materials and equipment incorporated in the Work shall match the accepted samples. The Contractor shall be responsible for researching the availability of the specified product in the dimensions and colors specified at no additional cost to the County. Failure of the Contractor to identify specified products that are not commercially produced within the time required for submittal transmittal in order to meet the project schedule shall not be entitled to additional time or compensation.

10. TESTS

Any specified tests of materials and finished articles shall be made by bureaus, laboratories or agencies approved by the Project Officer or designee and the certified reports of such tests shall be submitted to the Project Officer or designee. All tests shall be in compliance with the Specifications. All costs in connection with the testing and test failures shall be borne by the Contractor. Failure of any material to pass the specified tests or any test performed by the Project Officer or designee, will be sufficient cause for refusal to consider, under this Contract, any further materials of the same brand or make of that material. Samples of various materials delivered on the site or in place may be taken by the Project Officer or designee for testing. Samples failing to meet the Contract requirements will automatically void previous acceptance of the items tested.

The Contractor will not be compensated for additional time and/or cost incurred in finding an acceptable replacement or the removal and replacement of the defective item.

11. MATERIALS AND EQUIPMENT LIST

- a. Unless otherwise specified in the Specifications, within thirty (30) days of the Commencement Date the Contractor shall submit to the Project Officer or designee a complete list of materials and equipment proposed for use in connection with the Project. Partial lists submitted from time to time will not be considered unless specifically approved by the Project Officer or designee.
- b. After any material or piece of equipment has been approved through submittal process, no change in brand or make will be permitted unless satisfactory written

evidence is presented to prove that the manufacturer cannot make scheduled delivery of the accepted material, or that material delivered has been rejected and the substitution of a suitable material is an urgent necessity, or that other conditions have become apparent which indicate that acceptance of such other material is in the best interest of the County. The Contractor is solely responsible for the cost and time required to obtain and install a suitable replacement.

12. 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 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.

13. SURVEYS AND CONTROLS

Unless otherwise specified, the Contractor shall establish all baselines for the location of the principal component parts of the Work, establish a suitable number of benchmarks adjacent to the Work, and develop all detail surveys necessary for construction by a professional land surveyor licensed in the Commonwealth of Virginia. The Contractor shall carefully preserve benchmarks, reference points and stakes, and in the case of destruction thereof by the Contractor or due to the Contractor's negligence or the negligence of any subcontractor or supplier, the Contractor shall be responsible for expense and damage resulting therefrom and shall be responsible for any mistakes that may be caused by the loss or disturbance of such benchmarks, reference points and stakes. The Contractor shall within 30 days of NTP perform a full site survey to verify all control points shown on the drawings against existing conditions within the site limits. Any discrepancies found during

this effort shall be made known immediately to the Project Officer. Failure to perform this survey and provide proof and acceptance of Project datum, control points, and existing benchmarks will not give rise to any extensions to contract time or amount. The cost of all necessary surveying services shall be considered incidental to the work and, unless otherwise specified, shall be included in the cost of the Work.

14. RECORD DRAWINGS

Record drawings shall be the responsibility of the Contractor. The Contractor shall maintain and mark up one set of prints of the applicable Contract Drawings to portray record construction. The prints shall be neatly and clearly marked in red to show all variations between the Work actually provided and that indicated on the Contract Drawings, and all utilities encountered in the Work. All drafting shall conform to good drafting practice and shall include such supplementary notes, legends and details as may be necessary for legibility and clear portrayal of the record construction. These drawings shall be marked promptly upon any approved change to the Work or discovery of any undocumented utility or obstruction and shall be submitted to the Project Officer or designee in sufficient time to be approved no later than thirty (30) calendar days after the Substantial Completion Date. The final record drawings approved by the Project Officer or designee shall be submitted in paper copy and .pdf format electronic files prior to Final Completion. Unless otherwise required under the Contract Documents, incorporation of red-lined changes into CADD format shall be the responsibility of the Architect and/or Engineer of Record, with the exception being any documents prepared by the Contractor in CADD, the record version of which shall also be provided to the County in CADD format by the Contractor. Final payments will be held until the complete set of red-line drawings are submitted to and approved by the Project Officer.

C. COUNTY, COUNTY PROJECT OFFICER, AND CONTRACTOR RELATIONS

1. STATUS OF COUNTY PROJECT OFFICER OR DESIGNEE

The Project Officer or designee shall be the County's representative during the construction period. All Contractor instructions or requests shall be issued from or submitted through the Project Officer or designee. The Project Officer or designee shall have authority to suspend the Work whenever such suspension may be necessary in the responsible opinion of the Project Officer or designee to ensure the proper execution of the Contract. The Project Officer or designee shall also have authority to reject all work and materials that do not conform to the Contract and to decide questions that arise in the execution of the Work.

The County Project Officer or designee will, within a reasonable time, make decisions on all matters relating to the execution and progress of the Work.

2. LIMITATION ON COUNTY'S RESPONSIBILITIES

The County shall not supervise, direct, or have control or authority over, nor be responsible for: The Contractor's means, methods, techniques, sequences or procedures of construction; the safety precautions and programs related to safety, or the Contractor's failure to perform or furnish the Work in accordance with the Contract Documents.

3. DISPUTES

a. All disputes or claims arising under this Contract or its interpretation, whether

involving law or fact or both, or extra work, and all claims for alleged breach of Contract shall be submitted in writing to the Project Officer or designee as set forth in these General Conditions. Such claims must set forth in detail the amount of the claim and shall state the facts surrounding it in sufficient detail to identify it together with its character and scope.

- b. Claims denied by the Project Officer shall be processed in accordance with the procedures outlined in Sections 7-107, Contractual Disputes and 7-108, Legal Actions of the Arlington County Purchasing Resolution and the Dispute Resolution paragraph in the Agreement.
- c. The Contractor shall not cause a delay in the work pending a decision of the Project Officer or designee, County Manager, County Board, or court, except by prior written approval of the Project Officer or designee.

4. INSPECTION OF 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.

5. INSPECTION OF MATERIALS

All articles, materials, and supplies purchased by the Contractor for the Work are subject to inspection upon delivery to the site and during manufacturing or fabrication. The County reserves the right to return for full credit, at the risk and expense of the Contractor, all or part of the articles, materials, or supplies furnished contrary to Specifications and instructions. Nothing in this section shall abrogate or otherwise limit or relieve the Contractor's independent duty to inspect materials.

6. EXAMINATION OF COMPLETED WORK

If the Project Officer or designee requests it, the Contractor, at any time before acceptance of the Work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the Specifications. Should the work thus exposed or examined prove acceptable, then the uncovering or removing, and the replacing of the covering or making good of the parts removed shall be paid for as extra work but should the work so exposed or examined prove unacceptable, then the uncovering, removing and replacing shall be at the Contractor's expense.

7. RIGHT TO SUSPEND WORK

The County shall have the authority to suspend the Work, in whole or in part, for such periods and such reasons as the County may deem necessary or desirable. Any such suspension shall be in writing to the Contractor and the Contractor shall obey such order immediately and not resume the Work until so ordered in writing by the County. No such suspension of the Work shall be the basis for a claim by the Contractor for any increase in

the Contract Amount provided that the suspension is for a reasonable time under the circumstances then existing. If the suspension of Work is caused by the County's belief that non-conforming work is being installed, and subsequent investigation proves that the Work was non-conforming, the Contractor shall not be awarded additional time or costs.

8. RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a 10-day period after receipt of written notice from the County or such shorter time as may be reasonable under the circumstances, to commence and continue correction of such default or neglect with diligence and promptness, the County may, without prejudice to other remedies the County may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including the County's expenses, and any additional architect or engineering costs necessary by Contractor's default, neglect or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the County upon demand.

9. CONTRACTOR MANAGEMENT PERSONNEL

The Contractor shall keep a competent superintendent and any necessary assistants on the Site at all times during progress of the Work and such persons shall be satisfactory to the Project Officer or designee. The superintendent or project manager shall not be changed except with the Project Officer or designee's consent. If the Project Officer determines that the superintendent or project manager is no longer satisfactory, then the superintendent or project manager must be replaced within 15 days of the Project Officer's written notice with a replacement superintendent or project manager with equal or superior qualifications and subject to Project Officer approval.

The superintendent and project manager shall represent the Contractor and all directions given to such persons shall be as binding as if given to the Contractor. The Contractor shall at all times enforce strict discipline and good order among the workers performing under this Contract and shall not employ on the Work any person not reasonably proficient in the Work assigned. Persons permitted to perform Work under Contractor, or any subcontractor, or sub-subcontractor, shall meet all employment eligibility, safety training, security or drug/alcohol testing requirements required by law or by the County. Any person not complying with all such requirements shall be immediately removed from the Site.

10. DRUG-FREE POLICY

The Contractor is responsible for ensuring that the Site remains a drug-free site. Contractor will require that employees undergo random drug/alcohol screening on a quarterly interval. Any employee who fails the test must be removed from the Site immediately. Random screening shall be performed by a third party licensed to do so in the Commonwealth of Virginia. The Contractor shall provide its random testing policy and schedule to the Project Officer within 30 days of Notice to Proceed. The Contractor will include this provision in every subcontract relating to this Contract. Any infraction by an employee of the Drug-Free policy shall be reported to the Project Officer within 24 hours.

11. LANDS BY COUNTY

The County shall provide access to the lands shown on the Drawings upon which the Work under the Contract is to be performed and to be used for rights of way and for access. In case all the lands, rights-of-way or easements have not been obtained as herein contemplated before construction begins, then the Contractor shall begin its work on such lands and rights-of-way that the County has acquired access to. No additional time or compensation shall be awarded to the Contractor for modifying work location and sequence provided other locations are available for work.

Contractor shall verify the acquisition of all off-site easements and Rights-of- Way prior to the start of off-site construction. Restore all off-site easements to the conditions existing prior to the start of work.

12. LANDS BY CONTRACTOR

If the Contractor requires additional land or lands for temporary construction facilities and for storage of materials and equipment other than the areas available on the site or right-of-way, or as otherwise furnished by the County, then the Contractor shall provide such other lands and access thereto entirely at the Contractor's own expense and without liability to the County. The Contractor shall not enter upon private property for any purpose without prior written permission of all of the persons and entities who own the property. The Contractor shall provide copies of all agreements to the County and shall include language in the agreement indemnifying and holding the County harmless for any damages, repairs, restoration or fees associated with the use of the property.

Upon termination of the agreement, the Contractor shall provide to the County a fully executed release from the property owner.

13. 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.
- 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.

14. SEPARATE CONTRACTS

- a. The County reserves the right to let other contracts in connection with this Project. The Contractor shall afford other contractors reasonable access to the Project including storage of their materials and the execution of their work and shall properly connect and coordinate its work with the work of other such contractors.
- b. If any part of the Contractor's work depends, for proper execution or results, upon the work of any other contractor, the Contractor shall inspect and promptly report to the Project Officer or designee any defects in such work that renders it

unsuitable for such proper execution and results. The Contractor's failure to so inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of the Contractor's work, except as to defects which may develop in other contractor's work after its execution.

- c. If the Contractor or any of the Contractor's subcontractors or employees cause loss or damage to any separate contractor on the Work, the Contractor agrees to settle or make every effort to settle or compromise with such separate contractor. If such separate contractor sues the County on account of any loss so sustained, the County shall notify the Contractor, who shall indemnify and save the County harmless against any expense, claim or judgment arising therefrom, including reasonable attorney's fees.
- d. 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.

15. SUBCONTRACTS

- a. Unless otherwise specified, the Contractor shall, within fifteen (15) calendar days after the execution of the Contract by the County, provide to the Project Officer or designee, in writing, the names of all subcontractors proposed for the principal parts of the Work and for such others as requested by the Project Officer or designee, and shall not employ any subcontractors that the Project Officer or designee may object to as incompetent or unfit after an appropriate determination of the subcontractor's ability. No proposed subcontractor will be disapproved except for cause.
- b. The Contractor shall make no substitutions for any subcontractor previously selected/approved unless first submitted to the County for approval.
- c. The Contractor shall be as fully responsible to the County for the acts and omissions of the Contractor's subcontractors as the Contractor is for the acts and omissions of persons directly employed by the Contractor.
- d. The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the Work to bind subcontractors to the Contractor by the terms of the General Conditions of the Contract, Special Provisions and other Contract Documents comprising the Contract insofar as such documents are applicable to the work of subcontractors.
- e. Nothing contained in the Contract shall be construed to create any contractual relation between any subcontractor and the County, nor shall it establish any obligation on the part of the County to pay to or see to the payment of any sums to any subcontractor. The County will not discuss, negotiate or otherwise engage in any contractual disputes with any subcontractor.
- f. If requested by the County, the Contractor shall replace any subcontractor at no cost to the County within 30 days of the Project Officers written notice or as

otherwise specified. No additional time or compensation will be provided in the event a subcontractor is removed due to non-compliance of the requirements outlined within the Contract.

16. ELIMINATED ITEMS

If any item(s) in the Contract are determined to be unnecessary for the proper completion of the Work contracted, the Project Officer or designee may, upon written notice to the Contractor, eliminate such item(s) from the Contract. Payment will not be made for such item(s) so eliminated; except that the Contractor will be compensated for the actual cost of any work performed and the net cost of materials purchased before the item(s) was eliminated from the Contract, including freight and tax costs, as evidenced by invoice. No additional compensation will be made for overhead or anticipated profit. The County will receive the full unit price credit for work eliminated prior to production or installation.

17. COUNTY ORDINANCES

The Contractor shall comply with all applicable County ordinances, including but not limited to: *The Noise Control, Erosion & Sediment Control, Storm Water Management, and Chesapeake Bay Preservation ordinances (Chapters 15, 57, 60, and 61 of the County Code).*

D. MATERIALS AND WORKMANSHIP

1. MATERIALS FURNISHED BY THE CONTRACTOR

Unless otherwise specified, all materials and equipment incorporated in the Work under the Contract shall be new. All work shall be accomplished by persons qualified in the respective trades.

2. IBC AND VUSBC REQUIREMENTS

The Contractor certifies that all material supplied or used under this Contract meets all current International Building Code (IBC) requirements and the requirements of the Virginia Uniform Statewide Building Code (VUSBC); and further certifies that, if the material delivered or used in the performance of the work is found to be deficient in any of the applicable state or national code requirements, all costs necessary to bring the material into compliance with the requirements shall be borne by the Contractor. The County shall be entitled to offset such costs against any sums owed by the County to the Contractor under this Contract.

3. ADA COMPLIANCE

The Contractor shall ensure that all Work performed under this Agreement is completed in accordance with the Contract Documents, including Work intended to meet the accessibility requirements of the Americans with Disabilities Act (ADA).

The Contractor is not required to ascertain whether the Contract Documents meet ADA design standards and guidelines. However, should the Contractor discover any non-conformity with such requirements, the Contractor shall immediately inform the County and its design consultant, if applicable, to allow for corrective action.

The Contractor shall defend and hold the County harmless from any expense or liability

arising from the Contractor's non-compliance in meeting its obligations herein. The Contractor shall be responsible for all costs related to permitting delays, redesign, corrective Work, and litigation relating to such non-compliance.

4. MANUFACTURER'S DIRECTIONS

Manufactured articles, material, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the manufacturer's directions as accepted by the Project Officer or designee, unless herein specified to the contrary.

5. WARRANTY

All material provided to the County shall be fully guaranteed by the Contractor against manufacturing defects within the period of the manufacturer's standard warranty. Such defects shall be corrected by the Contractor at no expense to the County. The Contractor shall provide all manufacturers' warranties to the Project Officer by the date of Final Completion.

All Work is guaranteed by the Contractor against defects resulting from the use of inferior or faulty materials. The Contractor warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects or inferior or faulty workmanship, or work not in accordance with the Contract Documents for one (1) year from the date of Substantial Completion or as set forth in the Specifications of the work by the County in addition to and irrespective of any manufacturer's or supplier's warranty.

No date other than Substantial Completion or as set forth in the Specifications shall govern the effective date of the Warranty, unless that date is agreed upon by the County and the Contractor in advance and in a signed writing.

The Contractor shall promptly correct any defective work or materials after receipt of a written notice from the County to do so. If the Contractor fails to proceed promptly or use its best efforts and due diligence to complete such compliance as quickly as possible, the County may have the materials or work corrected and the Contractor and its Sureties shall be liable for all expenses and costs incurred by the County.

Nothing contained in this section shall be construed to establish a period of limitations with respect to other obligations the Contractor may have under this Contract.

6. INSPECTION AND ACCEPTANCE OF MATERIALS

Inspection and acceptance by the County will be at the work site in Arlington County, Virginia and within ten (10) calendar days of delivery unless otherwise provided for in the Contract Documents. The County will not inspect, accept, or pay for any materials stored or delivered off-site by the Contractor, except as provided by the Payment for Stored Materials clause of these General Conditions and other requirements of the Contract Documents. The County's right of inspection shall not be deemed to relieve the Contractor of its obligation to ensure that all articles, materials and supplies are consistent with Specifications and instructions and are fit for their intended use. The County reserves the right to conduct any tests or inspections it may deem appropriate before acceptance. The Contractor shall be responsible for maintaining all materials and supplies in the condition in which they were accepted until they are used in the work.

The Contractor is to coordinate its work and request inspections in such a manner as to minimize the cost to the County without impacting the overall schedule of the Project within reason. All costs associated with re-inspection shall be borne by the Contractor.

7. CONTRACTOR'S TITLE TO MATERIALS

No materials or supplies for the work shall be purchased by the Contractor or any subcontractor subject to any chattel mortgage or under a conditional sale or other agreement by which an interest is retained by the seller. The Contractor warrants that it has good title to, and that it will require all subcontractors to warrant that they have good title to, all materials and supplies for which the Contractor invoices for payment. The County may request proof of title or payment prior to acceptance of the Contractor's invoice.

8. TITLE TO MATERIALS AND WORK COVERED BY PARTIAL PAYMENTS

All material and work covered by partial payments made by the County will become the property solely of the County at the time the partial payment is made. However, risk of loss or damage to all items shall be the responsibility of the Contractor until Final Acceptance by the County. This provision will not be construed as relieving the Contractor from having sole responsibility for all materials and work upon which payments have been made and for the restoration of any damaged work or replacement or repair at the County's option of any damaged materials. This provision will not be construed as a waiver of the County's right to require fulfillment of all terms of the Agreement, including full rights under the terms of the Warranty provisions of the Agreement, nor shall payment indicate acceptance of the materials or work.

9. CONNECTING WORK

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.

10. REJECTED WORK AND MATERIALS

a. Any of the Work or materials, goods, or equipment which do not conform to the requirements of the Contract Documents, or are not equal to samples accepted by the Project Officer or designee, or are in any way unsatisfactory or unsuited to the purpose for which they are intended, shall be rejected and replaced immediately so as not to cause delay to the Project or work by others. Any defective work, whether the result of poor workmanship, use of defective materials, damage through carelessness or any other cause, shall be removed and the work shall be re-executed by the Contractor at the Contractor's expense. The fact that the Project Officer or designee may have previously overlooked such defective work shall not constitute acceptance of any part of it.

- b. If the Contractor fails to proceed at once with the replacement of rejected material and/or the correction of defective workmanship when notified to do so by the Project Officer or designee, the County may, by contract or otherwise, replace such material or correct such workmanship and charge the cost to the Contractor. This clause applies during the Contract and during any warranty or guarantee period.
- c. The Contractor shall be responsible for managing, addressing within a timely manner, and formally closing out all notices of non-compliance issued by the inspector of record, Arlington County Inspection Services, or the Design Team. The Contractor shall be solely liable for any costs or time associated with the corrective action to address any notices of non-compliance. The Contractor must work directly with the entity issuing the notice of non-compliance.
- d. If the Project Officer or designee deems it expedient not to require correction of work which has been damaged or not done in accordance with the Contract, an appropriate adjustment to the Contract Price may be made.

11. PROHIBITION AGAINST ASBESTOS CONTAINING MATERIALS

No goods or equipment provided to the County or construction material installed shall contain asbestos. If a Contractor or supplier provides or installs any goods, equipment, supplies, or materials that contain asbestos in violation of this prohibition, the Contractor shall be responsible for all costs related to the immediate removal and legal disposal of the goods, equipment or materials containing asbestos and replacement with County-approved alternate. The Contractor shall be responsible for all goods, equipment, supplies or materials installed or provided by any of its employees, agents or subcontractors in connection with the work under this contract. The Contractor shall also reimburse to the County all costs of such goods, equipment, supplies or materials installed if not corrected by the Contractor.

E. LEGAL RESPONSIBILITY AND PUBLIC SAFETY

1. SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK

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:

- a. conditions bearing upon transportation, disposal, handling, and storage of materials;
- b. the availability of labor, water, electric power, and roads;
- c. uncertainties of weather, river stages, tides, or similar physical conditions at the site;
- d. the information and conditions of the ground; and
- e. the character of equipment and facilities needed before and during work performance.

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.

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.

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 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.

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.

2. PUBLIC CONVENIENCE

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.

3. SAFETY AND ACCIDENT PREVENTION

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) 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.

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).

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.

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.

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.

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.

4. HAZARDOUS MATERIALS

Arlington County is subject to the Hazard Communication Standard, 29 CFR §1910.1200 (Standard). The Contractor agrees that it will provide or cause to be provided Safety Data Sheets (SDS) required under the Standard for all hazardous materials supplied to the County or used in the performance of the work. Such SDS shall be delivered to the County no later than the time of actual delivery of any hazardous materials to the County or use of such material in the performance of work under the Contract by the Contractor or its subcontractors, whichever occurs first. Container labeling meeting the requirements of the Standard shall be appropriately affixed to the shipping or internal containers. The County reserves the right to refuse shipments of hazardous materials not appropriately labeled, or when SDS have not been received prior to or at the time of receipt of the shipment for use by the County or for use by the Contractor in the performance of the Contract, or whenever the material is delivered in a manner inconsistent with any applicable law or regulation. Any expenses incurred due to the refusal or rejection of SDS are the responsibility of the Contractor. The Contractor shall comply with all federal, state, and local laws governing the storage, transportation, and use of toxic and hazardous materials. The Contractor shall maintain onsite an up to date SDS binder for all material used and delivered to the Project. The County Project Officer or his designee shall be allowed access to the SDS book at all times.

5. HAZARDOUS WASTE

Hazardous Waste Generator/Hazardous Waste Disposal: The County Board of Arlington County, Virginia and the Contractor shall be listed as Co-generators. The Contractor shall assume all the duties pertaining to the Waste Generator, including signing the Waste Shipment Record ("WSR") and manifest. The Contractor shall supply the County Project Officer with the executed original Owner's Copy of the WSR, as required by applicable regulatory agencies within 35 days from the time the waste was accepted by the initial waste transporter, and prior to request for final payment. A separate WSR shall be submitted for each shipment to the disposal site.

Delayed Waste Shipment Records: The Contractor shall report in writing to the EPA Region III office within 45 days if an executed copy of the WSR is not received from the operator of the disposal site. The report to the EPA regional office shall include a copy of the original WSR and a cover letter signed by the Contractor stating the efforts taken to locate the hazardous waste shipment and the results of those efforts.

Temporary Hazardous Waste Storage Prohibited: The Contractor shall not temporarily store hazardous waste unless pre-approved by the County in writing. If so approved, hazardous waste stored off-site in a temporary facility shall be monitored and records shall be kept on the number of containers, size, and weight. The Contractor shall inform the County when the hazardous waste is to be transported to the final disposal site. The County has the right to inspect the temporary site at any time. The Contractor shall submit copies of all relevant manifests, Waste Shipment Record(s), and landfill receipts to the County Project Officer prior to the request for final payment. All paperwork shall be signed by the Contractor and disposal site operator as required.

6. ASBESTOS

Whenever and wherever during the course of performing any work under this Contract the Contractor discovers the presence of asbestos or suspects that asbestos is present, the Contractor shall stop work immediately, secure the area, notify the County Project Officer immediately and await positive identification of the suspect material. During the downtime in such a case, the Contractor shall not disturb any surrounding surfaces but shall protect the area with suitable dust covers. Work shall not proceed without an Asbestos-Related Work Authorization executed by the County Asbestos Program Manager.

7. CROSSING UTILITIES

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.

8. OVERHEAD HIGH VOLTAGE LINES SAFETY ACT

If any work required herein will be performed within ten feet of an overhead high voltage line, the provisions of Virginia Statute 59.1-406, et. seq., "Overhead High Voltage Line Safety Act" (Act) shall apply. The "person or contractor responsible for the work to be done", as that term is used in the Act, will be interpreted to mean the Contractor. The Contractor shall notify the owner or operator of the high voltage line in the manner prescribed in Section 59.1-411 of the Act in sufficient time prior to the time work is to be commenced to avoid any delays in the work. The County will not pay for lost time, profits, or permit any extension of the work for any delays caused by the failure of the Contractor to make such arrangements in a timely manner. All costs for the work shall be paid by the Contractor. The County shall reimburse the Contractor for the actual reasonable cost paid to the owner or operator of the high voltage line by the Contractor on presentation to the County by the Contractor of original invoices from the owner or operator of the high voltage line in the same manner as for other Contractor invoices submitted for work performed. Retention, if applicable to the Contract, shall not be withheld from the payment to the Contractor by the County for this work. No processing, administrative, or other charges above the actual amount charged by the owner or operator of the high voltage line shall be paid to the Contractor by the County.

9. SANITARY PROVISIONS

The Contractor shall provide and maintain such sanitary accommodations for the use of the Contractor's employees and those of its subcontractors as may be necessary to comply with the requirements and regulations of OSHA and of the local and State departments of health.

10. SITE CLEAN-UP AND WASTE DISPOSAL

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.

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.

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.

11. STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

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.

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.

F. PROGRESS AND COMPLETION OF THE WORK

1. NOTICE TO PROCEED

The Contractor shall be given written Notice to Proceed with the Work. Such Notice to Proceed shall state the date on which the Work is to be commenced, and every calendar day thereafter shall be counted in computing the actual Time for Completion.

2. TIME FOR COMPLETION

It is hereby understood and mutually agreed by and between the Contractor and the

County that the Commencement Date, the rate of progress, and the Time for Completion of the Work to be done hereunder are essential conditions of the Contract. The Contractor agrees that the Work shall be started promptly upon receipt of a written Notice to Proceed in accordance with the accepted schedule. The Work shall be prosecuted regularly, diligently, and uninterruptedly at a rate of progress that will ensure full completion of the Project within the Time for Completion specified in the Contract Documents.

3. SCHEDULE OF COMPLETION

Unless otherwise specified, the Contractor shall within 10 business days after the Award Date, or prior to the pre-construction meeting, whichever occurs first, submit schedules which show the order in which the Contractor proposes to carry on the Work, with dates for starting and completing the various activities of the Work. The Contractor shall submit an updated schedule monthly with the request for partial payment. Review and acceptance by the County of the Contractor's schedule of completion shall in no way relieve the Contractor of its responsibility to complete the Work within the contract time. If the Work falls behind the schedule, the County may require the Contractor to prepare and submit, at no extra cost to the County, a recovery schedule indicating by what means the Contractor intends to regain compliance with the schedule. The recovery schedule must be submitted to the County for review by the date indicated in the County's written demand.

4. CONDITIONS FOR COMPLETION

a. **SUBSTANTIAL COMPLETION:** The Work will be considered Substantially Complete when all of the following conditions have been met and accepted by the Project Officer, and a Certificate of Substantial Completion has been issued:

1. The Contractor has provided formal notice that the Work is substantially complete, and the Project Officer has agreed that the condition of the Work warrants a Substantial Completion inspection;
2. The Contractor has provided a Punch List and that list has been reviewed and approved by the Project Officer. Failure to include an item on the Punch List does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents;
3. Final test reports as required by the Contract and certificates of inspection and approval required for use and occupancy;
4. Fire Marshal's report, if applicable;
5. Approval forms and transfer documents for all utilities;
6. All life safety systems, including fire alarms, visual and audios alarms, fire detectors and fire alarm annunciator system, sprinkler systems, and all mechanical and electrical systems are complete and working in an automatic mode, and the County has been adequately trained in the operation of the systems;

7. The HVAC system Testing and Balancing Report and build air quality test results as required for LEED certification have been accepted by the Project Officer;
 8. Operation and Maintenance Manuals have been submitted for review;
 9. All documents and verification of training required in accordance with any Commissioning Plan;
 10. Mark-ups of construction drawings showing the Record or "Record" condition have been submitted for review and approval by the Project Officer;
 12. Entrances and egress pathways have been constructed and can remain clear of construction activities;
 13. A Certificate of Occupancy has been issued for the space by the County's Inspection Services Division;
 14. All Commissioning has performed and completed to the satisfaction of the Project Officer; and
 15. Schedule to complete the Punch List and value of Work not yet complete.
- b. Upon the Contractor providing notice that the Work is substantially complete, the Project Officer or designee will invite all relevant parties to perform an inspection of the Work, and any noted deficiencies or incomplete items not indicated on the Contractor's punch list will be added. All punch list items, whether generated by the Contractor or any other party on behalf of the County, shall be completed within thirty (30) days of the date of Substantial Completion, unless otherwise agreed to by the County due to seasonal or other extenuating circumstances.
- c. FINAL COMPLETION: The Work will be considered Finally Complete when all of the following conditions have been met and accepted and a Final Completion Notice has been issued by the Project Officer:
1. The Contractor has provided formal notice that the Work is complete, and the Project Officer has agreed that the condition of the Work warrants a Final Completion inspection;
 2. All construction deficiencies and punch list items have been closed and all construction deficiencies corrected and accepted by the Project Officer;
 3. All spare parts and attic stock have been delivered, stored in an orderly manner in a space designated by the Project Officer and a complete inventory list has been verified and accepted by the Project Officer;
 4. All warranties and manufacturer certificates and contact information for

parties providing warranties have been delivered and accepted by the Project Officer;

5. All final Operating and Maintenance manuals have been delivered and approved and accepted by the Project Officer;
6. All final Record Drawings in .pdf format on a CD delivered and accepted by the Project Officer;
7. All commissioning has been completed and any open construction items in the commissioning agent’s report have be closed and accepted by the Project Officer; and
8. All LEED documents and submittals, if applicable, to be provided by the Contractor or sub-contractors have been submitted and accepted bythe Project Officer.

5. USE OF COMPLETED PORTIONS

The County shall have the right to take possession of and use any completed or partially completed portions of the Work, notwithstanding that the time for completing the entire Work or such portions may not have expired; but taking such possession and use shall not be deemed an acceptance of any work not done in accordance with the Contract Documents. If the Contractor claims that such prior use increases the cost or delays, the completion of remaining work, or causes refinishing of completed work, the Contractor may submit a claim for compensation or extension of time, or both.

G. MEASUREMENT AND PAYMENT

1. PAYMENTS TO CONTRACTOR

Progress Payments. The Contractor shall be paid its compensation in a series of progress payments and a final payment, for Work completed in accordance with the Contract, and for which proper Applications for Payment have been submitted and approved. The amount of each progress payment shall be as follows:

The Costs of Work Completed to Date			
Plus	(Cost of Work for Pay Period / Current approved estimated Cost of Work through completion)	x	(Not At-Risk Portion of the Construction Management Fee)
Plus	Any subset of the At-Risk Portion of the Construction Management Fee to which the County has determined the Contractor to be entitled		
Plus	the applicable portion of General Conditions Fee		
Minus	Applicable Retainage		
Minus	Amounts previously paid by the County		

In the event the Project schedule has been extended, the monthly portions of the

General Conditions Fee and the Not At Risk Construction Management Fee will be recalculated so the then remaining unpaid portion of both fees are spread evenly over the then-remaining duration of the Construction Phase.

2. PAYMENT FOR STORED MATERIALS

When requested in writing by the Contractor, payment allowances may be made for material secured for use on the Project and secured at the project site. Such payments will only be made for materials scheduled for incorporation into the work within sixty (60) days.

Payment for materials stored offsite may be considered at the discretion of the Project Officer. Any such request shall be made in writing, and the Contractor shall provide photographs of materials stored offsite, bills of sale, and proof of insurance on the premises at which off-site materials are stored with the application for payment.

Payment for stored materials may also be subject to additional requirements contained elsewhere in the Contract Documents.

3. PAYMENTS WITHHELD

The Project Officer or designee may withhold or, on account of subsequently discovered evidence, nullify the whole or a part of any certificate for payment to the extent necessary to protect the County from loss on account of defective work not remedied or withhold payment for violation of any contract term or condition not remedied after sufficient notice given to the Contractor.

Any such withholding shall not result in any liability to the Contractor for damages.

4. COUNTY ORDERED CHANGES IN WORK

The County, without invalidating the Contract, may order extra Work or make changes by addition, deletion or revision in the Work, with the total Contract Amount being adjusted accordingly if applicable. Any change that will increase the Contract Amount will require notice to sureties and require that Performance and Payment Bonds be increased by the Contractor. The increased Performance and Payment Bonds must be sent to the County's Office of the Purchasing Agent within 15 calendar days of the County's approval of such change. All such work shall be executed under the conditions of the original Contract, except that modification of the Time for Completion caused thereby shall be made at the time of approving such change.

a. The Project Officer or designee shall have authority to make minor changes in the Work by verbal order when such changes do not involve extra cost and are not inconsistent with the purpose of the Project. Otherwise, except in an emergency endangering life or property, no extra Work or change shall be made unless in pursuance of a written Construction Change Directive or Change Order and no claim for an addition to the Contract Amount or Contract Time shall be valid unless so ordered.

b. The Contractor shall review any County requested or directed change and shall respond in writing within 14 days after receipt of the proposed change stating the

effect of the proposed change upon Contractor's work, including any increase or decrease in Contract time and price. The Contractor shall furnish the County an itemized breakdown of the quantities and prices used in computing the proposed change. The Contractor shall also furnish any sketches, drawings, and or pictures to properly explain the change or impact to the Project Officer. It is the sole responsibility of the Contractor to provide adequate change order backup to satisfy the Project Officer.

- c. The value of any such extra work or change shall be proposed by the Contractor in one or more of the following ways: (a) by estimate in a lump sum; (b) by cost and fixed fee; (c) by unit price additions or deletions of quantities stated in the unit price contract; or (d) by any other method permitted under the Arlington County Purchasing Resolution. The Project Officer will determine the method appropriate based on the nature of the changes.
- d. If none of the aforementioned methods is agreed upon the Contractor shall proceed with the work without delay under force account, provided the Contractor receives a Construction Change Directive. In such case, the Contractor shall keep and present in such form as the Project Officer or designee may direct, a correct account of the cost, together with vouchers. The Project Officer or designee shall be permitted to verify such records on a daily basis and may require such additional records as are necessary to determine the cost of the change to the Work. The Project Officer or designee shall certify to the amount due to the Contractor, including a reasonable lump sum allowance for overhead and profit. A complete accounting of the extra cost shall be made within 14 days after completion of the work involved in the claim. Refer to Paragraph G.5, *Force Account Work*, below for a description of allowable costs when work is performed under force account.
- e. A cost proposal for a change in the Work shall provide a complete breakdown itemizing the estimated quantities and costs of labor, materials, and equipment (base cost) required in addition to any markup used. The allowable percentage markups for overhead and profit for a non-force account change to the Work performed by the Contractor's own forces or performed by the Subcontractor shall be negotiated based on the nature, size, and complexity of the Work involved but shall not exceed the percentages for each category listed below.
 - 1) Subcontractor's markup for overhead and profit for the work it performs in a change to the Work shall be a maximum of fifteen (15%).
 - 2) Contractor's markup for overhead and profit on the Subcontractor's base cost in a change to the Work shall be a maximum of ten percent (10%).
 - 3) Contractor's markup for overhead and profit (including bonds and insurance) for work it performs in a change to the Work shall be a maximum of fifteen percent 15%.
 - 4) The markup for overhead and profit of a sub-subcontractor at any tier on

a change to the Work it performs shall be a maximum of fifteen percent (15%). The Contractor and all intervening tiers of subcontractors' markup on such sub-subcontractor's base cost in the change to the Work shall not exceed a total of ten percent (10%).

- f. Base Cost is defined as the total of labor, material, and equipment costs, it does not include markup for overhead and profit. The labor costs include only the costs of employees directly constructing or installing the change in the Work and exclude the costs of employees coordinating or managing the work.
- g. The allowable percentage markups for overhead and profit stated above shall compensate the Contractor, subcontractor, and sub-subcontractor for all other costs associated with or relating to the change to the Work including by way of illustration and not limitation, general conditions, supervision, field engineering, coordination, insurance, bond(s), use of small tools, incidental job costs, and all other general and administrative home and field office expenses.
- h. Allowable costs for changes in the Work shall not include home office expenses including payroll costs for the Contractor's officers, executives, administrators, project managers, estimators, clerk's timekeepers, and other administrative personnel employed by the Contractor, whether at the Site or in the Contractor's principal or branch office for general administration of the Work. These costs are deemed overhead included in the percentage markups in Subsection (e) above.
- i. If the change to the Work also changes the Time for Completion by adding days to perform the Work, an itemized accounting of the following Site direct overhead expenses for the change to the time may be considered as allowable costs for compensation in addition to the base cost indicated above:
 - 1) site superintendent's pro-rata salary
 - 2) temporary site office trailer expense
 - 3) temporary site utilities including basic telephone service, electricity, heat, water, and sanitary/toilet facilities.

All other direct and indirect overhead expenses are considered covered by and included in Subsection (e) markups above. In no case shall subcontractor extended overhead be submitted or considered. The County does not have a direct contractual relationship with any subcontractor or supplier and therefore will not direct, discuss or negotiate with subcontractors employed by the Contractor.

- j. If Contractor requests an extension to the Time for Completion due to changes in the Work, it must provide to the Project Officer adequate documentation substantiating its entitlement for the time extension. The documentation must demonstrate an anticipated actual increase in the time required to complete the Work beyond that allowed by the Contract as adjusted by prior changes to the Work, not just an increase or decrease in the time needed to complete a portion of the total Work. In the event a Critical Path Method (CPM) schedule is required by the Contract, no extension to the Time for Completion shall be granted unless

the additional or change to the Work increases the length of the critical path beyond the Time for Completion as demonstrated on the approved CPM schedule or bar chart schedule. Any Float belongs to Arlington County. A written statement in addition to a CPM analysis shall be prepared explaining how no other sequence of work activities could have been performed to decrease the impact or eliminate the impact altogether. If requested by the Project Officer, the Contractor must provide alternate documentation detailing the claim to the County's satisfaction.

5. FORCE ACCOUNT WORK

A Force Account may be used at the County's discretion and only when either 1) agreement on the valuation of a change cannot be made using the methods described in the preceding paragraph, *County Ordered Changes in the Work*, or 2) the County cannot firmly establish an applicable and acceptable estimate for the cost of the work because the level of effort necessary to perform and complete the work cannot be reasonably estimated or anticipated but can only be determined by performing the work. Because of the significant burden on the County to monitor and control the work, Force Account work is not a preferred method, and it shall be the responsibility of the Contractor to provide all necessary documentation and justification of costs. The rates for labor, equipment and materials to be used in cases of work performed on a force account basis will be compensated as documented below. No costs other than those explicitly listed below shall be allowed:

- a. Labor: Before any Force Account work begins, the Contractor shall submit for approval to the Project Officer the proposed hourly rates and associated labor costs (benefits and payroll burden) for all laborers and forepersons to be engaged in the work. The number of laborers and forepersons engaged in the work will be subject to regulation by the Project Officer and shall not exceed the number that the Project officer deems most practical and economical for the work. For all labor and forepersons in direct charge of the force account work, excluding general superintendence, compensation will be as follows:
 - 1) Certified Pay Rate: The Contractor will receive the actual rate of wage or scale as set forth in his most recent payroll for each classification of laborers, and forepersons who are in direct charge of the specific operation. The time allowed for payment will be the number of hours such workers are actually engaged in the work. If overtime work is authorized by the County, payment will be at the normal overtime rate set forth in the Contractor's most recent payroll.
 - 2) Benefits: The Contractor will be entitled to receive the actual cost for any fringe benefits that are regularly provided to the classes of laborers and forepersons engaged in the work and that are not included in the certified pay rate.
 - 3) Payroll Burden: The Contractor will be entitled to receive the actual cost for all costs associated with required payroll taxes and payroll benefits not covered in 2) above, including:
 - Social Security Tax

- Medicare Tax
- Unemployment Tax
- Worker's Compensation Insurance
- Contractor's Public Liability Insurance
- Contractor's Property Damage Liability Insurance

4) If the Contractor is unable to provide the necessary documentation for Benefits and Payroll Burden as identified above, the Contractor will be entitled to an additive of 20% of the Certified Hourly Pay Rate as full and final compensation for Benefits and Payroll Burdens

5) Overhead and Profit: The Contractor will be entitled to an additive of 10% on all properly documented and approved costs established in paragraphs 1), 2), 3), and 4) above for all administrative, overhead, and profit associated with labor costs.

6) Subsistence and lodging allowances may be allowed by the Project Officer at the actual and documented costs for lodging and meals if the following conditions are met and the applicable rates and authorization for such costs are established prior to beginning the work. No additives for overhead, administrative, profit, or any other costs will be permitted for subsistence and lodging.

- i. The specific Force Account work is outside the scope of the original contract, requires mobilization of a separate crew not intended to be used on the original contract, and the Contractor's base location is more than 50 miles from the work site, or
- ii. Forces which have been working on the Contract will be used for the Force Account work and have been routinely staying overnight during the life of the Project, and the Force Account Work will warrant an extension of the contract time, and the distance from the Contractor's base location to the work site is more than 50miles

b. Materials: The Contractor will receive the actual cost of materials accepted by the Project Officer that are delivered and used for the work including taxes, transportation, and handling charges paid by the Contractor, not including labor and equipment rentals as herein set forth, to which 15 percent (15%) of the cost will be added for administration and profit. The Contractor shall make every reasonable effort to take advantage of trade discounts offered by material suppliers. Any discount received shall pass through to the County. Salvageable temporary construction materials will be retained by the County, or their appropriate salvage value shall be credited to the County, at the County's discretion.

c. Equipment: For all equipment other than small tools, the Contractor will be entitled to rental rates as established herein and agreed to in writing before the work is begun. Transportation costs directly attributable to Force Account work

will be as stated below. Small tools will be considered any equipment which has a new cost of \$1000 or less and will not be eligible for any compensation. The Contractor shall provide the Project Officer a list of all equipment to be used in the work. For each piece of equipment, the list shall include the serial number; date of manufacture; location from which equipment will be transported; and, for rental equipment, the rental rate and name of the company from which it is rented. The number and types of equipment engaged in the work will be subject to regulation by the Project Officer as deemed to be the most practical and economical for the work. No compensation will be allowed for equipment which is inoperable due to mechanical failure. Compensation for equipment shall be as follows:

- 1) Hourly Base Equipment Rental Rates (Owned Equipment) – For equipment authorized for use in the Force Account work that is owned by the Contractor, the Contractor shall be entitled to an Hourly Base Rental Rate as detailed in the following paragraphs. The Hourly Base Rental Rate for Contractor owned equipment will not exceed 1/176 of the monthly rates of the schedule shown in the *Rental Rate Blue Book* modified in accordance with the *Rental Rate Blue Book* rate adjustment tables that are current at the time the force account is authorized. The rates for equipment not listed in the *Rental Rate Blue Book* schedule shall not exceed the hourly rate being paid for such equipment by the Contractor at the time of the force account authorization. In the absence of such rates, prevailing rates being paid in the area where the authorized work is to be performed shall be used.
- 2) Hourly Base Equipment Rental Rates (Rented Equipment) – If the Contractor does not possess or have readily available equipment necessary for performing the force account work and such equipment is rented from a source other than a company that is an affiliate of the Contractor, payment will be based on actual invoice rates when the rates are reasonably in line with established rental rates for the equipment in question and are approved by the Project Officer.
- 3) Hourly Operating Rates – Hourly Operating Rates shall be as established in the Blue Book estimated operating cost per hour. This operating cost will be full compensation for fuel, lubricants, repairs, servicing (greasing, fueling, and oiling), small tools, and any and all incidentals. If rental rates for the equipment being used in the work are not listed in the Blue Book or otherwise readily available, the Hourly Operating Cost will be 15% of the established Hourly Base Rental Rate. If invoices for Rental Equipment include the furnishing of fuel, lubricants, repair, and servicing, then the Contractor will not be entitled to any Hourly Operating costs for that equipment.
- 4) Equipment Usage - Equipment usage will be measured by time in hours of actual time engaged in the performance of the work. The Contractor shall be entitled to the applicable Hourly Base Equipment Rental Rate and

Hourly Operating Rate for all approved Equipment Usage.

- 5) Equipment Standby – Standby time is defined as the period of time equipment authorized for Force Account work by the Project Officer is available on-site for the work but is idle for reasons not the fault of the Contractor or normally associated with the efficient and necessary use of that equipment in the overall operation of the work at hand. Hourly rates for Contractor owned equipment on standby, will be at 50 percent (50%) of the rate paid for equipment performing work. Operating costs will not be allowed for equipment on Standby. When equipment is performing work less than 40 hours for any given week and is on standby, payment for standby time will be allowed for up to 40 hours, minus hours performing work. Payment for Standby will be allowed only for working days. Payment for Standby will not be made for the time that equipment is on the Project in excess of 24 hours prior to its actual performance in the force account work.
 - 6) Transporting Costs – When it is necessary to obtain equipment exclusively for Force Account work from sources beyond the Project limits and the Project Officer authorizes the transporting of such equipment to the Project site, the cost of transporting the equipment will be allowed as an expense. Where the transport requires the use for a hauling unit, the allowable expense will consist only of the actual cost incurred for the use of the hauling equipment, or the applicable Blue Book cost, whichever is less. When equipment is transferred under its own power, the allowable Transporting cost shall be 50% of the Hourly Base Equipment Rental Rate.
 - 7) Overhead and Profit – The Contractor shall be entitled to an additive of 10% on all appropriate and approved Equipment Rental, Operating, and Transporting costs as defined above.
- d. Subcontracting: The Contractor shall receive the cost of work performed by a subcontractor as determined in (a), (b), and (c) above. In addition, the Contractor will be allowed an allowance per the schedule below for administrative costs and profit.

Total Cost of Subcontract Work: Rate Schedule

\$0 - \$10,000	10%
> \$10,000	\$1,000 + 5 % above \$10,000

- e. Other Costs: The Contractor shall not be entitled to any costs associated with Force Account Work other than those specifically identified in this section.
- f. Statements: Payments will not be made for work performed on a force account basis until the Contractor has furnished the Project Officer duplicate itemized statements of all costs of such work detailed as follows:
 - 1. Payroll indicating name, classification, date, daily hours, total hours, rate,

- and extension of each laborer, foreperson
2. Designation, dates, daily hours, total hours, rental rate, and extension for each unit of equipment
 3. Quantities of materials, prices, and extensions
 4. Transportation of materials
 5. Statements shall be accompanied and supported by invoices for all materials used and transportation charges. However, if materials used on the Force Account work are not specifically purchased for such work but are taken from the Contractor's stock, then in lieu of the invoices, the Contractor shall furnish an affidavit certifying that such materials were taken from his stock; that the quantity claimed was actually used; and that the price, transportation, and handling claimed represented his actual cost.

6. CLAIMS FOR EXTRA COST

If the Contractor claims that any event will give rise to a claim for an increase in the Contract Amount or that any instructions from the Project Officer, by drawings or otherwise, will incur him extra cost under the Contract, then, except in emergencies endangering life or property, it shall give the Project Officer written notice thereof no later than three (3) days of the event or instruction. 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. No such claims shall be valid unless so made. If the Project Officer agrees that such event or instructions involve extra cost to the Contractor, any additional compensation will be determined by one of the methods provided in the Changes in Work paragraph of these General Conditions as selected by the Project Officer. All pricing and supporting documentation requirements of the Changes in the Work clause shall apply to claims for extra cost deemed valid under this paragraph.

7. DAMAGES FOR DELAY; EXTENSION OF TIME OTHER THAN FOR WEATHER

The Contractor's relief for any claim for delay which is unreasonable or caused by the acts and omissions of the County, or due to causes within the County's control, shall be an extension of the Time for Completion and/or the Contractor's direct costs which result from the delay, but only to the extent any damages for delay were actually caused by the County. The Contractor must give the Project Officer written notice of such delay and damages at the time they were incurred but in no event later than three (3) calendar days following the perceived onset of the delay. The Contractor's written notice shall specify the nature the delay claimed by the Contractor, the cause of the delay, and the anticipated impact of the delay on the Contractor's work schedule. The Contractor thereafter must provide to the Project Officer a full claim within 14 days after cessation of the delay detailing the amount of additional contract time or compensation claimed, together with the basis therefor and documentation supporting the claim.

If the Contractor is entitled to compensation for delay which is unreasonable, or caused by the acts and omissions of the County, or due to causes within the County's control, and where there is no change in the Work, an itemized accounting of the following direct site overhead expenses will be considered as allowable costs to be used in determining the compensation due the Contractor: site superintendent prorata salary, temporary site

office expense, temporary site facilities, and temporary site utilities including basic telephone service, electricity, heat, water, and sanitary/toilets. A fifteen percent (15%) markup of these expenses will be allowed to compensate the Contractor for home office and other direct or indirect overhead expenses.

If the Contractor submits a claim for damages pursuant to this Section, the Contractor shall be liable to the County for a percentage of all costs incurred by the County in investigating, analyzing, negotiating and litigating the claim, which percentage shall be equal to the percentage of the Contractor's total delay claim that is determined through litigation to be false or to have no basis in law or fact (Virginia Code §2.2-4335).

The Contractor's sole relief on any claims for delay which is reasonable, or not caused by the acts or omissions of the County, or due to causes not within the County's control, or Force Majeure, shall be an extension of the Time for Completion provided the Contractor gave the Project Officer timely written notice at the inception of such delay.

No extension of the Time for Completion or additional compensation, if applicable, will be granted for any delay unless the Contractor demonstrates the claimed delay directly impacts the Critical Path of the accepted CPM schedule or bar chart schedule, whichever is applicable, and any float has been consumed. Claims for compensation for direct costs which result from delay must be substantiated by adequate documentation clearly showing that the Work delayed was on the critical path of the approved CPM schedule or on the sequence of Work on the approved bar chart schedule, as modified, and that the additional costs incurred by the Contractor are directly attributable to the delay in the Work claimed.

8. TIME EXTENSIONS FOR WEATHER

The Contractor's sole relief on any claims for delay which is caused by abnormal weather shall be an extension of the Time for Completion provided the Contractor gave the Project Officer written notice no later than five (5) calendar days after the onset of such delay and provided the weather affected the Critical Path. A fully-documented claim for a time extension under this Section must be submitted no later than thirty (30) calendar days after the cessation of the delay. It shall be the Contractor's responsibility to provide the necessary documentation to satisfy the Project Officer that the weather conditions claimed were encountered, which may include daily reports by the Contractor, copies of notification of weather days to the Project Officer, NOAA backup, and pictures from each day claimed.

The Time for Completion will not be extended due to inclement weather conditions which are normal, as defined below, for Arlington County. The Time for Completion includes an allowance for workdays (based on five (5) day workweek) which according to historical data may not be suitable for construction work. The Contractor may request extension to the Time for Completion if it can demonstrate unusual and disruptive weather conditions per the requirements below:

- a. That one or more of the Weather Conditions listed below was encountered; and,
- b. The occurrence of the Weather Condition(s) resulted in an inability to prosecute work which would have otherwise been performed on the day(s) the Weather

- Condition(s) occurred; and,
- c. The work which was not able to be completed was on the Critical Path and could not be completed **only** due to the Weather Condition(s) claimed.

The Project Officer will determine the Contractor’s entitlement to an extension of the Time for Completion. A time extension of no more than one (1) day will be granted for one (1) day of lost work which satisfies the requirements above, regardless of the number of Weather Conditions encountered. The Contractor’s sole relief shall be an extension of the Time for Completion and no claim for an increase in Contract Amount will be allowed.

The Weather Conditions listed below will be the only basis for consideration by the County, based upon the requirements listed above, as an extension of the Time for Completion due to inclement weather or weather-related site conditions.

Weather Condition #1: Unusually Heavy Precipitation - Figure 1 illustrates the anticipated monthly inclement weather due to precipitation (Rain Days). If the number of days with precipitation in excess of 0.10”, as recorded at Washington Reagan National Airport, exceeds the anticipated Rain Days, the Contractor will be entitled to an extension of one (1) day on the Time for Completion for every day in excess of the Rain Days illustrated in Figure 1. The anticipated value of Rain Days for partial months at the beginning and end of the Contract shall be evaluated on a pro-rated basis.

FIGURE 1
Average days with precipitation of 0.1” or more

Ja n	Fe b	M ar	A pr	M ay	Ju n	Ju l	A ug	Se p	O ct	N ov	D ec
7	6	7	6	8	6	7	6	6	5	6	6

Weather days are not exclusive to the individual months that they represent in Figure 1. If weather days are not used in a previous month(s) they can be used to offset weather delays in subsequent months. This will be reviewed on a case by case basis and is subject to reconciliation at the end of the Project.

Condition #2: Temperature – The Contractor may be entitled to an additional day for every day that the recorded high temperature at Washington Reagan National Airport is 32 degrees Fahrenheit or less, that has not already been incurred under Weather Condition #1 above. This condition does not apply to vertical construction as defined by the Arlington County Vertical Construction Standards.

9. RELEASE OF LIENS

The County, before making final payment, shall require the Contractor to furnish a complete release of all liens arising out of this Contract. The Contractor may, if any subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the County, to indemnify him against any lien. If any lien remains unsatisfied after all payments have been made, the Contractor shall refund to the County all money that the latter may be compelled to pay in discharging such lien. However, the County may make payments in part or in full to the Contractor without requiring the releases or receipts, and the payments so made shall not impair the obligations of any Surety or Sureties on any

bond or bonds furnished under this Contract.

10. FINAL PAYMENT

After the Contractor has completed all work and corrections to the satisfaction of the Project Officer or designee and delivered all maintenance and operating instructions, schedules, quantities, bonds, certificates of inspection maintenance record documents, and other items required as final payment submittal documents, the Contractor may make application for final payment following the procedure for progress payments. The Final Application for Payment shall be accompanied by all documents required in the Contract, including a complete and signed and notarized copy of the Final Payment Release Form as follows:

RELEASE AND REQUEST FOR FINAL PAYMENT

CONTRACT NUMBER: _____ CONTRACTOR NAME: _____ FINAL

PAYMENT AMOUNT: _____

The Contractor hereby requests final payment in the amount indicated on the above referenced Contract. The Contractor agrees that its acceptance of final payment releases and forever discharges Arlington County and its officers, employees, servants and agents from any and all actions, claims, demands and liability of whatever nature now existing, or which may hereafter arise as a result of or in connection with the above referenced Contract.

The Contractor certifies that all of the debts for labor, materials, and equipment incurred in connection with the above referenced Contract have been fully paid.

AUTHORIZED SIGNATURE DATE: _____

The date of Final Acceptance is the date on which the County issues the final payment for the work performed.

COMMONWEALTH OF VIRGINIA COUNTY OF ARLINGTON

On this the _____ day of _____, 20____, before me, personally appeared _____, who acknowledged himself/herself to be _____ in the above instrument, and that he/she, as such _____, being authorized so to do, executed the foregoing instrument for the purposes therein contained, by signing his/her name by himself/herself as _____.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

Notary Public My Commission Expires: __

EXHIBIT D

GUARANTEED MAXIMUM PRICE (GMP) AMENDMENT

THIS GUARANTEED MAXIMUM PRICE AMENDMENT (“Amendment”) is entered into by and between the County Board of Arlington County, Virginia (the “County”), and name of Contractor, (the “Contractor”) pursuant to Agreement No. 19-219-RFP (the “Agreement”), dated _____, between the County and the Contractor, for _____ to establish a Guaranteed Maximum Price (GMP) and Time for Completion of Construction Services as set forth below.

1. GUARANTEED MAXIMUM PRICE

Subject to additions and deductions which may be made only in accordance with the Agreement, the Contractor represents, warrants and guarantees to the County that the total maximum cost to be paid by the County for Contractor’s complete performance under the Agreement, including, but not limited to, Final Completion of all Work, and all fees, compensation and reimbursements to Contractor, shall not exceed the total amount of _____ dollars (\$ _____) (“Guaranteed Maximum Price”). Costs which would cause the Guaranteed Maximum Price (as may be adjusted pursuant to the Contract Documents) to be exceeded shall be paid by the Contractor without reimbursement by the County.

2. GUARANTEED MAXIMUM PRICE COMPONENTS

The Guaranteed Maximum Price is comprised of the maximum amount payable by the County for:

- D. the Cost of the Work, as defined in the Contract Documents, for full and complete performance of the Work in strict accordance with the Contract Documents;
- E. a Construction Management Fee for the Contractor, as defined in the Contract Documents, in the amount of _____ dollars (\$ _____); and
- F. a General Conditions Fee, as defined in the Contract Documents, in the amount of _____ dollars (\$ _____).

The Guaranteed Maximum Price is further broken down into line items and categories as specified in Attachments _____ to this Amendment.

3. BASIS FOR THE GMP

The GMP is for the performance of the Work in accordance with the Contract Documents and the following Attachments to this Amendment:

- A. Attachment _____: List of Drawings, Specifications, addenda and General, Supplementary and other Conditions of the Contract on which the Guaranteed Maximum Price is based.
- B. Attachment _____: A list of Unit Prices and Allowance items as well as a statement of their basis.
- C. Attachment ____: Assumptions and Clarifications made in preparing the Guaranteed Maximum Price, noting in particular any exclusions. The Assumptions and Clarifications shall take precedence over the Drawings and Specifications but shall be subordinate to the Agreement and the terms of this Amendment.

- D. Attachment ____: The proposed Guaranteed Maximum Price, including a statement of the detailed cost estimate organized by trade categories, Allowances, Contractor's Contingency, and any other items, as well as the Construction Management Fee and General Conditions Fee that comprise the Guaranteed Maximum Price.
- E. Attachment ____: A Construction Phase Schedule, which shall include, but not be limited to, the Substantial and Final Completion Dates upon which the proposed Guaranteed Maximum Price is based, and a schedule of issuance of the Construction Documents upon which the Substantial and Final Completion Dates are based (the "Project Schedule").

4. INCOMPLETE DRAWINGS AND SPECIFICATIONS

The Contractor and the County acknowledge that the Drawings and Specifications are not complete and, as of the date hereof, that such Drawings and Specifications have reached the level of approximately _____% of the total design effort. The Contractor, however, has been actively involved in the design process and hereby represents that it has a sufficient understanding of the Project to agree to a Guaranteed Maximum Price to fully complete the Project. The Contractor hereby acknowledges that the GMP Drawings and Specifications provides sufficient detail and information to provide a firm Guaranteed Maximum Price and that the Guaranteed Maximum Price proposed therein is intended to represent the Contractor's offer to fully complete the Project. The Contractor and the County agree to work together to complete the Drawings and Specifications as provided in the Contract Documents, consistent with the Guaranteed Maximum Price premises and assumptions, and with Project Schedule.

5. DESIGN INTENT; INFERABLE WORK

The GMP Drawings and Specifications include various clarifications and assumptions that are intended to further define the scope of Work that will be required to complete design. The Contractor has included within the Guaranteed Maximum Price sufficient amounts to cover aspects of the Work that are not shown on the GMP Drawings and Specifications.

6. COST OVERRUNS

Subject to additions or deductions, which may be made in accordance with the Contract, the Contractor shall be solely liable and responsible for and shall pay any and all costs, fees and other expenditures in excess of the Guaranteed Maximum Price for and/or relating to the Work, without entitlement to reimbursement from the County. The Contractor shall not be entitled to any fee, payment, compensation or reimbursement under this Agreement or relating to the Work or Project other than as expressly provided in the Agreement.

7. ALLOWANCES

The Guaranteed Maximum Price includes specific "Unit Price Allowance Amounts" for certain items as shown on the Schedule of Values and budgeted in the Guaranteed Maximum Price ("Allowance Items"). The only Allowance Items shall be those specifically identified as such in the Schedule of Values and in the Guaranteed Maximum Price. The Allowance Amounts represent all Costs of the Work of the Allowance Items, including, without limitation, costs of materials, labor, handling, transportation, loading and unloading and installation, as determined by the Contractor.

8. CONTRACTOR'S CONTINGENCY

The Guaranteed Maximum Price includes Contractor's Contingency. The Contractor's Contingency is a sum of money unassociated with any specific work to allow the Contractor to accommodate market changes and/or estimating errors in order to complete the Project within the Guaranteed Maximum Price.

9. CONTRACTOR'S RESPONSIBILITIES

The Contractor has been, and will continue to be, an active participant in the design process. Given such participation, the Contractor represents that it is familiar with the scope and quality of those aspects of the Project that have not yet been fully designed and has taken such scope and quality matters into consideration in preparing each component of the Guaranteed Maximum Price. The Contractor agrees to work with the County in managing the construction and design work to complete the design process. If necessary, the Contractor shall work with the Architect to facilitate redesign or value engineering necessary or advisable for certain aspects of the Project in order to bring the cost of undesigned Work within or below the respective allowances, budgeted or allocated amounts included in the Guaranteed Maximum Price for such Work. Once the Drawings and Specifications are complete, it is recognized by the Contractor and the County that the scope of the Guaranteed Maximum Price may include Work not expressly indicated in the Contract Documents, but which is reasonably inferable from the Contract Documents, and such Work shall be performed without any increase in the Guaranteed Maximum Price or extension of Contract Time, except if and to the extent otherwise expressly provided in the Agreement.

WITNESS these signatures:

**THE COUNTY BOARD OF ARLINGTON
COUNTY, VIRGINIA**

MCN BUILD, INC.

AUTHORIZED
SIGNATURE: _____

AUTHORIZED
SIGNATURE: _____

NAME AND TITLE: SHARON T. LEWIS
PURCHASING AGENT

NAME AND
TITLE: _____

DATE: _____

DATE: _____

EXHIBIT E

ARLINGTON COUNTY
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Revision	Description	Date
1	Removed Details R-2.3, R-2.3B St 1of2, R-2.3B 2of3, R-2.3C 1of2, R-2.3C 2of2 and replaced with Details DW-1.0, DW-1.1, DW-2.0, DW-2.0 2of2, DW-2.1 1of2, DW-2.1 2of2, DW-2.2 1of2, DW-2.2 2of2, DW-2.3, DW-2.4, DW-2.5	5/13/2010
2	Removed the General Conditions, Sections 01100, 02110, 02201, 16550 & 16680. Removed Details R-5.1, R-5.1A, R-5.2, R-5.3, R-5.4, R-5.5A, R-5.5B, R-5.6A, R5.6B, R-5.3C, R-5.7, R-5.8, R-5.9, R-5.9A & R-5.9B Modified Sections 01000, 01300, 01400, 01500, 02100 & 02200. Updated the Table of Contents	02/17/2012
3	<p>Revised: 01400 (Testing), 02400 (Sheeting, Shoring, & Bracing), 02505 (Storm Sewers & Appurtenances), 02510 (Sanitary Sewers & Appurtenances), 02550 (Water Mains & Appurtenances);</p> <p>Created: 02500 (Gravity Sewers & Appurtenances), 02515 (Televised Inspection of Sewers);</p> <p>Revised Standards: M-3.0 (Pipe & Bedding Details), D-1.7 (Catch Basin w/ Grate Top), D-3.2, Storm Sewer Manhole w/ Grate Cover), W-8.1 and W-8.2 (Water Service Connections), W-9.3 through W-9.6 (Water Meter Installation), W-10.0 (Water Meter Fact Sheet)</p> <p>Created Standard: R-2.9 (Concrete Valley Gutter), R-8.1 (Bike Rack Layout)</p> <p>Eliminated Standards: R-7.0 through 7.9C and renamed R-7.9C (Continuous Soil Panel) to R-7.0, D-1.0 (Concrete Pipe Crushing Strength), D-5.0 through D-5.2,</p> <p>Renamed the DW- (Driveway) series of standards as R-2.3 and R-2.4(A-C);</p>	9/30/13

SECTION 01000 - GENERAL PROVISIONS AND REQUIREMENTS1. Purpose of Section

This section outlines the general provisions and requirements common to these standard specifications and details. This section includes definitions and abbreviations used 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.

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:

BUSINESS DAY – Any day that the County is open for general business.

CALENDAR DAY - Any day of twenty-four hours measured from midnight to the next midnight. Included are weekends and holidays. Where these Specifications do not clarify or distinguish between Calendar Day and Business Day, the reference shall be assumed to indicate a Calendar Day.

CONTRACT - The written agreement (including all attachments and amendments thereto) between OWNER and CONTRACTOR covering the work to be performed.

CONTRACT DOCUMENTS – The collection of documents which as a whole comprise the requirements of the Contract or Permit, including any amendments or addendums.

CONTRACT DRAWINGS – The drawings which show the locations, character, dimensions, and details of the Work to be performed under the Contract.

CONTRACTOR – The individual, partnership, firm, corporation, limited liability company, joint venture, or other person or entity contracting with the County for performance of prescribed work or holding a PERMIT for work to which these specifications apply.

COUNTY – See OWNER

ENGINEER – The Director, Department of Environmental Service, Arlington County, or designee.

OWNER – The County of Arlington, Virginia, for whom the work is to be performed.

PERMIT – Written authorization from the Engineer or other authorizing agency, where applicable, to perform the stipulated work.

PROJECT – The entire construction to be performed as provided in the Contract Documents, Permit, or other relevant construction plans or documents.

PROJECT OFFICER – See ENGINEER

PROVIDE – Indicates “provide complete and in place”, that is to “furnish and install”.

ROADWAY- The portion of the right of way used for vehicular, and/or pedestrian travel.

SHOP DRAWING – Fabrications, erection and setting drawings, manufacturer’s standard drawings, schedules, descriptive literature, catalogs, brochures, performance and test data, wiring and control diagrams, and all other descriptive data pertaining to the materials and equipment as required to demonstrate compliance with the contract or permit requirements.

SUBCONTRACTOR – Those who have a direct contract with the Contractor or other Subcontractor to perform Work or furnish material worked to a special design according to the Contract Documents. However, the term shall not include those who merely furnish material not so worked.

SUBMITTAL – Any data required by the Contract Documents to be submitted to the Engineer at any point prior to continuing Work. By way of illustration, Submittals would include, but not be limited to: construction schedules, shop drawings, equipment specifications, material samples, and subcontractor or supplier lists.

SUPPLIER - Any person or organization who supplies materials or equipments for the work (including that fabricated to a special design), but who does not perform labor at the site.

WORK – The labor, equipment, materials, and all appurtenant items and actions necessary to satisfy the requirements and intent of the contract or permit.

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
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

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.

5. Reference to Standards or Specifications

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 contract documents, shall have full force and effect as though printed in the Specifications.

Reference 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 manufacturers where fully suitable, as determined by the Engineer.

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.

- Arlington County Traffic Signal & Streetlight Specifications
- “Manual on Uniform Traffic Control Devices for Streets and Highways” U.S. Department of Transportation, Federal Highway Administration.
- The Arlington County Code
- VDOT Road and Bridge Specifications

7. Applicable Ordinances for Environmental Services and Building Construction

The Contractor or permit holder is responsible for familiarizing himself with the Arlington County Code

prior to commencing with any construction. The following codes, in particular, relate to the Environmental Services and building industry:

Chapter 1	General Provisions
Chapter 3	Building Code
Chapter 7	Electrical Code
Chapter 8	Fire Prevention
Chapter 10	Garbage, Refuse and Weeds
Chapter 11	Licenses
Chapter 14	Motor Vehicles and Traffic
Chapter 15	Noise Control
Chapter 18	Plumbing and Gas Codes
Chapter 22	Street Development and Construction
Chapter 23	Subdivisions
Chapter 26	Utilities
Chapter 48	Flood Plain Management
Chapter 55	Underground Utilities Protection
Chapter 57	Erosion and Sediment Control
Chapter 60	Storm water Detention

8. 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. In the event there is a conflict between these specifications and VDOT Specifications these specifications shall govern.

9. 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 Engineer of such infeasibility. If the Engineer agrees

that any aspect of the Specifications are in fact rendered infeasible, such determination shall in no way invalidate or otherwise revoke the remainder of the Specifications.

10. Inspection of the Work

The Engineer and representatives of any public authority or public entity shall, at all times, have access to and from the work site during preparation or progress of the work. 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 Contract Documents, the Engineer's instructions, and any laws, ordinances, or regulations of any public entity applicable to the Work.

11. Removal and Disposal of Obstructions

Unless instructed otherwise, the Contractor shall remove existing structures, materials and obstructions, whether explicitly identified in the contract documents or not, which interfere with the new construction at no expense to the County. If such structure, material, or obstruction is unanticipated by the Contract Drawings, the Contractor shall notify the Project Officer prior to disturbance. Structures, materials, artifacts, relics, and other obstructions found on the work site shall be the property of the County. Structures and materials not desired by the County will become the property of the Contractor and shall be disposed of by the Contractor in accordance with all applicable State, Federal, and local regulations. Disposal of such items shall be at no additional expense to the County.

12. Work Site Conditions

The work site shall be kept and maintained by the Contractor in a neat, orderly, and workmanlike appearance at all times. The Contractor shall remove and legally dispose of, as frequently as necessary, all refuse, rubbish, scrap materials and debris generated at the site. At the completion of the work, but before final acceptance by the Engineer, the Contractor shall remove and legally dispose of all surplus materials, false work, temporary structures (including foundations thereof), and debris of every nature resulting from the contractors operations or any activity associated with the work, and restore the site to a neat, orderly condition. If the Contractor, at any time, fails to maintain the site in a neat, orderly, and workmanlike condition, the County shall have the right, upon 24 hours notification, to remove and dispose of such surplus materials, false work, temporary structures, and debris, and put the site in a neat and orderly condition at the Contractor's expense.

13. Public Convenience

At all times, work shall be conducted so as to ensure the least possible obstruction to traffic and inconvenience to the general public and the properties and residents in the vicinity of the work. No road or street shall be closed to the public except with the specific written permission of the Engineer and the proper governmental authorities. Fire hydrants on or adjacent to the work site shall be kept in operating condition and accessible to firefighting equipment at all times, unless explicitly permitted by the Engineer. Temporary provisions shall be made and provided by the Contractor to ensure the continued use of sidewalks, trails, and transit facilities compliant with all applicable ADA and other regulations.

14. Protection of Work and Property

- a. The Contractor shall continuously maintain protection of all its Work from damage and shall protect all public and private property from injury or loss arising in connection with this Work. The Contractor shall make good any such damage, injury, or loss, except such as may be caused by agents or employees of the County.
- b. The Contractor shall not place upon the Work, or any part thereof, any loads which are not consistent with the safety of that portion of the Work.
- c. The Contractor shall be responsible for the preservation of all public and private property, trees, monuments, 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 Work shall be completely repaired by the Contractor at the Contractor's expense.
- d. 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 embraced in this Work. The Contractor shall be responsible for the giving of any and all required notices to any adjoining or adjacent property owned or other party before commencement of any work. The Contractor shall indemnify and save 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.
- e. 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 Engineer or 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.

15. Accident Prevention

The Contractor shall exercise proper precaution, at all times, for the protection of persons and property and shall be responsible for all damages to persons and property either on or off the site, which occur as a result of the Contractor's performance of the work. The Contractor shall observe the safety provisions of all applicable laws, including those of the Occupational Safety and Health Administration, and building and construction codes. The Contractor shall take or ensure that such additional safety and health measures are taken 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 "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 shall follow the "Rules and Regulations Governing Construction, Demolition, and all Excavation" as adopted by the Safety Codes Commission of Virginia, 1966, or latest edition, covering requirements for shoring, bracing, and sheet piling of trench excavations.

16. Permission to Work on Highways and Across Utilities

When construction shall proceed to cross highways, railroads, or utilities under the jurisdiction of the State, County, 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 furnish to the Engineer a release from the proper authority before final acceptance of the work.

17. Adjacent Work

In case of a dispute arising between two or more contractors engaged on adjacent work as to the respective rights of each under these specifications, the Engineer shall determine the rights of the parties. The Engineer's decision shall be final and binding on the parties concerned.

18. Connecting Work

The Contractor shall do all cutting, fitting, patching, digging, and other necessary preparations that may be required to make several parts of the work fit properly and/or to receive or be received by the work of other Contractors as shown upon or reasonably implied by the Construction Documents and as directed by the Engineer. The Contractor shall not endanger the integrity of or adversely affect any work by such cutting, fitting, patching, or other preparations. The Contractor shall not alter the work of any other Contractor except with the written consent of the Engineer.

SECTION 01300 SUBMITTALS AND SUBSTITUTIONS1. Purpose of Section

This section outlines the requirements for submitting and processing the construction schedule, substitutions, shop drawings, samples, and other data which are required for the Engineer's review for conformance with the standards, specifications and contract documents.

2. Related Requirements Specified Elsewhere

Section 01000 - General Provisions and Requirements

Section 01400 - Testing

3. Submittals – General Requirements

- a. The Contractor or permit holder shall not begin work which requires the submission of other data, until said submittals are returned with the Engineer's initials or signature indicating review and acceptance.
- b. After any Submittal has been reviewed by the Engineer, no change will be considered unless satisfactory evidence is presented to prove that the approved Submittal cannot be obtained or that such change is in the County's best interest.
- c. All submittals shall be made so as to cause no delay in the project, allowing reasonable time for review and checking by the Engineer. Except as specified otherwise, all submittals shall be submitted at least ten (10) Business Days before the start of the affected work.
- d. Submittals shall be accompanied by all required certifications and other such supporting materials and in such sequence or in such groups that all related items may be checked together.
- e. When Submittals cannot be adequately reviewed because a submission is incomplete, does not include all necessary appurtenant submittals, has been submitted out of sequence, is illegible, or for any other reason, the Submittal will be returned by the Engineer without action, or will be held until such materials as are necessary are received. Incomplete or defective submissions as described above shall not be considered to have been submitted.
- f. Submittals shall have been reviewed by the Contractor and coordinated with all other related or affected work before they are submitted for approval. If the submittals indicate variations from the Contract Documents because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in the Contractor's letter of transmittal such that, if acceptable, suitable action may be taken for proper adjustment. Otherwise, the Contractor will not be relieved of the responsibility of executing the work in accordance with the Contract Documents, even if the Submittal was approved.
- g. The Engineer shall review the submittals with reasonable promptness. Review and/or approval of submittals will be general for conformance with the design concept of the project

and compliance with the information given in the Contract Documents. Approval shall not be construed as permitting any departure from Contract requirements, as authorization of any increase in price, as verification of quantities or field conditions, nor as relieving the Contractor of the responsibility for any error in details, dimensions, or otherwise that may exist.

- h. The Contractor shall be responsible for the detailed accuracy of the submittals. Deviations in submittals from the requirements of the Contract Documents or the construction standards shall not be relieved unless the Engineer specifically accepts deviations named in writing by the Contractor.
- i. Unless otherwise specified, submit three copies of all submittals.
- j. Accompany submittals with a transmittal letter containing the following information:
 - 1. Date
 - 2. Project title and number
 - 3. Contractor's and supplier's name and address
 - 4. The number of each shop drawing, product data and sample submitted.
 - 5. Identification of product or material
 - 6. Relation to adjacent structure or material
 - 7. Field dimensions, clearly identified as such
 - 8. Applicable specification section number
 - 9. Applicable standards, such as ASTM number or VDOT specifications.
 - 10. Identification of deviations from Contract Documents
 - 11. Contractor's stamp, initiated or signed, certifying his review of the submittal, verification of field measurements and compliance with Contract Documents.

4. Construction Schedule

Prior to commencing Work, the Contractor shall submit a Construction Schedule with the following information:

- a. Work breakdown structure to a level of detail appropriate to the work such that the Engineer may reasonably monitor and determine at any point whether the Contractor is prosecuting the Work as expected.
- b. Task dependencies, durations, early and late starts and finishes.
- c. Identification of Critical Path tasks.

5. Subcontractors

- a. Prior to commencing Work, the Contractor shall submit for approval a list of all Subcontractors which are proposed to be used on the Project. The list shall include the following information for each Subcontractor:
 1. Name and address of Subcontractor
 2. Contact name, title, and phone number
 3. Description of the Subcontractor's qualifications to perform the anticipated Work.

6. Materials & Supplier of Products

Prior to commencing Work, the Contractor shall submit for approval a list of all Suppliers and Products which are proposed for installation. The list shall be tabulated by applicable Specification section or related trades or construction activities.

7. Substitutions

- a. The Engineer will consider formal requests for substitution of products in place of those specified up to fifteen Business Days before the start of work.
- b. All proposals for substitutions shall be submitted in writing by the General Contractor or permit holder and not by individual trades or material suppliers.
- c. Include in the following information in any Substitution request:
 1. Complete data substantiating compliance of proposed substitution with Contract Documents.
 2. Product identification, including manufacturer's name, address and literature outlining the product description, performance, test data and reference standards.
 3. Samples, if applicable.
 4. Name and address of similar projects on which product was used and date of installation.
 5. 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.
- d. If any proposed Substitution will 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 will 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.
- e. The County will bear no additional expense as a result of any Substitution.

- f. The Engineer will review proposed substitutions and make his recommendations in writing within ten working days. The Contractor shall abide by the Engineer'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.

8. Shop Drawings

- a. Submit drawings, prepared by Contractor, subcontractor, supplier or distributor, which illustrates some portion of the work; showing fabrication, layout, setting or erection details.
- b. Identify details by reference to sheet and detail numbers shown on Contract Drawings or the Construction Standards.
- c. Use a minimum sheet size of 8 ½ inches x 11 inches.
- d. When submitting specific product data, catalog sheets, or the manufacturer's standard schematic drawings, modify the submissions to delete information which is not applicable to the project. When required, supplement the standard information to provide additional information applicable to project.
- e. Show dimensions and clearances required.
- f. Show performance characteristics and capacities, where applicable.
- g. Note clearly on the drawings any deviations from the material or equipment as specified.
- h. The Engineer will review the Shop Drawings with reasonable promptness.

9. Samples

- a. Where required, provide physical examples to illustrate materials, equipment or workmanship, and to establish standards by which completed work is to be judged in such quantities and locations as required by the specifications.
- b. Samples shall be submitted in single units, unless specified otherwise.
- c. Materials and equipment incorporated into the Work shall match the approved Samples.

10. Resubmissions Requirements

If Submittals are disapproved or require revision, revise the initial submittal and resubmit as specified for initial submittal. Indicate on re-submittal any changes which have been made other than those requested by the Engineer.

PART 1 - GENERAL1.1 Purpose of Section

This section outlines the requirements for testing and verification of work, materials, and any other miscellaneous items required by the Contract Documents.

1.2 Related Requirements Specified Elsewhere

Section 01300 – Submittals

PART II - MATERIALS**PART III - EXECUTION**3.1 General Requirements

- A. Materials, supplies, equipment, and work shall be fully tested in accordance with the Contract Documents. Unless otherwise noted within the specification section, perform the type and number of tests called for by the standards referenced.
- B. Testing shall be done by an independent testing laboratory approved by the Engineer.
- C. Certifications of testing and inspections by the testing laboratory, mills, shops, and factories shall be submitted per Section 01300.
- D. The Contractor shall provide the necessary labor and supervision required to support field testing and inspection by the Engineer at no additional cost to the County. Defects disclosed by tests shall be rectified at no additional cost to the County.
- E. Testing and inspection of the Work shall not relieve the Contractor of his responsibility for conforming to the requirements of the Contract Documents.

PART IV – MEASUREMENT AND PAYMENT4.1. Testing

- 1. Unless otherwise specified, testing of materials, supplies, equipment, and work to comply with these specifications shall be considered incidental to the work, and the Contractor will not be entitled to further payment. The County 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.

SECTION 01500 TEMPORARY EROSION AND SEDIMENT CONTROL**PART 1 - GENERAL**1. Description of Work

This work shall consist of the application of temporary measures throughout the life of the project to control erosion and siltation. Such 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. Temporary erosion and siltation control measures as described herein, shall be applied to erodible material exposed by any activity associated with the construction, and consistent with state and local control standards.

2. Related Work Specified Elsewhere

Section 02100- Clearing and Grubbing

Section 02200- Earthwork

3. Applicable Specifications

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

4. Applicable References

Virginia Soil and Water Conservation Commission Erosion and Sediment Control Handbook.

5. Submittals

Prior to the start of the work the Contractor shall prepare and submit a plan for applying temporary and permanent erosion and siltation control measures. The plan shall include, but is not limited to, the operations of clearing and grubbing, stripping of topsoil, grading, stabilizing cleared areas, dewatering, and the construction of structures at watercourses. Construction work shall not commence until the schedule of work and the methods of operations have been reviewed and approved by the Engineer.

Temporary measures shall be coordinated with the construction of permanent 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.

6. Permits

Unless otherwise specified, the Contractor is responsible for obtaining and complying with any and 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, and Virginia Stormwater Management Program Permits issued by the Virginia DCR.

PART 2 - MATERIALS

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

PART 3 - EXECUTION**7. Installation and Maintenance of Erosion and Sediment Control**

- a. No grading operations will be allowed until temporary sediment and erosion control measures have been installed in accordance with the approved plan conforming to the requirements of Arlington County Erosion and Sediment Control Ordinance.
- b. Control measures shall be periodically cleaned of silt and maintained. Immediately after every rainstorm, all control measures shall be inspected and any deficiencies corrected by the Contractor.
- c. The County reserves the right to order the performance of other temporary measures not specifically described herein to correct an erosion or siltation condition.
- d. Temporary control measures may be removed when the area has been stabilized.

8. 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 Engineer, the grubbing of root mat and stumps shall be confined to the area over which excavation is to be actively prosecuted 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, is to remain denuded longer than 30 days without temporary seeding or otherwise stabilizing the area.

9. Dewatering and Discharges

- a. All dewatering operations shall be conducted in a manner that prevents or minimizes the amount of sediment or other pollutants which discharge to the County storm sewer system, which includes curb and gutter, or any open watercourse. Any discharge from dewatering operations shall be properly filtered prior to being discharged. Dewatering activities shall not create any erosion nor flooding. A dewatering plan must be included as part of the Erosion and Sediment Control plan with sufficient detail to ensure that the proposed dewatering will meet all applicable requirements.

- b. All non-stormwater discharges to the County's storm sewer system, which includes curb and gutter, or any open watercourse must comply with the conditions of Section A.1.a.3 of the County's VSMP Municipal Separate Storm Sewer System (MS4) Permit. Contaminants, including but not limited to, volatile organic compounds, petroleum products, metals, PCBs/Pesticides, shall not be discharged to the County's storm sewer system without approval from Arlington County. A separate Virginia Pollutant Discharge Elimination System (VPDES) permit, issued by DEQ may be required.
- c. Contractors shall not dump or dispose of anything in a storm drain, street, stream, or riparian area that could cause adverse conditions. Contractors shall employ good housekeeping and pollution prevention measures at work sites at all times. Work areas, including staging or stockpile areas, shall be kept clean and free of trash and debris to the maximum extent possible. Construction materials shall be properly stored and secured. Stockpiled materials shall be kept covered and perimeter controls shall be employed to minimize exposure to wind, precipitation, and runoff. Equipment and vehicle washing shall not be permitted on-site without proper controls and facilities to collect all sediment and/or pollutants. Spill kits and appropriate tools for cleanup shall be kept on-site at all times. Spills shall be cleaned immediately using absorbent materials or other appropriate measures which will prevent any pollutants from entering a storm drain or open watercourse.

PART 4 - MEASUREMENT AND PAYMENT

10. Measurement and Payment

- a. Unless otherwise specified, no separate measurement of quantities will be made for this work. Temporary erosion and sediment control as detailed on the approved plan is considered to be a subsidiary obligation to the Contract and therefore, there will be no payment made for this work.
- b. No measurement 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.
- c. No measurement will be made for limiting the area of construction operations as directed by the Engineer. 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.
- d. 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.

SECTION 02100 CLEARING AND GRUBBING**PART 1 - GENERAL**1. Description of Work

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.

2. Related Work Specified Elsewhere

Section 01500 – Temporary Erosion and Sediment Control

Section 02200- Earthwork

3. Applicable Specifications

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

Garbage, Refuse and Weeds Code (Chapter 10 of the Arlington County Code)

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

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

4. Protection of Vegetation

- a. Protect existing trees, shrubs and bushes outside the limits of clearing and grubbing by fencing or barricading as required by the Urban Forester (DPRCR). Protect existing trees designated to be saved inside the limits of clearing and grubbing by methods approved by the Urban Forester (DPRCR), which may include tree protection fencing, root pruning, and/or protective matting.
- b. Trees damaged by construction operations shall be evaluated by the Urban Forester (DPRCR) and replaced, pruned, and/or treated. Pruning or treatment must be performed by an International Society of Arboriculture (I.S.A) Certified Arborist.
- c. Replace trees damaged beyond repair by the construction process with nursery grown stock meeting American Association of Nurserymen (A.A.N.) Standards. Trees shall be replaced per the County's tree replacement guidelines.

5. Protection of Property

- a. Protect property pipes, stones and monuments from damage. The Contractor will be responsible for replacing disturbed markers by a registered surveyor at no expense to the County.

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

PART 2 - MATERIALS

PART 3 - EXECUTION

6. Clearing

The area of clearing shall be maintained within the limits shown on the plans. Individual trees, groups of trees and other vegetations, which are to remain within the areas to be cleared, are to be undisturbed, standing and not injured. Tree protection boundaries will be established and secured as directed by the Urban Forester (DPRCR) to protect the root systems as well as above ground trees. The tree protection area shall not be violated.

7. Grubbing

The area of grubbing shall be maintained within the clearing limits shown on the 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.

8. Trimming of Trees

- a. Trees may be trimmed to remove branches or roots which interfere with construction when so approved by the Engineer and Urban Forester (DPRCR). All trimming and pruning shall conform to specifications and standards of practice of the National Arborist Association.
- b. Do not unnecessarily cut tree roots extending into grading limits. When roots are exposed by the work, cut them back cleanly with hand pruning shears, lopping shears or hand saws, and backfill with approved topsoil immediately. Backfill around tree roots immediately after 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 Engineer.

9. 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 Engineer 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

10. Disposal

- a. Dispose of trees and shrubs in accordance with the Garbage, Refuse and Weeds Ordinance of the Arlington County Code. When approved by the Engineer, material may be dumped within the Contract area where directed.
- 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

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

SECTION 02200 EARTHWORK**PART 1 - GENERAL**1. Description of Work

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.

2. Related Work Specified Elsewhere

Section 01500 – Temporary Erosion & Sediment Control

Section 02100 - Clearing and Grubbing

Section 02202 - Rock Excavation

Section 02400 - Sheeting, Shoring and Bracing

Section 02650 - Restoration of Roadway

3. Applicable 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)

4. Underground Utilities

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.

5. Overhead Utilities

The Contractor shall identify and protect all existing overhead utility poles and facilities in the vicinity of the Work. The Contractor will be solely responsible for all necessary notification and coordination

with the utility owner(s). There will be no payment made for necessary bracing, sheeting, shoring, or other work required to protect and maintain existing utility poles or overhead utilities.

6. Existing Foundations

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 will be no payment made for these measures.

7. Stability of Excavations

The Contractor shall be solely responsible for the stability of excavations and for meeting all State and Federal OSHA requirements. Provide all sheathing, lagging, bracing, and other support required to retain the stability of excavations.

8. Care and Restoration of Pavement and Property

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. 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.

9. Construction Tolerance

Compact, shape, slope, and dress to yield the grades and slopes illustrated on the approved plans. In backfilled or other non-paved areas, grades shall be within 0.10 foot of the design grade. Slopes shall not be steeper than 2(H):1(V) and shall not deviate from a theoretical plane surface by more than 0.5 feet.

PART 2 - MATERIALS

10. Backfill

Backfill shall be free of vegetation, masses of roots, and stones over 3-inches in any dimension, frozen material, cinders, ashes, refuse, or porous matter. Organic matter shall not exceed minor quantities and shall be well distributed. In addition, Backfill shall be of such a nature and in such condition that it can be compacted to a dense and stable fill.

11. Topsoil

- a. Topsoil furnished by the Contractor shall consist of a natural friable surface soil without admixtures of subsoil, refuse, or foreign materials. It shall be reasonably free from roots, hard clay, coarse gravel, stones larger than 2 inches in any dimension, noxious weeds (including quackgrass rhizomes and the nut-like tubers of nutsedge), tall grass, brush, sticks, stubble, or other materials which would be detrimental to the proper development of vegetative growth.

- b. Topsoil shall contain not less than 3% nor more than 10% organic matter by weight.
- c. The Contractor shall Submit per Section 01300 to the Project Officer a soil analysis describing the soil composition including pH factor and percentage of organic content prior to placing any Topsoil.

12. Select Borrow

Select Borrow shall conform to VDOT Section 207 – Select Material, Type I.

13. Inspection of Materials

The Project Officer shall determine the feasibility or suitability of soils based upon testing provided by the Contractor and any other relevant information. The Project Officer's decision shall be final.

PART 3 - EXECUTION

14. 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 will 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 will be allowed for repair of damages.

15. 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 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 thoroughly compact. 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 Engineer. The Engineer may direct additional excavation below the bottom of the proposed pipe or structure and direct the contractor to provide an alternate bedding or foundation. Additional excavation due to the fault or negligence of the Contractor or without prior approval from the Engineer shall be remedied at the expense of the Contractor.

16. Sheeting, Shoring, and Bracing

Provide sheeting, shoring and bracing in accordance with Section 02400.

17. 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 will result in the Contractor being directed to use Select Borrow or other approved material at no expense to the County. Unless otherwise specified, the Contractor will 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 will be considered for such activities.
- d. All materials deemed unsuitable for use in the Work by the Project Officer shall be disposed of by the Contractor at his own expense. Storing, transporting, loading, handling, treating, and other associated costs are considered to be incidental to the Work and no additional compensation will be considered for such activities.
- e. The County shall take preference over others in claiming excavated material. The Contractor shall consult the Engineer before disposing of such materials.
- f. If space is available at the County's Trades Center, the Contractor may be directed to dispose of clean excavated asphalt and/or unreinforced concrete pavement there, at no cost to the Contractor or the County. If space is not available at the Trades Center, the Contractor will be responsible for alternate disposal arrangements. No additional compensation will be made

if the Trades Center does not have adequate space to accommodate materials from the project.

18. Dewatering

At all times during construction – provide, place and maintain ample means and devices with which to remove promptly all water entering trenches and other excavations. Keep excavations dry 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.

19. 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 material from areas outside the job-site to complete the backfill.
- b. All backfill materials shall contain sufficient moisture for proper compaction.
- 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, in such portions of the trenches as may be required.
- d. Backfill all excavations as rapidly as practicable after the completion of each section of the work. All unauthorized excavations made by the Contractor shall be immediately backfilled at the Contractor's expense. 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, Concrete Formwork, Reinforcement and Materials.
- 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.

20. 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.
- b. Place backfill material in six-inch layers to a point at least two feet above the pipe crown. 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 will be responsible for pipe damage as a result of excessive tamping force.
- c. Remainder of trench, more than two feet above pipe crown, may be backfilled by machinery in one-foot layers, thoroughly compacted.

21. Final Grading & Topsoil

- a. Prior to placement of topsoil, the subgrade shall be disced or rototilled to a minimum depth of 2 inches.
- b. Topsoil shall be uniformly distributed in a 4-8 inch layer and lightly compacted to a thickness of 4 inches (or as indicated on the plans) using a cultipacker, roller, or other approved equipment weighing 100-160 pounds per linear foot of roller.
- c. Topsoil shall not be placed when either the topsoil or the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to proper grading.
- d. Final grading shall not permit ponding of water.

22. Tests and Testing

- a. The optimum moisture content and the maximum density of each type of material used for structural fill and backfill 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)”.
- b. 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).
- c. Perform sufficient field density and field moisture content tests on each lift of material to ensure the Engineer that the requirements of this Section of the Specifications are compiled with.
- d. State when and where the tests are to be made so that the Engineer may observe the testing. Submit certified reports verifying test results. The Engineer 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.

23. 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 Engineer, the County may correct any dangerous 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 previous to the end of the aforementioned guarantee period.

24. Fill or Embankments

- a. Fill or embankment above existing grade shall consist of the placing, shaping, and compaction of approved Backfill material as illustrated on the approved plans.
- b. Concrete foundations, slabs, rocks, boulders, and similar material removed during excavation may be utilized in embankments when said material will 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 will 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 Backfill. 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 T-99.
- 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. Compact the ground upon which the embankment will be constructed to a depth of 8 inches prior to placing any fill material.
- g. Embankments to be constructed over swampy areas may be deposited by end dumping the original course. This course may exceed 8", but shall be the minimum depth required to support the equipment and shall be determined by the Engineer. The use of compaction equipment will not be required on the original course.

PART 4 - MEASUREMENT AND PAYMENT25. Excavation

When explicitly included as a pay item, Excavation will be measured by the cubic yard as illustrated on the approved plans, or as approved by the Project Officer. Excavation in excess of that shown on the approved plans will not be compensated, unless specifically approved in advance by the Project Officer. Payment will include all labor, materials, and equipment and will include excavation, handling, storage and disposal of materials, backfilling, compaction, testing, and all other activities necessary to comply with these Specifications.

26. Fill

When explicitly included as a pay item, Fill will be measured by the cubic yard in place as illustrated on the approved plans, or as approved by the project Officer, and will include all materials, equipment, and labor to construct the fills or embankments as illustrated on the construction drawings. Unless otherwise specified, Backfilling of excavations will not be compensated as Fill. Payment will include all clearing and grubbing, preparation, acquisition, transporting, storing, and handling of material, placement, shaping, compaction, and other activities necessary to comply with these Specifications.

27. Over excavation

When included as a pay item or Stipulated Price Item, and authorized by the Project Officer, Over Excavation conducted as a result of obstructions or unsuitable bedding for pipes or structures shall be measured in cubic yards excavated in excess of the contract documents. Payment shall be made for cubic yards and will include excavation, handling, storage and disposal of materials, backfilling, compaction, testing, and all other activities necessary to comply with these Specifications. When not included as a pay item or Stipulated Price Item, Over Excavation will be paid as Excavation. No payment shall be made for any Over Excavation unless ordered in writing by the Engineer prior to commencement of the operations.

28. Select Borrow

When included as a pay item or Stipulated Price Item, and authorized by the Project Officer, Select Borrow shall be measured in cubic yards in place. Payment will include acquisition of materials, transport, preparation, handling, storage, placement, compaction, testing, and other activities necessary to comply with these Specifications

29. Protection of Existing Utilities, Structures, and Property

Protection of existing utilities (above and below ground), structures, and other property is considered a subsidiary obligation of the Work. There will 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 Engineer. The Contractor shall identify appropriate methods to protect the unidentified facilities, and any compensation deemed due, and shall obtain approval from the Engineer prior to undertaking any action.

30. Testing

Testing will be considered subsidiary to the Work and no compensation will be approved. If the Project Officer directs testing in excess of that required by the Contract Documents, the Contractor shall be entitled to compensation unless such testing reveals noncompliant work

PART 1 - GENERAL1.1 Description of Work

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

1.2 Related Work Specified Elsewhere

Section 02200 - Earthwork for Structures and
Pipelines Section 02201 - Earthwork for Roadways

1.3 Applicable Specifications

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

1.4 Submittals

Submit the blasting plan to the Engineer for review and acceptance. Keep and submit to the Engineer 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:

Rock shall be defined as:

1. Boulders or concrete material, excluding curb and gutter and sidewalk, exceeding 1/2 cubic yard in volume.
2. Solid ledge rock conglomerate deposits and non-stratified masses so firmly cemented as to require drilling and blasting; wedging; and/or barring for its removal.

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 Underground Utility Protection Ordinance of Arlington County as well as state and federal laws and ordinances relating to explosives. Blasters shall have licenses available for examination at all times on the work site.

PART 2 - MATERIALS

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

PART 3 - EXECUTION3.1 General

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

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

3.3 Blasting

- A. Notify the Engineer at least 48 hours in advance of blasting operations.
- B. Conduct all operations involving explosives using experienced personnel only.
- C. Blast only with such quantities and strengths of explosives and in such manner as will break the rock approximately to the intended lines and grades.
- D. Avoid excessive cracking of the rock upon or against which any structure will 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

If rock is excavated beyond the limits of excavation indicated on the standard and is not authorized in writing by the Engineer, 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.

2. In excavations for structures, excess rock excavation beneath foundations shall be filled with Class A3 concrete. Other excess rock excavations shall be filled with structural fill as specified in Section 02200 with the approval of the Engineer.
3. In excavations for roadways, excess rock excavation shall be filled with material as specified for the sub grade.

3.5 Shattered Rock

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 the pipe trench standards for pipe and shall be the outside dimension plus 12 inches for structures. The pay width and depth shall be fixed regardless of the actual dimensions of rock excavation. Payment shall be made for the cubic yards excavated and shall include the pipe or precast structure bedding due to over excavation. Any additional testing required, including seismograph, other than that shown on approved plans shall be done at no cost to the County.
- 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.

PART 1 - GENERAL

1.1 Description of Work

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

Section 03100 - Concrete Formwork, Reinforcement and Materials Section 04100 - Mortar and Grout

1.3 Applicable Specifications

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

PART 2 - MATERIALS

2.1 General

- A. Stone for riprap and bedding shall be as specified in VDOT Section 205 and shall be sound, durable and free from seams, cracks and other structural defects or imperfections tending to destroy its resistance to weathering.
- B. Riprap bedding shall be reasonably well graded crush stone within the following limits:

<u>Sieve Size</u>	<u>Total Percent Passing</u>
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 414.03(a).
- B. Dry riprap, Class II, shall meet VDOT Section 414.03(a).
- C. Dry riprap, Class III, shall meet VDOT Section 414.03(a).

2.3 Mortared Riprap

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

2.4 Grouted Riprap

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

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.

2.6 Concrete Slab Riprap

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 conform to the general requirements of this section and 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 conform to the general requirements of this section and 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.

PART 3 - EXECUTION**3.1 Riprap Bedding**

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 Engineer 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 will 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 will 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 will 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

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 will 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.

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.

After the work has been completed 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.

3.4 Grouted Riprap

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.

In hot, dry weather, protect the work 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

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

3.6 Concrete Slab Riprap

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

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

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. The slopes above mean high water 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. Immediately prior to placing riprap bedding in any area, the prepared base shall be inspected by the Engineer 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. 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 will be allowed in the finished surface, but the extremes of such tolerance shall not be continuous over an area greater than 200 square feet.

- 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.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Riprap Bedding

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.

4.2 Dry Riprap

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

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

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

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

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

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

PART 1 - GENERAL1.1 Description of Work

Provide all labor, material and equipment to perform all work pertaining to the fabrication, construction, and installation of gabions in accordance with these specifications and the lines, grades and dimensions shown on the approved plans.

1.2 Related Work Specified Elsewhere

Section 02200 - Earthwork for Structures and Pipelines

1.3 Applicable Specifications

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

PART 2 - MATERIALS2.1 Gabion Units

Wire mesh used to form gabion baskets shall conform to Section 228 of the VDOT Specifications. Mesh edge wire and selvedge reinforcing wire shall be not less than 0.150 inch (9 gauge) and lacing/tie wire for binding gabion units together, not less than 0.087 inch for galvanized gabion units. When PVC coated gabions are specified on the plans, minimum edge wire and selvedge wire shall be 0.132 inch and lace wire 0.087 inch.

2.2 Stone

Stone shall conform to Section 204.02 of the VDOT Specifications.

2.3 Filter Material

Filter material shall be Miraf 140, Typar 3401 or equal.

PART 3 - EXECUTION

3.1 Excavation for gabions shall be performed in accordance with Section 02200. Gabions shall be placed on a smooth foundation. Final line and grade shall be approved by the Engineer.

- 3.2 The assembly, placement and filling of the gabion units shall be as specified in Section 610.02 of VDOT Specifications.

PART 4 - MEASUREMENT AND PAYMENT

Gabion structures shall be measured in cubic yards based on the nominal dimensions of the baskets (units) placed. Payment shall be at the unit price stated in the Bid Proposal and shall include slope preparation, excavation, erosion and sediment control, filter material, backfill where required and all other work necessary for a complete installation in place.

PART 1 - GENERAL1.1 Description of Work

Provide all labor, material and equipment to furnish and construct pile foundations as called for on the approved plans and specified herein.

The work includes pile foundations and all other incidental construction.

1.2 Related Work Specified Elsewhere

Section 02100 - Clearing and Grubbing

Section 02110 - Demolition

Section 06100 - Structural Timber and Lumber

Section 09800 - Wood Preservatives

1.3 Applicable Specifications

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

B. American Wood Preserver's Association (AWPA)

1.4 Applicable References

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

B. National Forest Products Association (NFPA)

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

1.5 Product Handling

Piling shall be delivered, stored and handled carefully to prevent physical damage such as excessive kinks, camber or twist that would prevent proper installation.

PART 2 - MATERIALS2.1 General

Timber piles shall conform to the applicable requirements of AASHTO M168. When the piles are to be treated, the treatment shall be as specified in Section 09800 of these specifications title: Wood Preservatives.

Timber piles which will be below water level at all times may be of any species of wood which will satisfactorily withstand driving.

In untreated piling for use in exposed work, the diameter of the heartwood shall be not less than 80 percent of the required diameter of the pile.

All wood piling shall be cut from sound and solid trees, preferably during the winter season. They shall contain no unsound knots. Sound knots will be permitted, provided the diameter of the knot does not exceed four (4) inches or one-third (1/3) of the diameter of the stick at the point where it occurs. Any defect or combination of defects, which will impair the strength of the pile more than the maximum allowable knot, shall not be permitted. The butts shall be sawed square and the tips shall be sawed square or tapered to a point not less than four (4) inches in diameter as directed by the Engineer.

Shoes for timber piles shall be of steel or cast iron and of a shape which will allow a secure connection to the pile and will withstand driving.

2.2 Timber Piles

Piles shall be cut above the ground swell and shall taper from butt to tip. A line drawn from the center of the tip to the center of the butt shall not fall outside of the center of the pile at any point more than one (1) percent of the length of the pile. In short bends, the distance from the center of the pile to a line stretched from the center of the pile above the bend to the center of the pile below the bend shall not exceed four (4) percent of the length of the bend or two and one-half (2-1/2) inches. All knots shall be trimmed close to the body of the pile.

Round piles shall have a minimum diameter at the tip, measured under the bark, as follows:

<u>Length of Pile</u>	<u>Tip Diameter</u>
Less than 40 feet	8 inches
40 to 60 feet	7 inches
Over 60 feet	6 inches

The minimum diameter of piles at a section four (4) feet from the butt, measured under the bark, shall be as follows:

<u>Length of Pile</u>	<u>Diameter</u>	
	So. Yellow Pine, Douglas Fir, or Species of So.	<u>All Other</u>
20 feet & under	<u>Cypress</u> 11 inches	11 inches
20 to 30 feet	12 inches	12 inches
30 to 40 feet	12 inches	13 inches
Over 40 feet	13 inches	14 inches

The diameter of the piles at the butt shall not exceed twenty (20) inches. Square piles shall have the dimensions shown on the plans.

PART 3 - EXECUTION**3.1 Inspection**

Timber piles shall be branded, prior to shipment, with the supplier's brand, year of treatment, species of timber and preservative treatment, retentions and class and length. The brand symbols shall conform to the American Wood Preserver's Association Standard M6.

3.2 Installation

Unless otherwise specified, all piles shall be peeled by removing all of the rough bark and at least eighty (80) percent of the inner bark. No strip of inner bark remaining on the stick shall be over three-fourths (3/4) inch wide or over eight (8) inches long, and there shall be at least one (1) inch of clean wood surface between any two (2) such strips. Not less than eighty (80) percent of the surface on any circumference shall be clean wood.

The timber pile foundations shall be installed properly in the sizes and to the alignment, batter and bearing as shown on the approved plans.

Driving heads, mandrels or other devices shall be provided so that the piling will be driven without injury.

The piling heads shall be square and a driving cap provided to hold the axis of the pile in line with the axis of the hammer.

PART 4 - MEASUREMENT AND PAYMENT

Timber bearing piles will be measured by the number of linear feet from points of tips to heads of the piles remaining in place on the completed project. Payment shall be at the unit price stated in the Bid Proposal and shall include splicing, pointing tips; the furnishing, fitting and attaching of metal shoes or points painting, and for furnishing all other labor, tools, equipment and incidentals necessary to complete the work.

PART 1 - GENERAL1.1 Description of Work

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

The work includes using cofferdams to allow the construction of substructures in open excavation.

1.2 Related Work Specified Elsewhere

Section 02100 - Clearing and Grubbing

Section 02200 - Earthwork for Structures and Pipelines

Section 02300 - Pile Foundations - Timbers

Section 02400 - Sheeting, Shoring and Bracing

Section 03100 - Concrete Formwork, Reinforcement and Materials

1.3 Permits and Regulations

The Contractor shall obtain all permits required by the State Water Control Board, and the United States Army Corps of Engineers.

1.4 Applicable References

- A. Erosion and Sediment Control Ordinance (Chapter 57 of the Arlington County Code)
- B. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

1.5 Submittals

The Contractor shall submit, upon request, drawings showing his proposed method of cofferdam construction and other details left to his option or not fully shown on the plans.

PART 2 - MATERIALS

Materials shall be at the Contractor's option with the approval of the Engineer.

PART 3 - EXECUTION

Cofferdams for foundation construction shall be as watertight as practicable and carried to a depth which will allow them to function properly without displacement. In general, the interior dimensions of cofferdams and cribs shall be such as to give sufficient clearance for the

construction of forms, the inspection of their exteriors, and to permit pumping from outside of the forms. Cofferdams which are tilted or moved laterally during the process of sinking shall be corrected so as to provide the necessary clearance.

When conditions are encountered which render it impracticable to dewater the foundation, the Contractor may be required to construct a concrete foundation seal of such dimensions as may be necessary and the balance of the masonry shall be placed in the dry. When a foundation seal is placed under water, the cofferdam, if it is to remain in place, shall be vented or ported at low water level.

Cofferdams shall be constructed so as to protect fresh concrete against damage from a sudden rising of the stream and to prevent damage to the foundation by erosion. Timber or bracing shall not be left in cofferdams in such a way as to extend into the substructure masonry, unless specifically authorized by the Engineer.

Excavation shall not be made outside of cofferdams, except as necessary to permit the constructing of same. The natural stream bed adjacent to the structure shall not be disturbed without permission of the Engineer. If any excavation or dredging is made before the cofferdams are sunk or in place, the contractor shall, without extra compensation after the foundation base is in place, backfill all such excavation to the original ground surface or stream bed with approved material. Material deposited within the stream area from foundation or other excavation or from the filling of cofferdams shall be removed and the stream area freed from all obstructions caused by the Contractor's operations. The Contractor shall exercise every reasonable precaution throughout the duration of the project to prevent erosion of the soil and the pollution and siltation of rivers, streams and impoundments.

The Contractor shall prepare and submit a plan indicating the precautions to be followed to prevent the aforementioned conditions. Such plan shall be approved prior to beginning work. The plan shall include, but is not limited to, the specific location of all temporary structures or other obstructions which will constrict the stream flow; a description of construction activities which will contribute to the construction of the existing stream flow; the dimensions and number of all temporary structures and constructions that are to be placed in the stream at any one time; and a dimensional elevation view of the stream and proposed temporary structures and constrictions.

The Contractor shall prevent stream constriction which would reduce stream flows below the minimum, as defined by the State Water Control Board, during construction operations.

Unless otherwise provided, cofferdams or cribs with all sheeting and bracing shall be removed after the completion of the substructure, care being taken not to disturb or otherwise injure the finished masonry.

PART 4 - MEASUREMENT AND PAYMENT

Cofferdams shall be measured in vertical linear feet. Payment shall be at the contract unit price stated on the Bid Proposal and shall include all materials, labor and equipment for clearing and grubbing, excavation, placement, removal and backfill.

PART 1 - GENERAL1.1 Description of Work

Provide all labor, material, equipment, and incidentals to furnish and place the sheeting, shoring or bracing for the protection of the work, and 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

Section 02100 - Clearing and Grubbing

Section 02200 - Earthwork

Section 02300 - Pile Foundations - Timber

Section 02350 - Cofferdams

Section 03100 - Concrete Formwork, Reinforcement and Materials

1.3 Applicable 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)

1.4 Applicable References

- A. Erosion and Sediment Control Ordinance (Chapter 57 of the Arlington County Code)
- B. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

PART 2 - MATERIALS

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

PART 3 - EXECUTION3.1 General

- A. Be fully responsible for the design and supervision of installation and removal of all sheeting, shoring and bracing required to support the excavation. Submit the design and proposed installation procedure to the Engineer for approval prior to any excavation. Approval by the Engineer will not relieve the Contractor of the responsibility for the adequacy of the shoring, and if at any time during the progress of the work it is determined by the Engineer 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 Engineer and in conformance with all applicable Local, State, and Federal regulations.

- B. The sheeting, shoring or bracing installation 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.

3.2 Installation

- A. Furnish, put in place, and maintain such sheeting, bracing and shoring 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 will 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 Engineer, in writing, shall be required for payment. Cut off sheeting and bracing at the elevations specified by the Engineer.

3.3 Removal

Remove sheeting, shoring and bracing 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 will increase the safe backfill load on the pipe or structure.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Sheeting, Shoring and Bracing

- A. Timber sheet piling, shoring and bracing, left in place as shown on the approved plans, or approved by the Engineer, in writing, shall be measured in 1,000-foot-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 and incidental work necessary for the installation.
- B. Steel sheet piling, left in place as shown on the approved plans or approved by the Engineer, 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 and incidental work necessary for the installation.
- C. Sheeting, shoring and bracing removed from the installation shall be considered a subsidiary obligation of the work to which it pertains. Payment for such sheeting, shoring and bracing shall be included in the unit and lump sum prices of the work to which it pertains.

PART 1 - GENERAL1.1 Description of Work

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

Section 02200 - Earthwork
Section 02505 – Storm Sewers
Section 02510 - Sanitary Sewers
Section 02515 – Televised Inspection of Sewers
Section 02950 - Tunneling
Section 02951 - Boring and Jacking
Section 03400 - Precast Concrete
Section 04200 - Masonry Units
Section 05500 – Structural Steel

1.3 Applicable 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)

1.4 Applicable Reference

- 1. Arlington County Plumbing Code (Chapter 18 of the Arlington County Code)
- 2. Arlington County Utilities Code (Chapter 26 of the Arlington County Code)
- 3. Erosion and Sediment Control Ordinance (Chapter 57 of the Arlington County Code)
- 4. Virginia Department of Conservation and Recreation Erosion and Sediment Control Handbook
- 5. 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].

1.5 Submittals

Submit full descriptions and details of all pipe, valves, hydrants, and other appurtenances proposed for the project Per Section 01300 Submittals.

1.6 Quality Assurance

- 1. 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 01300.
- 2. The Contractor shall provide ample space and other accommodations to enable the Engineer to inspect all pipe, structures, and other materials upon delivery to the site and prior to utilizing the

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GRAVITY SEWERS AND APPURTENANCES

pipe, structures and materials in the Work. The Contractor shall ensure that materials are stockpiled or otherwise stored such that the Engineer has access to all aspects and components.

3. The Contractor shall conduct a television inspection of all installed sewer installations in accordance with Section 02515 (CCTV Sewer Inspections) prior to final acceptance.

1.7 Easements

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

PART 2 - MATERIALS

Reinforced Concrete Pipe (RCP)

1. RCP shall conform to ASTM C-76, Class III or greater. Asbestos containing pipe or appurtenances will not be accepted.
2. 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.

Polyvinyl Chloride Pipe

1. PVC pipe and fittings 15" and less shall comply with ASTM D3034.
2. PVC pipe and fittings larger than 15" shall comply with ASTM F679, T-1.
3. 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.
4. PVC pipe shall be less than 6 months old at the time of installation.

Precast Concrete Manholes

1. 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.
2. 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.
3. 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.
4. Precast manholes shall be manufactured by Americast, or approved equal.

Concrete

SECTION 02500

GRAVITY SEWERS AND APPURTENANCES

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

Brick

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

Mortar

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.

Manhole Frames and Covers

1. Manhole frames and covers shall be constructed of gray or ductile iron conforming to ASTM A48 and A536.
2. Frames and covers shall have machined bearing surfaces to prevent rocking and rattling under traffic.
3. 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 equal.

Manhole Steps

1. 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.
2. Steps shall be PSI-PF as manufactured by M.A. Industries or Wedge-Lok as manufactured by Delta Pipe Products, or approved equal.

Manhole Neck Adjustments

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

Quick-Setting Grout

Quick-setting non-shrink grout shall conform to the requirements of VDOT. Use Octocrete, Speedcrete, or approved equal.

Miscellaneous Metals

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

PART 3 - EXECUTION

1. General

SECTION 02500**GRAVITY SEWERS AND APPURTENANCES**

1. No sewer facilities shall be constructed without approved plans, shop drawings, and construction cut sheets.
2. Sewer size, material, direction, and grade shall remain constant between manholes or structures.
3. Bring any conflicts during the installation of piping to the attention of the Engineer.
4. If any active sewers must be removed from service for any period of time, the Contractor shall submit for approval per Section 01300 a plan for diverting flow or otherwise maintaining service and capacity of the existing pipe(s) while out of service.

2. Laying 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' 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
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

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

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. 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 engineer shall be used.
- D. 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.
- E. Steps shall be provided in any structure greater than 4' in depth. Steps shall be installed in accordance with Standard Drawing M-2.0.
- F. The crown of inlet pipes shall not be lower than the crown of outlet pipes.
- G. 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.
- H. Adjust frame and cover to match finished grade using concrete adjusting ring(s).

5. Abandonment of Sewers

- A. Sewers to be abandoned may be excavated and removed or abandoned in place as detailed below.
- B. 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.

- C. Sewers to be abandoned in place shall be capped at all open ends and completely filled with flowable fill.

6. As Built Plans

- A. Prior to Final Release & Payment, the Contractor shall submit one set of As-Built drawings per Section 01300 and meeting industry standards for clarity, detail, and precision. As-Built drawings shall include a certification from the Contractor that the plans as drawn indicate actual construction.
- B. The As-Built drawings shall include, at a minimum:
 - a. Invert Elevations
 - b. Manhole top elevations
 - c. Percent of grade between manholes
 - d. Horizontal distance between manholes
 - e. Any material changes
 - f. Location of connection to existing system measured from nearest structure
 - g. Location of pipe connections, including service lines, measured from nearest manhole
 - h. Actual location, depth or elevation, and type and size of all utility crossing.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Sewer

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, and all work incidental to providing a complete sewer installation.

4.2 Manholes

Manholes for the various internal diameters shall be measured by the vertical foot from the invert of the outlet pipe to the top of the manhole cover. Payment shall include excavation, backfill, bedding, foundation, base and components, channels, sleeves, frame and cover, intermediate landings, steps, restoration and all other work necessary for a complete installation.

4.3 Adjust Existing Manholes to New Grade

Adjusting existing manhole tops to meet new grades, for the various types of adjustments listed in the Standard details, shall be measured as each. Payment shall include all materials, labor, and incidentals necessary for complete adjustment.

4.4 Excavation Below Grade and Additional Bedding

Over excavation, additional bedding and associated work shall be measured and paid in accordance with Section 02200.

PART 1 - GENERAL1.1 Description of Work

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

Section 02200 - Earthwork
Section 02500 – Gravity Sewers and Appurtenances
Section 02510 - Sanitary Sewers
Section 02515 – Televised Inspection of Sewers
Section 02950 - Tunneling
Section 02951 - Boring and Jacking
Section 03400 - Precast Concrete
Section 04200 - Masonry Units
Section 05500 – Structural Steel

1.3 Applicable 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)

1.4 Applicable Reference

- 1. Arlington County Plumbing Code (Chapter 18 of the Arlington County Code)
- 2. Erosion and Sediment Control Ordinance (Chapter 57 of the Arlington County Code)
- 3. Virginia Department of Conservation and Recreation Erosion and Sediment Control Handbook

PART 2 - MATERIALS2.1 Precast Concrete Blocks

Precast concrete blocks shall conform to ASTM C-139.

PART 3 - EXECUTION3.1 General

- A. Storm sewers shall be RCP as specified in Section 02500 Gravity Sewers. Other materials may be approved on a case by case basis.

- B. Maintain a minimum 5-foot horizontal distance between storm sewer and all other utilities.
- C. 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 DPW.

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 parged 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 and placed such that the inlet openings run perpendicular to any anticipated traffic flow.
- F. Shape inverts per drawing D-2.1.
- 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.

3.3 Design Requirements

Storm sewers shall be designed as described in the VDOT Drainage manual, with the exceptions defined below:

- A. 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 100-year storm should be the design basis.
- B. 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 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. Concrete saddles shall not be permitted.
- C. For connections to pipes 24" and smaller, the saddle shall be a strap-style saddle, with straps extending around the entire circumference of the pipe. Connections to pipes larger than 24" shall use saddles or fittings specifically designed and manufactured for such connection, with appropriate anchors. When anchors are set into concrete pipes, expansion anchors shall not be permitted. Such fittings or saddles shall eliminate any encroachment of the pump discharge pipe into the flow line of the existing pipe when flowing full. Saddles shall provide flexural relief for the pump discharge line without transmitting any stress onto the storm sewer pipe.
- 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 will be permitted.
- E. 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 chiseling or removing single bricks or blocks such that the clearance between the connection pipe and any portion of the manhole is minimized.

PART 4 - MEASUREMENT AND PAYMENT

Payment shall be as described in Section 02500 Gravity Sewers, except the items listed below.

4.1 Catch Basins and Yard Inlets

Catch basins, and yard inlets, shall be measured as each. Payment shall include excavation, bedding, backfill, concrete base and invert, walls, top, frame and cover, gutter or apron, steps, restoration, and all other work necessary for a complete installation.

4.2 Catch Basins or Other Structures Converted to Manholes

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, restoration, and all other work necessary for a complete installation.

PART 1 - GENERAL1.1 Description of Work

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

Section 02200 - Earthwork
Section 02500 – Gravity Sewers and Appurtenances
Section 02505 - StormSewers
Section 02515 – Televised Inspection of Sewers
Section 02950 - Tunneling
Section 02951 - Boring and Jacking
Section 03400 - Precast Concrete
Section 04200 - Masonry Units
Section 05500 – Structural Steel

1.3 Applicable Specifications

- A. American National Standards Institute (ANSI)
- B. American Society for Testing and Materials (ASTM)
- C. American Water Works Association (AWWA)

1.4 Applicable Reference

- A. Arlington County Plumbing Code (Chapter 18 of the Arlington County Code)
- B. Arlington County Utilities Code (Chapter 26 of the Arlington County Code)
- C. Plumbing Code adopted by the State of Virginia
- D. Erosion and Sediment Control Ordinance (Chapter 57 of the Arlington County Code)
- E. Virginia Department of Conservation and Recreation Erosion & Sediment Control Handbook
- F. 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].

1.5 Submittals

Submit full descriptions and details of all materials, and appurtenances proposed for the project Per Section 01300 Submittals

1.6 Quality Assurance

A. Sanitary Sewer Field Tests

Conduct field tests as specified in paragraph 3.6.

B. Force Main Field Tests

Hydrostatic testing of force mains shall conform to the hydrostatic testing specifications of Section 02550, except that the entire force main may be pressure tested at one time.

1.7 Definitions

- A. Terminal Sewer – Any sewer which has no other common sewers discharging into it.

PART 2 - MATERIALS

2.1 Polyvinyl Chloride pipe (PVC)

PVC pipe shall be as specified in Section 02500 Gravity Sewers and Appurtenances.

2.2 Concrete Pipe

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)

Ductile iron pipe shall conform to AWWA C-151 (ANSI A21.51), minimum class 52. Pipe lining shall be corrosion resistant to sewer gas, sewercoat, protecto 401 or approved equal 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.

2.4 Vitrified Clay Pipe

Vitrified clay pipe shall not be used as sanitary sewer pipe.

2.5 Asbestos-Cement Pipe

Asbestos-cement pipe shall not be used as sanitary sewer pipe.

2.6 Manhole Covers

Manhole covers shall be watertight, and as specified in Section 02500 Gravity Sewers and Appurtenances

PART 3 - EXECUTION

3.1 Design Basis

A. Per Capita Flow

New sanitary sewer systems shall be designed on the basis of an average daily per capita flow as follows:

<u>Establishment</u>	<u>Average Daily Usage</u>
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

Note: 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 ____

3.2 Sanitary Sewer Design Criteria

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:

- A. 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.
- B. 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 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.
- C. 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.
- D. 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.
- E. 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.
- F. 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.
- G. 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.
- H. 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:
1. The top (crown) of the sanitary sewer main shall be a minimum of 18 inches below the bottom (invert) 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.
- I. 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 Engineer, or the sewer shall be constructed of ductile iron pipe, pressure tested in place without leakage before backfill, and with no joint of the sewer closer than 8 feet of the water main.
- J. 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 backfill. 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).
- K. The minimum clear horizontal separation between sanitary sewer and utilities other than water main shall be 5 feet.
- L. 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.
- M. 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.

- N. 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)].
- O. Sanitary sewer lines constructed in fill areas shall be continuous ductile iron (CL-50) 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 3.4C for manholes in fill areas.

3.5 Sewer Service Connections

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.

3.6 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 Engineer. The Contractor shall schedule the final acceptance tests with the Engineer at least 48 hours in advance. Final acceptance tests shall be performed in the presence of the Engineer 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 Engineer'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 will 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.
- a. 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.
 - b. 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.
 - c. 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 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.

- a. 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 such as the –"Pomon-o-Weir" or equivalent.
- 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.

VACUUM TEST TABLE

Specified test period for vacuum to
Drop less than one-inch mercury

Manhole Depth In Feet	4-Foot Inside Diameter (seconds)	5-Foot Inside Diameter (seconds)	6-Foot Inside Diameter (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

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

SECTION 02510**SANITARY SEWERS AND APPURTENANCES**

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
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	1:20
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						
350	1:02	2:19	3:47						
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**4.2 Sewer Service Connections**

Sewer service connections shall be measured in linear feet along the center line of the main sewer, from the center line of main sewer to the end of the cap of where tied into the existing line. Payment for house connections shall include the plumbing permit, sewage excavation, backfill, tapping main sewer, pipe, fittings, and all cap work incidental to a complete and operable house connection.

4.3 Sanitary Sewer Force Mains

Measurement and payment shall be as per Section 02500, and shall also include thrust blocks, anchorage, and any other restraint required.

4.6 Drop Connections

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 incidentals necessary for a complete and operable installation.

PART 1 - GENERAL1.1 Description of Work

Provide all labor, materials, equipment to inspect sewer pipes using closed circuit television technology as specified herein.

1.2 Related Work Specified Elsewhere

Section 02500 – Gravity Sewers and Appurtenances
Section 02505 – Storm Sewers
Section 02510 - Sanitary Sewers & Appurtenances

1.3 Applicable Specifications

- A. National Association of Sewer Service Companies (NASSCO)

1.4 Submittals

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.

1.5 Quality Assurance

- A. The vendor performing the Television Inspections shall hold a valid NASSCO PACP certification.

PART 2 - MATERIALS2.1 Equipment

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 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 no less than 6 inches.

PART 3 - EXECUTION3.1 General

- A. After cleaning, all sewer sections shall be visually inspected by means of closed-circuit television. The inspection will be done one segment at a time from manhole to manhole and the flow in the section being inspected will 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 at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition and any connections. In no case will the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If, during the inspection operation, the television camera will 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 visually inspect all entering pipe connections and other features of interest.

3.2 Documentation

- A. All documentation shall clearly reference the adjacent structure numbers for each segment of pipe inspected.
- B. Electronic media location records shall be kept by the Contractor and will clearly show the location, by distance in 1/10 of a foot or nearest mm, from the manhole wall, in relation to an adjacent manhole of each infiltration point observed during inspection. 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, will be recorded on electronic media and a copy of such records will 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.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Television Inspection

Where specifically included as a payment item, payment shall include the labor, materials, equipment, operations, maintenance of traffic, operational modifications to the existing system, and any other work incidental to Television Inspections. If not included as a specific pay item, Television Inspection should be considered a subsidiary obligation to installation of any new sewer.

PART 1 - GENERAL1.1 Description of Work

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

Section 02200 - Earthwork for Structures and Pipelines

Section 02950 - Tunneling

Section 02951 - Boring and Jacking

1.3 Applicable Codes, 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 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).
- G. Plumbing Code adopted by the State of Virginia

1.4 Applicable References

- A. Erosion and Sediment Control Ordinance (Chapter 57 of the Arlington County Code).
- B. Virginia Department of Health (VDH) Waterworks Regulations (12 VAC 5-590)

1.5 Submittals

Submit full descriptions and details of all pipe, valves, hydrants, and other appurtenances proposed for the project Per Section 01300 Submittals.

1.6 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 Engineer will inspect pipe, fittings and joint material upon delivery to the site. The Contractor shall provide ample space between rows of stockpiled pipe to facilitate adequate inspections.

PART 2 - MATERIALS**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 Iron Pipe

- A. Iron pipe shall be ductile iron conforming to AWWA C151 (ANSI A21.51), class 53 minimum for 6-inch pipe and class 52 minimum for 8-inch and larger pipe. Pipe shall be single cement lined conforming to AWWA C104 (ANSI A21.4) and shall have mechanical or push-on joints utilizing rubber gasket rings, conforming to AWWA C111 (ANSI A21.11). Coatings shall be bituminous 1.0 mil. thick.
- 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 ANSI A21.4.
- 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 Cor-Ten corrosion resistant steel, ASTM-A242, Super Star series of Star National Products or approved equal.
- B. Mechanical joint restraints shall be used with all water main appurtenances as directed or as approved by the engineer. 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 insure proper installation of the restraining device. The minimum working pressure shall be at least 250 psi and shall be manufactured by EBAA iron, inc., MEGALUG or approved equal.

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 equal.
- 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 approved equal.

- 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. Valves shall be Mueller Co. 2360 series or approved equal.
- 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 approved equal.

2.5 Butterfly Valves, Check Valves and Cone Valves

Butterfly, check, and cone valves shall be as directed by the Engineer on a special project basis.

2.7 Fire Hydrants

- A. Fire hydrants shall be dry top, dry barrel compression type, with a valve opening of 5-1/4inches, double O-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" using Duron Duraclad 12-10611 or approved equal. Hydrants shall be Mueller Super Centurion 250, American AVK or approved equal.

2.8 Valve Boxes

Valve boxes shall be of the two-piece, sliding type 5-1/4-inch shaft, cast iron kind. Valve box 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.

2.9 Copper Pipe

Copper pipe shall be seamless water tube, AWWA type K conforming to ASTM designation B88 requirements. Fittings shall be underground copper service flared type.

2.10 Water Meters and Services by Arlington County

Water meters, including taps, pipe fittings, meter box and accessories from the water main through the meter, will 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.

2.11 Water Meters and Services 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. New water mains shall pass all acceptance testing procedures before the installation of water service connections.
- D. 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 ¾ inch and 1 inch connections. Use approved saddles for 1 ½ inch and 2 inch connections.
- E. Water service lines shall have a minimum of three feet of cover and shall be approved by the engineer, 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.
- F. 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, or approved equal.

2.12 Air Release Valves

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 requirements. Air release valves shall be manufactured by Apco, Crispin or approved equal.

2.13 Tapping Sleeves and Valves

Tapping sleeves and valves shall conform to the applicable requirements specified herein for installation on the existing type of pipe described below.

- A. Iron Pipe: The 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 and Ford style FAST or approved equal.
- B. Concrete Pipe: The tapping sleeve shall be in accordance with AWWA Manual M-9. 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. Tapping sleeves shall be JCM 415 or approved equal.

2.14 Inserting Valves

Inserting valves shall be EZ Valve as manufactured by Advanced Valve Technologies, LLC, InsertValve™ or approved equal

2.15 Service Clamps

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, 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 equal.

2.16 Manhole Frames and Covers

Manhole frames and covers shall conform to the requirements of Section 02500 Gravity Sewers, or as specified on the plans.

2.17 Manhole Steps

Manhole steps shall conform to the requirements of Section 02500 Gravity Sewers

PART 3 - EXECUTION

3.1 Water Main Design Criteria

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:

- A. 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 Section 12.10 of the Virginia Department of Health Waterworks Regulations, will 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.
- B. The hydraulic conditions at the points of proposed connection of the existing Arlington County water system shall be defined. DES will 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.
- C. 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.
- D. 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.
- E. 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.
- F. 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:
1. Sewer manholes shall be of watertight construction and tested in place.
 2. 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.
- G. No water mains shall pass through or come in contact with any part of a sewer manhole.
- H. 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 Engineer, 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.
- I. Water mains crossing under sanitary sewers shall be protected by the following provisions:
1. A minimum vertical separation of 18 inches between the top of the water main and the bottom of the sewer.
 2. Sewer shall be constructed of ductile iron pipe, pressure tested in place without leakage before backfilling.

3. 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.
 4. 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.
- J. 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.
- K. Water mains crossing under surface waters shall be protected by the following provisions:
1. The pipe shall be of special construction, having flexible watertight joints.
 2. 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.
 3. 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.
 4. Permanent taps shall be made for testing and locating leaks.
- L. The minimum clear horizontal separation between water main and utilities other than sanitary sewer shall be 5 feet (see 3.1.F for separation between water main and sanitary sewer).
- M. 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.
- N. The minimum horizontal separation between water main and buildings or other structures shall be provided as follows:
1. Ten feet for water mains less than 16 inches and 10 feet or less in depth.
 2. Fifteen feet for water mains 16 inches and larger or all mains in excess of 10 feet in depth.
- O. 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.
- P. 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):
1. Air release valves shall be located at "strategic" high points as directed or approved by DES.
 2. Refer to the standard drawings for air release valve settings.
 3. Air release valve and piping shall be two inches unless directed or approved otherwise by DES.
 4. 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.
 5. Tapping saddles shall be used.
 6. 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.
- Q. 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.
- R. No water service taps shall be made without special approval from DES in transmission mains 16 inches and larger.
- S. 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.

- T. 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.
- U. All existing segments of water main to be cut and capped shall be strapped or thrust blocked as directed by DES.
- V. 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 W-4.0).

3.2 Fire Protection Requirements

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

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 case 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, weepholes on the hydrant shall be plugged and the hydrant shall be marked for seasonal dewatering or the weephole 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

Prior to acceptance of water mains and appurtenances, the Contractor shall submit to Arlington County DES, a set of mylar tracings and CD indicating the as-built conditions. Such submittals shall be made prior to Request for Final Payment. The As-Built record drawings shall include the following:

- i) Changes in valve and fire hydrant locations.
- ii) Horizontal line changes and/or location of water main appurtenances changes.
- iii) Any changes in water main profiles greater than 6-inches.
- iv) Actual materials, limits of mechanical joint restraints and location of reaction blocking used on the project.
- v) Water main to meter distances and locations of all water service meters and water service lines.
- vi) Show actual location, depth or elevation, type and size of all utility crossings.
- vii) Provide a minimum of two (2) swing ties to all valve boxes and permanent blowoffs 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 blowoff located.
- viii) Statement from the Contractor that the As-Built construction record drawings are in substantial conformance with the associated design drawings unless otherwise noted on the as-built plans.

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 Engineer.

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.
- B. Connections to Existing Mains
1. Notify the Engineer two (2) working days prior to scheduling work on existing water mains (notify Engineer 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 Engineer.
 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

Provide caps, tees, bends and inserting valves in water mains with reaction backing and other joint restraints such as "MEGALUG", manufactured by EBAA Iron, Inc., or approved equal, 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.

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.

E. Water Service Connections

1. Water meters, including taps, pipe fittings, meter box, and accessories from the water main through the meter, will 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. 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.
3. The Contractor shall assume complete responsibility for the installation, adjustments and any damage that may occur until final acceptance of the project.
4. New water mains shall pass all acceptance testing procedures before the installation of water service connections.
5. 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 ¾ inch and 1 inch connections. Use approved saddles for 1 ½ inch and 2 inch connections.

6. Water service lines shall have a minimum of three feet of cover and shall be approved by the engineer, 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.
7. 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. Meter box covers shall be furnished by Bingham and Taylor, Capitol Foundry, or approved equal.

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 Engineer.
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.

4. 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 will be removed by DES as required. No credit or allowance will 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 requirements.
2. Water for disinfection, flushing and testing will be furnished to the Contractor from the existing water system at no charge to the Contractor. Schedule water usage with the Engineer 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 2.5 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 Engineer. 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:
- a) 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.
 - b) Tablet Method: Tablet method shall not be used if trench water or foreign material has entered the main or if the water is below 5°C (41°F). 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.
- d. 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 Engineer. The Contractor shall install corporation cocks and copper tubing for the tests at the locations indicated by the Engineer.
- e. 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 Engineer. All tests will 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.
3. The Contractor shall notify the Engineer when the work is ready for hydrostatic testing and tests shall be taken soon thereafter as practicable under the direction of the Engineer. Personnel for reading meters, gauges or other measuring devices will be furnished by the Engineer, 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

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 24 hours apart shall be obtained from the distribution system before the system can be placed into service. Samples shall be collected at all accessible locations not exceeding 2,000 feet apart in the line downstream

from where the pipe was filled with water. 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.

2. 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 Engineer 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
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 dechlorination has been achieved.
 3. Contractor shall be responsible to identify, implement, and monitor appropriate dechlorination 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. Superchlorinated 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 Engineer 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.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Water Mains

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 utilities, certification, testing, dewatering, restoration, trench maintenance, abandoning and/or removing existing mains and appurtenances as required and all other work incidental to providing a complete water main installation.

4.2 Valves

Valves shall be measured as each, by size and type. Payment shall include excavation, bedding, backfill, disinfection, certification, extension stems, thrust restraint, valve box and paved collar as required.

4.3 Fire Hydrants

Fire hydrants shall be measured as each. Payment shall include the hydrant and elbow, excavation, bedding, drainage gravel, thrust protection, backfill, disinfection, and certification.

4.4 Existing Fire Hydrants – Removed

Existing fire hydrants removed shall be measured as each. Payment shall include excavation, sheeting, shoring, backfilling, dewatering, removing, cleaning, capping hydrant branch, concrete thrust block and tie rods, joint restraint and testing of the cap.

4.5 Blow offs

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, and other incidental work to complete the installation.

4.6 Connections to Existing Water Mains

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, sleeves, dewatering, cutting, thrust restraint, and other work required to make the connection.

4.7 Tapping Sleeves and Valves

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 and backfill.

4.8 Inserting Valves

Inserting valves shall be measured as each, by size. Payment shall include test pits, excavation, bedding, thrust restraint, installation, valve, valve box and backfill.

4.9 Air Release Valves

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, and backfill.

4.10 Cutting and Capping Water Main to Remain in Service

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, and backfill.

4.11 Water Service Connections

Water Service Connections shall be measured as each, by size. Payment shall include excavation, provision of all materials and backfill. The County shall provide the water meter at no cost for service relocations.

4.12 Restoration in Paved Areas

Payment for restoration in paved area shall normally be made separately unless indicated otherwise on the approved plans or special provisions.

PART 1 - GENERAL1.1 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 will 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

Section 02201 - Earthwork for Roadways
Section 02601 - Bituminous Hiking, Biking and Jogging Trails
Section 02650 - Restoration of Roadway
Section 09900 - Protected Coatings (traffic marking material)

1.3 Applicable Specifications

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

1.4 Release

The Contractor shall obtain a release from the Engineer prior to commencing paving operations.

1.5 Applicable References

- A. American Association of State Highway and Transportation Officials (AASHTO)
- B. American Society for Testing and Materials (ASTM)

PART 2 – MATERIALS2.1 Subbase

The subbase materials shall be in conformance with VDOT Section 208, gradation 21A, except as specified on approved construction plans.

2.2 Base Course

The base course shall be bituminous concrete consisting of course and fine aggregate combined with asphalt cement, resulting in a mixture of Type BM-2 in conformance with Section 211 of the VDOT Specifications.

2.3 Surface Course

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-2A in conformance with Section 211 of VDOT Specifications.

The use of fine or coarse aggregate which tend to polish under traffic will 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

Tack coat shall be asphalt cement of viscosity grade CMS-2 or CRS-2 in conformance with Section 310 of VDOT Specifications.

2.5 Traffic Marking

Traffic marking will be provided by the County.

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.
- 3.2 Grades shall be established by the Contractor. Thoroughly prepare and compact the sub grade as specified in Section 02201 - Earthwork for Roadways. Do not prime the sub grade.
- 3.3 Lay the subbase to the compacted thickness as shown on the Construction Standards 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 Standards 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, and repair depressions and holes with material equal to that specified.

PART 4 - MEASUREMENT AND PAYMENT

- 4.1 Bituminous pavement shall be measured to the street width shown on the approved plans regardless of the actual dimension constructed times its actual length 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 pavement installed and shall include 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 regardless of the actual dimensions constructed. Payment shall be in cubic yards of material installed.

PART 1 - GENERAL

1.1 Description of Work

- A. Provide all plant, labor, material and equipment to furnish and construct the bituminous hiking, biking and jogging trails 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 will 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

Section 02600 - Bituminous Roadway Pavements

1.3 Applicable Specifications

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

1.4 Applicable References

- A. American Association of State Highway and Transportation Officials - (AASHTO)
- B. American Society for Testing and Materials (ASTM)

PART 2 - MATERIALS

2.1 Aggregate Base

The aggregate base shall be 6 inches of crusher run aggregate of size 25 or 26 and in conformance with Section 205 of the VDOT Specifications, or 6 inches of course aggregate of size 57 or 68 in conformance with Section 203 of the VDOT Specifications.

2.2 Surface Course

The surface course shall be 4-inch in thickness and type SM-2A as specified for the surface course in Section 02600.

PART 3 - EXECUTION

- 3.1 Place and compact bituminous concrete walks in conformance with Section 315.04 of the VDOT Specifications.

PART 4 - MEASUREMENT AND PAVEMENT

- 4.1 Bituminous concrete pavement shall be based on 120 pounds per sq. yd. per inch of depth and shall be measured to the width shown on the approved plans regardless of the actual dimension constructed. Payment shall be in tons of bituminous concrete installed.

- 4.2 Aggregate base shall be measured to the width shown on the approved plans regardless of the actual dimensions constructed. Payment shall be in cubic yards of material installed.

PART 1 - GENERAL1.1 Description of Work

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

Section 03100 - Concrete Formwork, Reinforcement and Materials

1.3 Applicable Specifications

- A. American Society for Testing and Materials (ASTM)
- B. Virginia Department of Transportation, Road and Bridge Specifications
(VDOT)

PART 2 - MATERIALS2.1 Aggregate Base

The aggregate base shall be aggregate conforming to VDOT Section 205 gradation 25 or 26 or course aggregate of size 68 in conformance with Section 203 of the VDOT Specifications.

2.2 Concrete

Concrete shall be Portland Cement air-entrained Class A3 in conformance with Section 03100.

2.3 Joint Filler

Joint filler shall be 1/2-inch preformed asphalt expansion joint material conforming to ASTM D994 or ASTM D1751.

PART 3 - EXECUTION

3.1 Concrete testing shall be conducted in conformance with Section 03100.

3.2 Grades shall be established by the Contractor. Thoroughly prepare and compact the sub grade as specified in Section 02201.

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 premolded 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 transverse 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 Engineer.
- 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 premolded material only along back at curb and place for the full depth of the slab. Place a premolded expansion joint between the sidewalk and adjacent curb at all crosswalks both public and private. Fasten premolded 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 premolded 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 premolded 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 Engineer. 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. No separate payment will be made for excavation or concrete used in these columns, but shall be included in the price bid for the sidewalk.
- 3.9 Provide concrete forms, and pour the concrete in conformance with Section 504 of the VDOT Specifications.
- 3.10 Finish concrete walks and driveways as specified in Section 404.19 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 measured to the width shown on the plans, regardless of the actual dimension constructed, unless otherwise approved by the Engineer, times its

SECTION 02611

**CONCRETE WALKS AND
CONCRETE DRIVEWAY ENTRANCE**

actual length. Payment shall be in square yards for each type of concrete walk, and shall include the cost of stress columns.

- 4.2 Concrete driveway entrances shall be measured by the square yard of driveway entrance placed to the limits shown on approved drawings and indicated by the Engineer. Payment shall be in square yards for each type of driveway entrance.
- 4.3 Aggregate base shall be measured to the width and depth shown on the approved plans regardless of the actual dimensions constructed, unless otherwise approved by the Engineer. Payment shall be in cubic yards of material constructed.
- 4.4 Excavation shall be measured in cubic yards in its original condition based on the cut sheets and typical section. Payment shall be in cubic yards as described in Section 02201.

PART 1 - GENERAL**1.1 Description of Work**

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

Section 02611 - Concrete Walks and Concrete Driveway Entrances

Section 02613 - Paver Crosswalk

Section 03100 - Concrete Formwork, Reinforcement and Materials

Section 04100 - Mortar and Grout

1.3 Applicable 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.
- 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 - MATERIALS

- 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.
- 2.2 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 Joint sand

<u>Sieve Size</u>	<u>Percent Passing</u>
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

- 2.3 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.
- 2.4 Aggregate used for compacted base shall be well graded crushed limestone or crushed stone specified as VDOT grade 21A, 25 or 26.
- 2.5 PVC edge restraint shall be Pave Tech edging with 12-inch x 3/8-inch diameter galvanized steel pins @ 1' on center or approved equal.

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 $\pm 1/4$ -inch to the following grades.
- 6 cm concrete pavers - 3 1/2-inch below finish grade of pavers
8 cm concrete pavers - 4 1/4-inch below finish grade of pavers
brick pavers - N/A
- 3.3 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.
- 3.4 The leveling base shall be treated with a soil stabilizer to prohibit the growth of grass.
- 3.5 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 can not be used. Hammer cutting is not acceptable. No cut segment shall be smaller than one third of a paver unit measured in any direction.
- 3.6 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.
- 3.7 Joints shall be filled after vibration using dry sand. Brush and vibrate sand into joints until they are completely filled, then remove surplus sand.
- 3.8 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.
- 3.9 Brick pavers shall be laid into a mortar setting bed and leveled. All joints shall be filled completely with mortar.
- 3.10 The color of the concrete or brick pavers shall be as indicated on approved plans. Pavers shall be selected from four or more cubes to blend color and texture variations. The laying pattern shall be herringbone unless specified otherwise.
- 3.11 Do not finish concrete base as provided for in Section 02611.
- 3.12 Edge restraints shall be 1/4-inch below the top of the edge pavers to minimize the potential for tripping and to allow for minor settlement of the pavers and to assure drainage of pavement runoff.
- 3.13 The final surface elevations shall not deviate more than 3/8-inch under a 10 foot long straight edge.
- 3.14 The surface elevation of pavers shall be 1/8 to 1/4 inch above adjacent drainage inlets, concrete collars or channels.

PART 4 - MEASUREMENT AND PAYMENT

- 4.1 Interlocking concrete and brick pavers for sidewalk application shall be measured to the width shown on the plans, regardless of the actual dimension constructed, unless otherwise approved by the Engineer, times its actual length. Payment shall be in square yards for each type of masonry walk installed, complete in place and shall include the necessary preparation of the sub grade surface, aggregate base, sand leveling base, filter fabric and edge restraints, if required.
- 4.2 Excavation shall be measured in cubic yards in its original condition based on the cut sheets and typical sections. Payment shall be in cubic yards as described in Section 02201.

PART 1 - GENERAL1.1 Description of Work

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

Section 02611 - Concrete Walks & Concrete Driveway Entrance

Section 02612 - Interlocking Concrete and Brick Pavers

Section 03100 - Concrete, Formwork, Reinforcement and Materials

Section 04100 - Mortar and Grout

1.3 Applicable 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
 - 3.

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 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 will 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 will drop to 40 degrees F or below before the mortar has set. Work will not be permitted with or on frozen materials.
 3. Do not install sand or pavers during heavy rain.

PART 2 - MATERIALS

2.1 Mortar

- A. General Requirements: Consult paver installers locally to determine the best suited for the project. Hard, naturally occurring sands with symmetrical particles are recommended for pavements subject to vehicular traffic.
- 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

<u>Sieve Size</u>	<u>Percent Passing</u>
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.

2.2 Concrete Pavers

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

The concrete base slab, slab reinforcing and expansion joints shall be as specified in Section 03100 of these specifications.

2.4 Aggregate Subbase

The aggregate subbase shall be gradation 21A conforming to VDOT Specifications, Section 208.

2.5 Geotextile

Shall be woven of polyester or polypropylene fibers, with a permeability rating 10 times greater than that of soil on which paving is founded and an apparent opening size (AOS), small enough to prevent passage of fines from setting bed into soil sub grade or graded aggregate base.

PART 3 - EXECUTION

- 3.1 Examine the areas and conditions where masonry is to be installed and notify the Engineer 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 Engineer.
- 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 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 no 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 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

Paver crosswalks shall be measured to the width shown on the plans, regardless of the actual dimension constructed times its actual length. Payment shall be in square yards for the type paver crosswalk installed, including the necessary preparation of sub grade, restoration of adjacent pavement, excavation, aggregate subbase, concrete base and incidentals necessary for a complete installation.

PART 1 - GENERAL1.1 Description of Work

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

Section 02600 - Bituminous Roadway Pavements

Section 02601 - Bituminous Hiking, Biking and Jogging Trails

Section 02611 - Concrete Walks and Concrete Driveway Entrance

Section 02612 - Interlocking Concrete and Brick Pavers

Section 02750 - Curb and Gutters

Section 03100 - Concrete Formwork, Reinforcement and Materials

1.2 Applicable Specifications

A. American Society for Testing and Materials (ASTM)

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

1.4 Applicable Reference

American Association of State Highway and Transportation Officials (AASHTO)

1.5 Permits

Before performing any work, secure the necessary permits to work within the County or State right of way and easements when surface materials will be disturbed or demolished.

PART 2 - MATERIALS

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-2 and SM-2A 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-2 as specified in Section 02600.

PART 3 - EXECUTION

- 3.1 Where trenches have been opened in any roadway or street that is a part of the State of Virginia 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 Construction Standards.
- 3.2 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.
- 3.3 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 will be constructed.
- 3.4 Complete the pavement restoration for the various types of streets in conformance with Construction Standard M-6.0 and Section 02600.
- 3.5 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 will not be permitted.
- 3.6 Maintain restored sections and surfaces as part of the Contract requirements for a period of one year following the date of final acceptance.
- 3.7 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 Pavement restoration shall be measured in square yards of the surface area restored based on the payment width, regardless of actual dimension constructed times its actual

length. Payment shall be in square yards per category of street pavement restored and shall include the necessary preparation of the sub grade surface, tack coats, bituminous concrete materials, and the crusher run backfill required in paragraph 3.3.

- 4.2 Concrete curb and gutter shall be measured in linear feet of actual replacement. Payment shall be in linear feet of curb and gutter at the price bid.
- 4.3 Concrete sidewalk restoration shall be measured in square yards to restore to original width. Payment shall be in square yards for each type of concrete walk, plain concrete or concrete with brick, and shall include the cost of stress columns.
- 4.4 There shall be no payment for temporary asphalt patch.

PART 1 - GENERAL1.1 Description of Work

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

Section 02611 - Concrete Walks and Concrete Driveway Entrance

Section 03100 - Concrete Formwork, Reinforcement and Materials

1.3 Applicable Specification

- 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 - MATERIALS2.1 Concrete

Concrete shall be Portland cement class A3 in conformance with Section 03100.

2.2 Joint Filler

Joint filler shall be 1/2-inch performed asphalt expansion joint material conforming to ASTM D994 or ASTM D1751.

2.3 Subbase

The subbase materials shall be in conformance with VDOT Section 208, gradation size 21A.

PART 3 - EXCAVATION

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 Construct forms of wood or metal conforming to VDOT Section 403.03.

- 3.3 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-foot 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.
- 3.4 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.
- 3.5 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.
- 3.6 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.
- 3.7 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.
- 3.8 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 of actual construction. Payment will be at the unit price bid per type of curb section bid, except where the curb or curb and gutter is adjacent to catch basins or drop inlets, in which case the unit price for such catch basins or drop inlets shall include that part of the curb and gutter within the limits of the structure.
- 4.2 Subbase material shall be measured to the width and depth shown on the approved plans regardless of the actual dimensions constructed. Payment shall be in cubic yards of material installed.

PART 1 - GENERAL1.1 Description of Work

Provide all plant, materials and labor required to execute this work as indicated on the approved plans, as specified and as necessary to complete the Contract, including, but not limited to, soil treatment; planting of trees, topsoil in planting areas; protection, maintenance, warranty, and replacement of plants; related items of work as indicated on drawings; inspection; and maintenance.

1.2 Related Work Specified Elsewhere

Section 02100 - Clearing and Grubbing

Section 02200 - Earthwork for Structures and Pipelines

Section 02801 - Seeding and Sodding

1.3 Applicable References

- A. Arlington County Cooperative Extension Office
- B. Erosion and Sediment Control Ordinance (Chapter 57 of the Arlington County Code)
- C. Hortus III, 1979 Edition
- D. American Association of Nurseryman's Standards
- E. Maryland Forest Conservation Manual

1.4 Permits

Before any tree may be planted on public rights-of-way, or County easements, a permit from the Department of Environmental Services shall be obtained, and reviewed and approved by PRCR.

1.5 Plant Warranty and Replacement

- A. Warranty: Guarantee that plants will be alive and in satisfactory growth for a period of two years, beginning the day the County has approved the planting.
- B. Replace dead or dying plants as soon as possible at no cost to the County.
- C. Plants used for replacement shall be the same species and size as specified in Plant List; plant, mulch, maintain and warrant as specified.
- D. Properly maintain all planting and planting areas during the progress of the work and for a maintenance period of 60 days after acceptance.

PART 2 - MATERIALS2.1 Shrubs and Trees

- A. Shrubs and trees shall be of a variety, size and quantity as shown on the approved plans and shall be planted where shown on the planting plan. Plants shall be symmetrical, typical for variety and species, sound, vigorous, free from plant disease, insect pests or their eggs, and shall have healthy, normal root systems, well filling their containers, but not to the point of being root-bound. Plants not conforming to these requirements shall be considered defective, and shall be removed from the site immediately, and replaced with approved stock at the Contractor's expense.

2.2 Water

Water shall be provided by the Contractor for use of this trade.

2.3 Miscellaneous

Mulch: Shredded hardwood.

Soil: Natural for the area, fertile, friable and within acceptable pH limits for the shrubs and trees.

Fertilizer: Of the type and composition recommended by the Arlington County Cooperative Extension Office, 855 North Edison Street, Arlington, Virginia.

Tree Stakes: 2-inch x 2-inch x 8-inch hardwood pointed on one end.

Tree Grates: 180° square, flush, non-bolt, equal of Neenah Type R-8640.

PART 3 - EXECUTION3.1 Delivery, Storage, and Soil Testing

Contact the Arlington County Cooperative Extension Office for soil testing. Deliver plants to the site in a healthy condition and properly store and protect for planting.

3.2 Grading

- A. Do not plant until finish grades are established and planting areas are properly prepared and graded.
- B. Do not work the soil when the moisture content is so great that excessive compaction will occur; nor when it is so dry a dust will form in the air or that clods will not break readily.

Apply water, if necessary, to provide ideal moisture for filling and for planting as herein specified.

- C. Preliminary grading shall be done in such a manner as to anticipate the finish grading. Remove excess soil or redistribute before application of fertilizer and mulch. Where soil is to be replaced by plants and mulch, make allowances so that, when finish grading has begun, there shall be no deficiency in the specified depth of mulched planting beds.
- D. When preliminary grading, including weeding and fertilizing, has been completed and the soil may be readily worked, grade all planting areas to a smooth, even and uniform plane with no abrupt change of surface. Slope soil areas adjacent to buildings away from the buildings, and direct surface drainage as indicated on the drawings.

3.2 Planting of Shrubs and/or Trees

- A. Remove canned stock by cutting can vertically on two opposite sides of can with instrument approved for the purpose.
- B. Spacing: Where plant material is shown on the drawings in a –“loose” pattern, space the material as shown, at all times maintaining an unequal, random spacing and conforming to the Tree Planting Details of the Construction Standards.
- C. Dig tree pits and plant pits in accordance with the Tree Planting Details, Drawing Nos. R-7.1, R-7.2 and R-7.6 of these Construction Standards.
- D. Setting: Plants shall bear some relation to soil level when planted as they did when in container. Place each plant in center of plant pit.
- E. Cut burlap, twine and wire baskets from top 12 inches of rootball and remove from site.
 - 1. Backfill with 1/2 clean existing soil, 1/4 sand, 1/4 peat moss.
- F. Firmly tamp backfill material into plant pits around and under the root ball to force out all air pockets. Backfill in conformance with the Tree Planting Details of the Construction Standards.
- G. Basin each plant with a berm 3 inches in height above crown of root ball immediately after planting and thoroughly water to saturate the root ball and backfill.
- H. Stake all trees with hardwood stakes driven 2' into firm ground and secure tree to stake as per detail R-7.2 (Planting and Guying For Trees Over 2 1/2-inch Caliper).

PART 4 - MEASUREMENT AND PAYMENT

- 4.1 Shrubs and trees shall be measured as each, by variety and size. Payment shall include the labor, materials and equipment necessary for a proper and complete installation, but shall not include tree grates.
- 4.2 Tree grates shall be measured as each, by size. Payment shall include the labor, materials and equipment necessary for a complete installation.

PART 1 - GENERAL1.1 Description of Work

Provide all labor, materials, tools and equipment as required to have topsoil, fertilizer, lime, mulch, seed and/or sod applied on all areas disturbed by construction and all areas called for on the approved plans.

1.2 Related Work Specified Elsewhere

Section 02100 - Clearing and Grubbing

Section 02200 - Earthwork for Structures and Pipelines

1.3 Applicable Specifications Virginia Field Seed Law1.2 Applicable Reference

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

Virginia Tech Specification

1.5 Submittals

In accordance with Section 01300 submit proposed names of fertilizers, sod and seed mixtures together with their composition and any certificates requested to the Engineer for approval.

1.6 Quality Assurance

The results of testing two samples from each source of topsoil to ensure that proper types and quantities of soil conditioners, and fertilizers, will be used resulting in a dense, vigorous growth of perennial lawn-quality grass. The results of this test will determine rates and types of fertilizers and lime. For seeding, the Virginia Tech rates for seeding shall be used as specified by VA/MD seed/ sod program, if available.

1.7 Testing

Test seed within 6 months of seeding to meet the requirements of the Virginia Field Seed Law for percentage of germination as follows:

Kentucky 31:	81%
German Foxtail Millet:	78%
Abruzzi Tye:	78%
Red Top:	77%

PART 2 - MATERIALS2.1 Topsoil

- A. Topsoil shall be a natural, fertile, friable soil, typical of productive soil in the vicinity, obtained from naturally well drained areas, neither excessively acid nor alkaline, and containing no substances harmful to grass growth.

2.2 Fertilizer

- A. As per Virginia Tech Specifications, soil test will be taken and fertilizer will be applied for seeding areas disturbed by clearing operations.

2.3 Seed

- A. For seeding areas disturbed by clearing operations only; where vegetation remains (per acre):

March to July:

Tall fescue, per current year Virginia Tech Recommended List: 50 pounds

German Foxtail Millet: 30 pounds

August to February:

Tall fescue, per current year Virginia Tech Recommended List: 70 pounds

Abruzzi Rye: 20 pounds

- B. For all other areas (per acre):

Tall fescue, per current year Virginia Tech Recommended List

Red Top : 3 Pounds

Under all conditions, seed shall be of the latest seed crop available.

2.4 Lime

Per acre: 2 tons/ground limestone of such fitness that 50% will pass through a U.S. Standard No. 100 mesh screen and 100% will pass through a U.S. Standard No. 10 mesh screen.

2.5 Mulch

Per acre: 2 tons of small grain mulch of high quality showing no rotting or caking and reasonably free of weeds.

2.6 Sod

Sod shall be vigorous, well-rooted, healthy turf, free from disease, insect pests, weeds, other grass, stones and of similar mix as used in seeding lawns. It shall be suitable character for the purpose intended and for the soil in which it is to be planted. Sod shall be certified at least eight (8) inches wide, not less than twelve (12) inches long, and shall have at least one and one half (1-1/2) inches in thickness, of dirt on its roots. Do not use broken or damaged sod.

2.7 Jute or Fabric

- A. Jute matting shall be of a uniform open plain weave of undyed and unbleached single juteyarn of a width of 4 feet. All material shall be new. Staples shall be made from No. 8gauge or heavier steel wire and bent to form a –“U” with a staple 1 to 1- 1/2 inches wide with 6 inch feet.
- B. Fabric shall be a combination of paper and yarn manufactured into plastic netting interwoven with paper strips as manufactured by Hold/Gro, Gulf States Paper Corporation. Staples shall be 6 inches high carbon iron.

PART 3 - EXECUTION

3.1 Topsoil

- A. After approval of rough grading rototill all areas indicated on the drawings and on other areas damaged by construction, as specified by PRCR, to a depth of 4-inch, removing stumps, all foreign objects and stones larger than one inch diameter; place topsoil approved by PRCR on all areas and incorporate by rototilling into subsoil. Topsoil origin to be specified and approved by PRCR; Certified soil tests specifying pit, % organic matter, textural analysis and N-P-K levels to be made by contractor and approved by PRCR before delivery.
- B. Remove stripped topsoil not used at the job site and dispose in a location approved by the Engineer.

3.2 Fertilizing and Rolling

If required by results of soil tests, Spread soil conditioners and fertilizers and thoroughly incorporate by rototilling work into topsoil to a depth of 4 inches. Rake topsoil until the surface is finely pulverixed and smooth. Compact with rollers weighing not over 100 pounds per linear foot of tread, to an even surface conforming to the prescribed lines and grades. Minimum depth shall be 3 inches after compaction.

3.3 Seeding

- A. Seed only when weather conditions are suitable between April 1 and May 30, or August 15 to October 1, unless approved by the Engineer. Use only certified seed blending Kentucky bluegrass cultivars with perennial ryegrass varieties approved by PRCR.

- B. If there is a delay in seeding, during which weeds grow or soil is washed out, remove the weeds or replace the soil before sowing the seed, without additional compensation. Immediately before seeding is begun, lightly rake the soil.
- C. If required by soil test results, uniformly apply lime, urea form and triple super phosphate or organic fertilizer approved by (DPRCR), with broadcast spreaders prior to seedbed preparation.
- D. Sow seed with mechanical spreaders at the specified rate on a calm day. Sow one-half the seed in one direction and the other half at right angles. Seed shall be raked lightly into the soil to a depth of 1/4-inch and rolled with a roller weighing not more than 100 pounds per linear foot of tread.
- E. If seeding by hydroseeder, add 500 pounds of wood cellulose fiber per acre and mix with the seed and the 10-10-10 fertilizer at the specified rate. Apply all seed mix within 45 minutes after mixing in hydroseeder to prevent fertilizer damage to seed and inoculants.
- F. Keep the surface moist by a fine spray until the grass shows uniform germination over the entire area. Wherever poor germination occurs in areas larger than three (3) square feet, reseed, roll, and water as necessary to obtain proper germination.

3.4 Mulching

Apply mulch immediately after seeding. Loosen baled straw and thoroughly break up before placing. Begin placement of mulch on the windward side and from the toe to slopes. Do not grind, cut or crush mulch into pieces so small as to form a mat. Cutting mulch to aid in distribution may be accomplished, provided that 10 to 25 percent of the seeded area will be exposed.

On slopes 2 to 1 and greater provide jute matting or Hold/Gro stapled 18 inches to 3 feet apart using closer spacing around curves and areas of concentrated storm water runoff.

Install jute strips beginning 12 inches behind the top of slope. Bury the top ends in a slit trench with prior approval by PRCR, urban forester. Trench should be 6 inches deep, and staple to trench bottom. Reinforce slit trench with a new row of staples one foot below trench and space at intervals of 6 to 10 inches. Staple all overlaps and the center of the material at intervals of 18-inch to 3 feet down the slope. After the jute matting is in place, overseed.

Install Hold/Gro with the fabric running vertically from the top of the slope in the direction of anticipated water flow. Do not stretch the material. Staple Hold/Gro in the same manner as specified for the jute.

3.5 Sodding

- A. The Contractor may plant ground cover, not requiring mowing, on grades exceeding a 2 to 1 slope. The contractor may sod all grades not exceeding a 3:1 slope in lieu of jute or Hold/Gro. or equivalent.

- B. On sloping areas where erosion may be a problem, sod shall be laid parallel to the contours of the slope with staggered joints and secured by tamping, pegging or other approved method.
- C. Plant only certified sod only when the soil is moist and favorable for growth. Shape the area to be sodded and finish to the lines and grades indicated on the drawings. Loosen the surface prior to placing sod. Keep the grade moist by sprinkling, if necessary, sod on the prepared surface with the edges in close contact. Each piece of sod laid shall be fitted and tamped into place with hand tampers not less than one hundred (100) square inches in area. Apply a sufficient quantity of water to all sod after laying and to prevent the sod from drying out for a period of at least two weeks to ensure growth.

3.6 Inspection

At the beginning of the next planting season after that in which the permanent grass crop is sown, inspect the seeded areas. Promptly reseed any section not showing dense, vigorous growth. Water, weed, cut and otherwise maintain the lawn until the end of that planting season.

PART 4 - MEASUREMENT AND PAYMENT

Seeding and sodding shall be measured in square yards. Payment shall include all labor, materials, and equipment including topsoil, fertilizers, seed or sod, mulch, jute or other synthetic matting and staples necessary to protect against erosion and required for a satisfactory growth of grass or sod.

PART 1 - General1.1 Description of the Work

Provide all plant, labor, materials and equipment to install water mains or sewer pipes by tunneling under railroad or highway crossings as called for on the approved plans and as specified herein.

1.2 Related Work Specified Elsewhere

Section 02110 - Demolition

Section 02202 - Rock Excavation

Section 02510 - Sanitary Sewers & Appurtenances

Section 02550 - Water Mains & Appurtenances

Section 03100 - Concrete Formwork, Reinforcement & Materials

Section 04100 - Mortar and Grout

Section 04200 - Masonry Units

1.3 Applicable Specifications

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

B. American Society of Testing and Materials (ASTM)

C. United State Bureau of Mines

1.4 Applicable References

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

1.5 Permits and Regulations

The County will obtain all permits required except those permits required for blasting as specified in Section 02110. The Contractor shall conform to the regulations set forth by the authorities having jurisdiction over the work performed in the areas of tunnel crossings.

1.6 Submittals

Submit detailed shop drawings which shall include the location of the tunnel pits, soils data, method of excavation and support, method of dewatering, tunnel linings showing thickness, size, shape and method of attachment, and grouting details. Include details on the method of installing the carrier pipe.

PART 2 - MATERIALS**2.1 Tunnel Liner Plates**

The tunnel liner plates shall be fabricated from structural quality, hot-rolled, carbon steel sheets or plates conforming to ASTM A-570, Grade B for sheets, or ASTM A-283, Grade B for plates. Liner plates shall be galvanized to meet the requirements of AASHTO M-167 and shall provide a minimum diameter of 4'-0-inch. Where specified, the tunnel liner plates shall be bituminous coated to meet the requirements of AASHTO M-190.

All tunnel liner plates shall be flanged and punched for bolting on both longitudinal and circumferential joints and shall be fabricated so as to permit erection from the inside.

2.2 Bolts and Nuts

Bolts and nuts shall be quick acting, coarse thread not less than 1/2-inch in diameter for specified plate thicknesses up to and including 0.179 inches and 5/8-inch in diameter for liner plates of greater thicknesses. Bolts and nuts shall conform to ASTM A307 Grade A and shall be galvanized as per ASTM A153.

2.3 Carrier Pipe

Water mains and sewers shall be as specified in Section 02550 and Section 02510 respectively.

2.4 Concrete

Concrete used in tunneling construction shall be as specified in Section 03100.

2.5 Brickwork

Brick and masonry work performed at the ends of the tunnel shall be as specified in Sections 04100 and 04200.

2.6 Forced Grout

Grout that is force injected between tunnel line plates and tunnel wall shall be one part Portland cement (ASTM C150, Type II), and six parts sand (ASTM C33).

2.7 Equipment

- A. Tunneling equipment shall be as approved by U.S. Bureau of Mines.
- B. The grout pump and injection system shall deliver the grout in a smooth and even flow without surge while developing a uniform pressure of 50 psi at the grout hole connection.

PART 3 - EXECUTION3.1 General

- A. Maintain free and full use of the surface on private property, streets, roadways and railways, under which tunneling construction takes place. Maintain close observation of surface facilities to detect settlement or displacement. Notify the Engineer immediately if settlement is detected. Take appropriate action to maintain safe conditions and prevent damage.
- B. Should the Contractor elect to sink shafts at any point on the tunnel alignment for more efficient construction, he shall obtain permission from the holders of private property or the agencies having jurisdiction over the property, easement, or right-of-way. Remove excavation from such shaft or shafts, as well as all mucking, from the premises to storage dumps acquired by the Contractor at his own cost and expense. Backfill shafts at no expense to the County with materials approved for backfilling by the Engineer. Line shafts with steel liner plate of structural adequacy to withstand all earth pressures. Plates shall form a concentric circle and be bolted in place as the shaft is sunk. Extend the liner plates above the surface 3'-12" for protection of the public. No shaft shall be less than 12' in diameter. Where shafts are at portals, timber sheeting and bracing of structural adequacy may be used as an alternate to steel liner plates if permission is granted by the Engineer in writing.

3.2 Ventilation System

Furnish, install, operate and maintain a temporary ventilation system for the removal of dust in the tunnel shaft according to local and Federal regulations.

3.3 Electric Lights

Provide temporary electric lights to properly and safely illuminate all parts of the tunnel construction area with special illumination provided at the working face. Lighting circuits shall be thoroughly insulated and separated from power circuits, and shall be enclosed in wire cages. Secure all necessary electrical permits for successful completion of this aspect of the work.

3.4 Excavation for Tunnel Liner Plates

On initial set-up, support the tunneling equipment on a concrete cradle poured to permit the proper installation of the tunneling. During forward movement of tunneling operations, provide sufficient support at the tunnel face to ensure that only materials physically displaced by the tunneling equipment are removed.

Excavation for liner plates shall proceed in increments sufficient for the erection of one ring of liners; install liner plates immediately after each increment of excavation. Keep voids behind liner plates to a minimum.

3.5 Installation of Tunnel Liner Plates

Handle liner plates in such a manner as to prevent bruising, scaling, or any other damage to the linings and coatings.

Ensure that the plate edges are clean and free from material that could interfere with proper bearing during installation.

Assemble liner plates to the lines and grades shown on the Contract Drawings in accordance with the manufacturers recommendations. Retention or replace any bolt that does not meet the requirements.

On 8' centers and in the liner plate at the top of each ring, there shall be a 2-inch standard half pipe coupling welded into a hole in the liner plate and cast iron closure plugs screwed therein. On the completion of each day's work the cast iron plugs shall be removed and the voids between the outside of the liner plate and the earth or rock shall be completely filled by pressure grouting with one part Portland cement and 6 parts mortar sand. The pressure shall be adequate to fill all the voids, but not great enough to bulge the liner plates.

3.6 Installation of Carrier Pipe in Tunnel

The carrier pipe shall be laid to the true line, grade, and elevations called for in the approved plans. Mount pipe on blocks, saddles, or other approved methods to obtain the exact lines and grades. Secure carrier pipe against flotation or vertical movement in accordance with standard details or as otherwise approved by the Engineer. Protect the ends of tunnel against entry of foreign matter and water with brick and masonry construction of 6-inch minimum grout. Provide 2-inch weep hole at each end of tunnel. Grout or provide sand as shown on the Standard Detail M-5.0.

3.7 Rock Excavation

Rock excavation shall be carried out as specified in Section 02202.

PART 4 - MEASUREMENT AND PAYMENT

Measurement shall be in linear feet of the tunnel liner plate invert. Payment shall include the liner plates, sand or grouting, dewatering and carrier pipe installed, complete in place

PART 1 - GENERAL1.1 Description of the Work

Provide all plant, labor, materials and equipment to install water mains or sewer pipes by boring and jacking under highway crossings as called for on the approved plans and as specified herein.

1.2 Related Work Specified Elsewhere

Section 02202 - Rock Excavation

Section 02510 - Sanitary Sewers and Appurtenances

Section 02550 - Water Mains and Appurtenances

Section 03100 - Concrete Formwork, Reinforcement and Materials

Section 04100 - Mortar and Grout

Section 04200 - Masonry Units

1.3 Applicable Specification

American Water Works Association (AWWA)

1.4 Applicable Reference

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

1.5 Permits and Regulations

The County will obtain all permits. The Contractor shall conform to the regulations set forth by the authorities having jurisdiction over the work performed in the areas of bore and jack construction.

1.6 Submittals

Submit detailed drawings which shall include the location and size of pit, the method of boring and jacking, the size, capacity and arrangement of equipment, the method of dewatering, and the method of controlling line and grade.

PART 2 - MATERIALS2.1 Casing Pipe

The casing pipe used shall be black seamless steel pipe with a minimum thickness of 3/8-inch of the sizes shown on the Standard Detail. Pipe shall have a minimum yield strength of 35,000 psi and shall conform to AWWA C-200.

2.2 Carrier Pipe

Water mains shall be as specified in Section 02550 and sewer pipes as specified in Section 02510.

2.3 Concrete

Concrete shall be as specified in Section 03100.

2.4 Brickwork

Brick and masonry work as performed at the ends of the casing pipe shall be as specified in Sections 04100 and 04200.

2.5 Equipment

Boring and jacking equipment shall be at the Contractor's option.

PART 3 - EXECUTION

3.1 General

- A. If an obstruction is encountered during installation which stops the forward action of the pipe and makes it impossible to advance the pipe, notify the Engineer immediately. If necessary, operations will cease and the pipe shall be abandoned in place and either plugged or filled completely with grout.
- B. Maintain close observation of surface facilities to detect settlement or displacement. Notify the Engineer immediately if settlement or displacement is detected. Take action to maintain safe conditions and prevent damage.

3.2 Construction of Boring Pit

Excavate boring pit in accordance with detailed drawing specified in Paragraph 1.6. The pit shall be of adequate length to provide room for the jacking frame, the jacking head, the reaction blocks, the jacks and two sections of casing pipe. The pit shall be wide enough to allow ample working space on either side of the jacking frame. The depth of the pit shall be such that the invert of the pipe when placed on the guide frame will be at the desired elevation for the finished line. The pit shall be tightly sheeted and kept dry at all times.

Design and install the reaction blocks to carry the thrust of the jacks to the soil without excessive soil deflection and in such a manner as to avoid any disturbance of adjacent structures or utilities.

Provide adequate protective railings and/or fences at the top of the pit at all times.

3.3 Boring and Jacking Operation

Provide removable auger and cutting head arrangement. Arrange the face of the cutting head to provide reasonable obstruction to the free flow of soft material. Push the pipe with boring auger rotating within the pipe to remove the spoil. Over cut by the cutting head shall not exceed the outside diameter of the casing pipe by more than 1/2-inch.

Use hydraulic jacks in the jacking operation and take extreme care to hold the pipe to the exact lines and grades shown on the Contract Drawings. Excavation at the heading shall not exceed on foot ahead of the lead pipe. As one section of casing pipe is installed, the next section shall be aligned on guide timbers and welded to preceding section, and the boring and jacking process continued.

3.4 Installation of Carrier Pipe

Lay the carrier pipe to the true line, grade and elevations called for on the Contract Drawings. Use rollers, timber skids or other supports, approved by the Engineer, strapped to the carrier pipe inside of the casing pipe to avoid the pipe resting on any bells and to keep the completed installation at the required line and grade.

Protect the ends of the casing pipe against entry of foreign matter and water with brick and masonry construction or 6-inch minimum grout. Provide 2-inch weep hole at each end of casing pipe.

3.5 Rock Excavation

Rock excavation shall be as specified in Section 02202.

PART 4 - MEASUREMENT AND PAYMENT

Measurement shall be in linear feet of casing pipe installed. Payment shall include the casing pipe and carrier pipe installed, complete in place.

PART 1 - GENERAL1.1 Description of Work

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

Section 03400 - Precast Concrete

1.3 Applicable 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.

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.
- 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 - MATERIALS**2.1 General**

Concrete materials, methods of mixing, conveying, curing, placing, reinforcement, and the making and removal of forms shall conform to the latest requirements of Section 217 of the VDOT Specifications.

2.2 Class of Concrete

Cast-in-place concrete shall be Class A3 General Use (3,000 psi) or Class B2 (2,200 psi) unless stated otherwise on the approved plans.

2.3 Earth Forms

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

Except where noted otherwise on the approved plans, use plywood forms for all concrete which will be exposed in the finished work, and for all exterior walls below grade which are to receive membrane waterproofing. Plywood shall conform to U.S. Product Standard PS 1-66 and 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

Use non-grain raising and non-staining type that will not leave residual matter on surface of concrete or adversely affect proper bonding of subsequent application of other material applied 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 equal. 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 will 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.

SECTION 03100

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 Engineer 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 Engineer. Failure to deliver such completed ticket to the Engineer will be cause for the Engineer 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.

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 deflection 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 Engineer.
- 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 Engineer. 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.
- 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 troweling 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 will 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.

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 Engineer may require for on site testing and for collecting and forwarding concrete samples for testing to an approved independent laboratory selected by the Engineer. 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 will 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 strength tests may be waived by the Engineer 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 will 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 will 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 Engineer 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 Engineer's approval. Should only surface imperfections occur, patch at the discretion of, and in a manner satisfactory to, the Engineer. 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.

PART 1 - GENERAL**1.1 Description of Work**

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

Section 02500 - Storm Sewers and Drainage Systems

Section 02510 - Sanitary Sewers and Appurtenances

Section 03100 - Concrete, Formwork, Reinforcement and Materials

1.3 Applicable 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 Engineer 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.

1.6 Class of Concrete

Concrete for precast structures shall be VDOT Class A4 General. Use unless stated otherwise on the approved plans.

PART 2 - MATERIALS2.1 General

Concrete materials, methods of mixing, conveying, curing, placing, reinforcement, and the making and removal of forms shall conform to the latest requirements of the VDOT Section 217.

2.2 Precast Concrete Manholes

Precast concrete manhole bases, risers and cones shall conform to requirements of ASTM C-478 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.

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 the Virginia Precast Corp., Valley Blox, Inc., or equal.

2.3 Precast Concrete Catch Basin

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

Fabrication and testing of the precast concrete structures shall be in accordance with the stipulated execution procedures of Section 03100.

PART 4 - MEASUREMENT AND PAYMENT

No separate measurement and payment will be made for this work. It is covered under other work to which it relates.

PART 1 - GENERAL1.1 Description of Work

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

Section 04200 - Masonry Units

1.3 Applicable Specifications

- A. American Society for Testing and Materials (ASTM)
- B. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

PART 2 - MATERIALS2.1 General

Mortar and grout shall conform to the latest requirements of Section 218 of the VDOT Specifications.

2.2 Mortar for Unreinforced Masonry and Brick

The mix for unreinforced masonry shall conform with ASTM C270, Type "M" with the following options:

- A. Portland Cement Mortar: 1 part Portland cement; 1/4 part hydrated lime and lime putty; 3-1/2 parts sand.
- B. Masonry Cement Mortar: 1 part Portland cement; 1 part masonry cement; 4-1/2 parts sand.

2.3 Mortar and Grout for Reinforced Masonry

The mix for reinforced masonry shall conform with ASTM C476 Type PM or PL.

PART 3 - EXECUTION3.1 Storage of Materials

Protect materials from moisture, foreign material and deterioration.

3.2 Weather Requirements

Hot Weather: Add water as needed to supplement evaporation losses. Cold Weather: When air temperatures range between 32°F and 40°F, heat mixing water or aggregate to between 70°F and 160°F maximum. When air temperature is below 32°F, and only with the approval of the Engineer, heat both the mixing water and aggregate to between 70°F and 160°F 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 Engineer for approval.

3.4 Mixing Mortar and Grout

Mix mortar in accordance with ASTM C270 (Unity Masonry) and mortar and grout in accordance with ASTM C476 (Reinforced Masonry). Mortar or grout not within 2-1/2 hours after mixing shall not be used in masonry work.

PART 4 - MEASUREMENT AND PAYMENT

No separate measurement and payment will be made for this work. It shall be considered a subsidiary obligation of the Contract under other work to which it relates.

PART 1 - GENERAL1.1 Description of Work

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

Section 04100 - Mortar and Grout
Section 09900 - Protective Coatings

1.3 Applicable Specifications

- A. American Society for Testing and Materials (ASTM)
- B. Virginia Department of Transportation, Road and Bridge Specifications (VDOT)

1.4 Submittals

Submit to the Engineer, 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 Engineer.

PART 2 - MATERIALS2.1 Masonry Units

Masonry block and brick units shall conform to Section 222 of the VDOT Specifications.

2.2 Welded Wire Fabric

Welded wire fabric shall conform to Section 228 of the VDOT Specifications.

2.3 Steel Reinforcement

Steel reinforcement called for on the approved plans shall be deformed bars, grade 40, in conformance with Section 223 of the VDOT Specifications.

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

3.2 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 will 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 32°F and 40°F -- protect newly laid masonry from rain and snow 24 hours.
 - 2. Avg. daily air temperature between 25°F and 32°F -- 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 20°F -- provide enclosure and heat to maintain air at 32°F for 24 hours. Do not lay masonry units at temperatures colder than 30°F.
- D. Before resuming work, top surface of masonry in place shall be cleaned of loose mortar and foreign material.

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 will 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.
- 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.

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

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, excavation and backfill, and all necessary appurtenant items. Other use of the masonry block and concrete block is covered under the work to which it relates.

PART 1 - GENERAL1.1 Description of Work

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

Section 04100 - Mortar and Grout

1.3 Applicable Specifications

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

PART 2 - MATERIALS2.1 Mortar

Mortar shall conform to Section 222 of the VDOT specifications.

2.2 Stone

Stone shall conform to Section 204 and 508.03(a) of the VDOT specifications.

2.3 Concrete Rubble

Concrete rubble shall be approved by the Engineer. Concrete rubble available from the County will be so noted on the approved plans.

2.4 Concrete Rubble Backing

Class A3 concrete conforming to Section 217 of the VDOT Specifications.

2.5 Filter Material

Filter material shall be Miraf 140, Typar 3401 or approved equal.

2.6 Backfill

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

Construct mortar rubble masonry walls in conformance with the approved plans and the standard details. Shaping, dressing, cleaning, wetting, laying and other construction procedures for the walls shall be performed in accordance with Section 508.03(b) of the VDOT Specifications.

PART 4 - MEASUREMENT AND PAYMENT

Mortar rubble masonry walls shall be measured in cubic feet based on the approved plans and sections. Payment shall include the concrete rubble backing, excavation, backfill, testing of materials, labor, material and equipment necessary for a complete and structurally sound retaining wall in place.

PART 1 - GENERAL1.1 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

Section 09900 - Protective Coatings

1.3 Applicable 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)

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. Fabrication and installation procedures shall conform to the specifications and practices of the American Institute of Steel Construction.

PART 2 - MATERIALS3.1 General

- A. Standard Structural Steel Shapes and Plates shall be in conformance with ASTM A-36.

SECTION 05500

- 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. General
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.
- B. Rail and Post Spacing

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.

2.3 Gratings

All gratings shall be as indicated on the standard drawings.

2.4 Expansion Bolts

- A. Bolts shall be "Wej-It" concrete anchors as manufactured by "Wej-It" Expansion Products, Inc., Broomfield, Col., "Taper Bolt" as manufactured by U.S. Expansion Bolt Co., York, Pa., or approved equal.

Self-drilling expansion anchors where called for on the plans shall be "Red Heads" as manufactured by the Phillips Drill Co., Michigan City, Indiana, or approved equal.

Contractor shall submit certified test reports establishing shear and tensile pull out for the anchors used.
- B. Bolts shall be of the same type as the members which they support, that is Type 2024-T6 alloy for aluminum shapes and hot dipped galvanized steel for structural steel shapes. Stainless steel bolts shall be used in all process units.

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

SECTION 05500

**STRUCTURAL STEEL
& MISCELLANEOUS METAL**

- 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.

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, will 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 will 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.

PART 1 - GENERAL1.1 Description of Work

Provide all labor, material and equipment to furnish and construct with structural timber and lumber as called for on the approved plans and specified herein. The work includes timber and lumber construction and all other incidental construction.

1.2 Related Work Specified Elsewhere

Section 02100 - Clearing and Grubbing

Section 02110 - Demolition

Section 09800 - Wood Preservatives

1.3 Applicable Specifications

A. American Lumber Standards

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

1.4 Applicable References

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

B. National Forest Products Association (NFPA)

1.5 Product Handling

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 - MATERIALS

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.

PART 3 - EXECUTION3.1 Inspection

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 Engineer.

3.2 Installation

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

All timber and lumber will 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 Engineer. Payment shall include all labor, materials and equipment, including preservatives and coatings, necessary for a complete installation.

PART 1 - GENERAL1.1 Description of Work

Provide all plant, labor, equipment and materials to waterproof all sanitary manholes and other structures subject to hydrostatic head when called for on the approved plans.

1.2 Related Work Specified Elsewhere

Section 07150 - Damp proofing

1.3 Applicable Specifications

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

1.4 Applicable References

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

B. American Society of Testing and Materials (ASTM)

1.5 Quality Assurance

Provide certified test reports of testing required by referenced specifications.

PART 2 - MATERIALS

2.1 Primer, asphalt, fabric and joint sealers shall conform to Section 213 of the VDOT Specifications.

2.2 Membrane: System A, B, C or D as specified in Section 214.04 of VDOT Specifications or preformed elastomeric waterproofing as manufactured by Polyguard (No. 650), B.F. Goodrich (20 mil vinyl water barrier) or Grace (Bithuthene 3000).

PART 3 - EXECUTION

3.1 Waterproof exterior, below grade structures when called for on the approved plans.

3.2 Conform to Section 416 of VDOT Specifications when applying System A, B, C, or D except that structures shall be treated as that specified for decks.

3.3 Conform to the manufacturer's printed instructions when applying preformed elastomeric waterproofing.

PART 4 - MEASUREMENT AND PAYMENT

No separate measurement and payment will be made for this work. It shall be considered a subsidiary obligation of the Contract under other work to which it relates.

PART 1 - GENERAL1.1 Description of Work

Provide all plant, labor, equipment and materials to damp proof structures not subject to hydrostatic head when called for on the approved plans.

1.2 Related Work Specified Elsewhere

Section 07100 - Waterproofing

1.3 Applicable Specifications

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

1.4 Applicable References

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

B. American Society for Testing and Materials (ASTM)

1.5 Quality Assurance

Provide certified test reports of testing required by referenced Specifications.

PART 2 - MATERIALS

Primer and asphalt shall conform to Section 213 of the VDOT Specifications.

PART 3 - EXECUTION

Conform to Section 417 of VDOT Specifications.

PART 4 - MEASUREMENT AND PAYMENT

No separate measurement and payment will be made for this work. It shall be considered a subsidiary obligation of the Contract under other work to which it relates.

PART 1 - GENERAL**1.1 Description of Work**

Provide all labor, materials and equipment for the complete application of paint to new and or existing ferrous metal structures in the conformance with the requirements of the various sections of these specifications.

Painting shall conform to the requirements specified in the specifications and where called for on the approved plans or special provisions.

For safety precautions, the Contractor shall wear protective goggles and masks for the cleaning and painting of metal structures.

1.2 Related Work

Section 09900 - Protective Coatings

1.3 Applicable Specifications

- A. American Society for Testing and Materials (ASTM)
- B. American Association of State Highway and Transportation Officials (AASHTO)
- C. Steel Structures Painting Council (SSPC)
- D. Virginia Department of Transportation (VDOT)
- E. Occupational Safety and Health Administration (OSHA)
- F. Toxic Substance Control Act (TSCA)
- G. Hazardous Material Transportation Act (HMTA)
- H. United States Environmental Protection Agency (USEPA)
- I. Virginia Department of Health, Solid & Hazardous Waste Management Division (VDH)

1.3 Surfaces not to be Painted

Refer to Section 09900, Paragraph 1.4

1.4 Submittals

Refer to Section 09900, Paragraph 1.5

1.5 Quality Assurance

A. Refer to Section 09900, Paragraph 1.6

B. Steel Structures Painting Council (SSPC):

SSPC-SP1-82	Solvent Cleaning
SSPC-SP2-82	Hand Tool Cleaning
SSPC-SP3-82	Power Tool Cleaning
SSPC-SP6-85	Commercial Blast Cleaning
SSPC-Visual	Pictorial Surface Preparation Standards For Painting Steel Surfaces

C. To assure quality control and the quality of the paint a representative of the paint manufacturer shall be present during the initial stages of mixing and application of the paint system.

1.7 Product Delivery, Storage and Safety Data

Product delivery, storage and safety data shall conform to the manufacturer's specification and Section 09900, Paragraph 1.7. All containers shall be labeled with:

- A. Manufacturer's Name
- B. Product Name & Number
- C. Batch Number
- D. Date of Manufacturer

1.8 Guarantee

Refer to Section 09900, Paragraph 1.8.

1.9 Weather Conditions

Paint shall be applied only on thoroughly dry surfaces and during periods of favorable weather conditions. Blasting and/or painting will not be permitted when the atmospheric temperature is at or below 40°F. in the shade; when the relative humidity exceeds 85% at the site of work or when weather conditions would prevent obtaining a satisfactory job, such as anticipating rain, fog or any type of condensation, dust or when it can be anticipated that atmosphere temperature will drop below 40°F. Painting shall not be permitted on surfaces that are sufficiently hot to cause blistering or when the surface is damp. The surface should be dry and at least 5°F above the dew point. Or as specified by the manufacturer.

1.10 Protection Against Damages

The Contractor shall provide protection devices such as tarps, screens, covers, as necessary to prevent damage to the work, other property, persons, or environment from all cleaning and painting operations.

A water trap acceptable to the Engineer, shall be furnished and installed on all equipment used in spray painting.

Paint or paint stains which result in an unsightly appearance on a surface not designated to be painted shall be removed by the Contractor at his expense and to the satisfaction of the Engineer.

All painted surfaces that are marred or damaged as a result of the Contractor's operation shall be repaired by the Contractor, at his expense, with materials and to a condition equal to the coating specified herein. Upon the completion of all painting operations and any other work that would cause dust, grease, or any other foreign materials to be deposited upon the painted surfaces, shall be thoroughly cleaned off to the satisfaction of the Engineer. If traffic conditions start to cause dust, the Contractor, when directed by the Engineer, shall sprinkle water or a dust palliative on area of the traveled way to control the problem. No additional payment will be made for this work.

1.11 Special Stenciling

The date (month and year) of painting shall be stenciled by the Contractor in two locations on the structure, as directed by the Engineer. The block letters shall be 2 1/2-inch high, and the paint used shall be in distinct contrast with the background.

PART 2 - MATERIALS

2.1. Acceptable Manufacturers

The protective coating system specified under this specification is in reference to the Tnemec Company. Other systems are acceptable provided that they are equal or better than the system referenced to:

TNEMEC Company Incorporated, Richmond, VA.
Ditsler Company (Manufacturer's representative)
302 West Cary Street
Richmond, VA 23220DC Metro (804)780-3077

2.2 Paint Materials

The paint for new or existing structural steel or other metal surfaces shall conform to the requirements of this section, unless otherwise specified on the plans or in the special provisions. The following descriptions apply to the TNEMEC system for primers, and top coat coating profile. Other systems will be accepted if proven to be equal or better than the system specified in this section.

<u>Coating</u>	<u>Description</u>
90-97 Tneme-Zinc: Zinc-Rich organic moisture cured	A two-component moisture cured urethane primer

zinc-rich primer, used in conjunction with chemical and corrosion resistant top coats. When used as a shop primer, may be recoated the same day.

Conforms to SSPC-PS 12.01.

Endura-Shield III

Series 73:

High build

acrylic polyurethane

A high-solids, high-build, fast-drying coating that is highly resistant to abrasion, corrosive fumes and chemical contact. Can be applied in a single coat directly to properly applied organic zinc-rich primers and other compatible coatings without the use of an intermediate or tie coat. Provides long-term color and gloss retention.

2.3 Material Preparation

- A. Do not use any material older than the manufacturer's recommended shelf life.
- B. Mix and thin materials according to manufacturer's latest printed instructions.
- C. Do not use mixed materials beyond manufacturer's recommended pot life.

2.4 Paint System

Unless specified in the plans or special provisions, it is understood that the coating application for primers, intermediate coats and top coats received shall be as recommended by the manufacturer. The minimum acceptable thickness is that enclosed in the parenthesis.

A. System – 1

Produced by TNEMEC

Primer- 9097 Tneme-Zinc

SURFACE PREPARATION
(SSPC-SP6)

Commercial Blast Cleaning

COLOR

Reddish-Gray

METALLIC ZINC CONTENT

83% by weight in dry applied film

SOLID BY VOLUME

63.0% ±2.0% (Mixed)

THEORETICAL COVERAGE

1003 mil sq. ft. per gallon

DRY FILM THICKNESS

2.5 to 3.5 mils per coat

CURING TIME

At 75°F To handle: 1 hour

To recoat: 4 hours

TEMPERATURE RESISTANCE

(Dry) Continuous 250°F

Intermittent 300°F

SPECIAL QUALIFICATIONS

This product meets the requirements of the United States Department of Agriculture for use in federally inspected meat and poultry processing plants

Intermediate Coat – (None applicable with this system)

Top Coat - Series 73 Endura Shield III

SURFACE PREPARATION

Prepare surfaces by method suitable for exposure and surface (see prime coat data). All surfaces must be dry and clean.

COLORS

Refer to Tnemec CHROMACOLORS

FINISHES

Semi-gloss

SOLIDS BY VOLUME*

58.0 + 2.0% (Mixed)

THEORETICAL COVERAGE*

930 mil. sq. ft. per gallon

DRY FILM THICKNESS

3.0 to 5.0 mils per coat

CURING TIME - AT 75oF

To touch: 1 hour

To handle: 5 hours

To recoat: 12 hours

To resist moisture condensation:

3 to 6 hours

TEMPERATURE RESISTANCE

(Dry) Continuous 170oF. Intermittent 200°F

MIXING RATIO

By volume-Four (Part A) to One (Part B)

CHEMICAL RESISTANCE

Organic Acids

Mineral Acids

Oxidizing Agents

Alkali Solutions

FREQUENT CONTACT

Alcohols

Aliphatic Hydrocarbons

Aromatic Hydrocarbons

Salt Solutions

Ketones

Fresh Water

Waste Water

Mineral Oils

Vegetable Oils

*Values may vary with color.

2.5 Performance Criteria

This product will meet or exceed the following test requirements

90-97 Theme-Zinc

Type: Zinc-rich Urethane Primer

Adhesion

Method:	Elcometer Adhesion Tester (0 to 1,000 psi). Coating applied to sandblasted steel panels and cured 7 days at 77°F./50% R.H.
System:	90-8 One-Coat 90-97 Theme-Zinc.
Requirement:	Not less than 800 psi pull, average of three trials.
Method:	ASTM D 3359 (Method B). Substrate: 4-inch x 12-inch x 1/8-inch steel panels.
Surface Preparation:	SSPC-SP10.
System:	90-8 One-Coat 90-97 Theme-Zinc cured 7 days at 77°F./50% R.H.
Requirement:	No less than a rating of 5, average of three trials.

Salt Spray (Fog)

Method:	ASTM B117-73. System: 90-8 One-Coat 90-97 Theme-Zinc.
Requirement:	No blistering, cracking, softening or delamination of film. No rust creepage at scribe and no rusting at edges after 3,000 hours of exposure.
Method:	ASTM B 117-73.
System:	90-97 Theme-Zinc/Series 73

Endura-Shield III.

Requirement :	No blistering, cracking, softening or delamination of film. No more than 1/16-inch rust creepage at scribe and no rusting at edges after 3,000 hours of exposure.
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Series 73 Endura-Shield III

Type: High-Build Acrylic Polyurethane Enamel

Abrasion Resistance: Federal Test Method Std. No. 141, Method 6192, CS-17 Wheel, 1,000 gram load. No more than 95 mg. loss after 1,000 cycles.

<u>Adhesion:</u>	ASTM D 3359 Method B (Crosshatch Adhesion). Coating systems applied to sandblasted steel panels and cured 30 days @ 77°F. Not less than a rating of 5, average of three tests.
<u>Humidity:</u>	ASTM D 2247-68. No blistering, cracking, softening or delamination of film after 600 hours exposure.
<u>Salt Spray:</u>	ASTM B 117-73. No blistering, cracking, softening or delamination of film. No rust creep age at scribe and no more than one percent rusting at edges after 1,000 hours exposure.

PART 3 - EXECUTION

3.1 Inspection

Refer to Section 09900 - PART 3.1

- A. Make visual comparison of cleanliness or prepared surfaces with pictorial standards in accordance with SSPC-VIS-1.
- B. Measure dry film thickness using a magnetic film thickness gage in accordance with SSPC-PA2.

3.2 Surface Preparation

All surfaces of new or existing structural steel or other metals to be painted shall be blast cleaned unless otherwise specified in the special provisions, or approved in writing by the Engineer.

In repainting existing steel structures the method of cleaning will be specified in the special provisions. Any damage to sound paint on areas not designated for treatment, resulting from the Contractor's operations shall be repaired by him at his expense to the satisfaction of the Engineer.

3.3 Blast Cleaning

Surfaces prepared by Commercial Blast Cleaning shall be in accordance with SSPC-SP6. The blast cleaning shall remove all rust, mill scale and other substances down to bright metal. Special attention shall be given to cleaning of corners and reentrant angles. Before painting, sand adhering to the metal in the corners and elsewhere shall be removed. The cleaning shall be approved by the Engineer prior to any painting. Bare metal shall be prime painted as soon as practicable after it is cleaned. All surface will be primed the same day they are blast cleaned. Any reblasted that is required will be done by the Contractor at his expense.

Abrasive used for blast cleaning shall meet all local state and federal specifications, regulations and laws to produce satisfactory results. The Anchor Pattern on the blast surface shall not exceed 1 1/2 to 2 mils.

3.4 Disposal and Removal of Lead Primer

All lead base primer shall be blasted off the structure, in accordance with OSHA (Occupational Safety and Health Administration) health and safety regulations. The regulations are outlined in the code of federal regulations section 1910.1025 "Lead".

The Contractor will have all testing required by regulations or by the selected waste hauler or landfill, such as Toxicity Characteristic Leaching Procedure Testing (TCLP Testing), or subsequent testing required by the Resource Conservation and Recovery Act (RCRA) or local or state regulations, to determine proper treatment and/or disposal requirements, including any follow-up testing, shall be done at the Contractor's expense. The Cost of all disposal on shall be paid for by the Contractor. Copies of all manifests, testing results and treatment procedure documents as shall be sent to the County.

The citizen and environmental protection will conform to all Local, State and Federal specifications, regulations, and laws governing the removal of lead paint. Each site will be reviewed for compliance with environmental and industrial containment standards and safe guards.

List of Agencies to contact:

Occupational Safety and Health Administration (OSHA)	(202) 523-9655
Environmental Protection Agency (E.P.A.)	(202) 260-4134
Water Pollution (Arlington County)	(703) 228-6820
Environmental Health (Arlington County)	(703) 228-4826
Hazardous Waste Violation, Health Dept. (VA)	(804) 225-2667
VA. State Air Pollution Control Board	(703) 644-0311

3.5 Notification

The Contractor shall notify the Engineer in writing, at least one week in advance of the date that cleaning and painting operations are to begin.

3.6 Coating Schedule

First coat: Series 90-97 Theme-Zinc at 2.5 - 3.5 dry mils. (Note: two coats of primer applied to severely rusted areas, bolts, bearing areas, pitted areas at a minimum of 2 feet from beam end as determined by the Engineer. Brush apply first full coat forcing material into these areas).

Second coat: Series 73 Endura-Shield III at 3 - 5 dry mils.

3.7 Method

Painting shall be done in a neat and workmanlike manner. Unless otherwise specified, paint shall be applied by conventional air spray, airless spray brush or any combination thereof. Refer to the manufacturer's recommendation on the application of their painting system.

- A. Apply a smooth, uniform coat, free of any skips, holidays, runs, sags, dry spray or any other film defects. Correct the deficiencies before the succeeding application.
- B. On all surfaces that are inaccessible for painting by regular means, the paint shall be applied by sheep skin daubers, bottle brushes or any means approved by the Engineer.
- C. Do not apply successive coats until the Engineer has completed inspection. Succeeding coats shall be applied within the following 24 hours. A minimum of 30 minutes shall elapse between applications or as specified by the manufacturer. Refer to the manufacturer's specification on application of succeeding coats.

3.8 Curing

Allow the prime coat to cure a minimum of 12 hours, or as specified by the manufacturer, before top coating.

The top coat shall be applied within 24 hours, or as specified by the manufacturer, to minimize contamination.

Refer to the manufacturer's recommendations or curing time for their brands of paints.

3.9 Field Painting

Surfaces which will be inaccessible after erection shall be cleaned free from any foreign material and painted prior to erection with such field coats as are called for on the plans or specified in the special provisions or authorized by the Engineer. Field painting, except for retouching, shall be performed only after all form work, such as concrete, is completed and the forms removed. When the paint applied for retouching has thoroughly dried, such field coats as called for on the plans or authorized shall be applied. However, no coat of paint shall be applied until the preceding coat has dried. Paint shall be considered dry when another coat can be applied without the development of any film irregularities.

To secure a minimum coating on edges of plates or shapes, bolt heads and nuts and other parts subjected to special wear and attack, the edges, shall first be stripped with a longitudinal motion and the bolt heads and nuts with a rotary motion, followed immediately by the general painting of the whole surface, including the edges and bolt heads nuts.

If traffic produces an objectionable amount of dust, the Contractor shall allay the dust for the necessary distance on each side of the structure and take any other precautions necessary to prevent dust and dirt from coming in contact with freshly painted surfaces or with surfaces before the paint is applied.

The second field coat shall not be applied in less than 2 days after the first field coat. The application of the final field coat shall be deferred until after all construction operations which might mar the finished coat are complete.

The Contractor shall protect adjacent property and pedestrian, vehicular and other traffic upon or underneath the structure and also all portions of the superstructure and substructure against damage or disfigurement by the painting operation.

PART 4 - MEASUREMENT AND PAYMENT

Preparing and painting of structural steel will be measured by the square foot or as noted. Measurement will be determined along the surface of the actual area painted. Payment shall be per square foot for preparing and painting structural steel and shall include full compensation for furnishing all labor, materials, tools, equipment, disposing and incidentals, and for doing all the work involved in preparing the steel and applying the paint to the surfaces as shown on the plans, specified in these specifications and the special provisions, and as directed by the Engineer.

PART 1 - GENERAL1.1 Description of Work

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

Section 06100 - Structural Timber & Lumber

Section 09900 - Protective Coatings

1.3 Applicable Specifications

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

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

1.4 Applicable Reference

American Wood Preserver's Association (AWPA)

1.5 Quality Assurance

Provide certified test reports as required by AASHTO M-133.

PART 2 - MATERIALS

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.

PART 4 - MEASUREMENT AND PAYMENT

No separate measurement and payment will be made for this work. It shall be considered a subsidiary obligation of the Contract under other work to which it relates.

PART 1 - GENERAL1.1 Description of the Work

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

Section 09800 - Wood Preservatives

1.3 Applicable Specifications

- A. American Society for Testing and Materials (ASTM)
- B. Steel Structures Painting Council (SSPC0)

1.4 Surfaces Not to be Painted

The following surfaces are not to be painted. (If surfaces referenced below are to be coated, specific instructions will be given on the approved plans.)

- A. Non-ferrous metals; for example - Aluminum Copper Monel Brass
- B. Stainless Steel
- C. Chain link fencing
- D. Concrete walks, curbs
- E. Exterior concrete foundations
- F. Plastic
- G. Brick
- H. Galvanized steel

1.5 Submittals

In accordance with Section 03100, submit a complete list of materials and color charts. The Engineer will 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.

- C. The protective coating systems shall be tested and inspected for acceptance in accordance with Part 3.

1.7 Product Delivery, Storage and Handling

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

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 Engineer will 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 Engineer will not be considered as failures.

PART 2 - MATERIALS

2.1 Acceptable Manufacturers

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. It is intended, therefore, that the systems be provided by the following manufacturers:

Koppers Company,, Pittsburgh, PA

Tnemec Company, Inc., Kansas City, MO

Hughson Chemicals, Lord Corp., Erie, PA

Wise Chemical Company, Pittsburgh, PA

Carboline Company, St. Louis, MO

Pennsbury Coating Corp., Bucks Co., PA

2.2 Paint Materials

The following descriptions apply to the short form identifications of the primers, intermediate and top coats specified under the various systems of paragraph 2.3 following. Other acceptable coatings of the above named manufacturers exist, but have not been defined herein.

<u>Coating</u>	<u>Description</u>
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.
Eproxy-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 will 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

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 ().

A. 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

2.0 mils d.f.t.

Semi-gloss (color)

(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

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)

B. Steel and Iron

1. System "B-1"

Non-Immersion - Severe Corrosive Condition

PRIMER

Epoxy - Polyamide 5.0 mils d.f.t.
(semi-gloss) (4.0 mils minimum)

TOP COAT

Polyurethane Enamel 2.0 mils d.f.t.
(semi-gloss - color) (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)

- C. Wood
1. System "C-1"
 - 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 A-386 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 Engineer. 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

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.

- A. Concrete:

Concrete shall be fully cured prior to coating. Fully cured shall be defined as 28 days at 75°F or 49 days at 50°F or 53 days at 50°F. 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".

B. Steel and Iron:

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 (Near-White Blast).
4. In areas where blasting is not feasible, obtain the approval of the Engineer 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 whip-blast or power tool areas exposed overnight.

C. Galvanized Steel Surfaces:

Conform to ASTM A-384 and A-385 (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.

D. Concrete or Cinder Block:

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.

E. Brick:

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.

F. Wood:

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 Engineer's representative 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 50°F or less than 5°F above the dew point. Do not apply paint to wet or damp surfaces or when the humidity exceeds 85%.
- D. Vary the colors of successive coats.
- E. Do not apply successive coats until the Engineer 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 with "Ferralloy", "Tin Easy Fluid", "galvaloy", or approved equal.

PART 4 - MEASUREMENT AND PAYMENT

No separate measurement and payment will be made for this work. It shall be considered a subsidiary obligation of the Contract under other work to which it relates.

PART 1 - GENERAL1.1 Description of the Work

Provide all labor, material and equipment to furnish and install, complete in place, the bus shelter in accordance with these specifications and to the lines, grades and dimensions shown on the approved plans.

1.2 Related Work Specified Elsewhere

Section 02611 - Concrete Walks and Concrete Driveway Entrance
Section 02612 - Interlocking Concrete and Brick Pavers
Section 03100 - Concrete Formwork, Reinforcement and Materials
Section 09900 - Protective Coatings

PART 2 - MATERIALS2.1 Bus Shelter Unit

The bus shelter shall be either an Arlington County type or a Metro type bus passenger shelter as specified on the plans. The Metro type bus shelter will be provided by Washington Metro Area Transit Authority (WMATA). The Arlington County bus shelter shall be furnished by the Contractor, unless otherwise specified on the approved plans.

2.2 Paint

Paint for the Metro shelter shall be custom blend, Metro Brown, available from MAB Paint Co., 3312 Wisconsin Ave. NW, Washington, DC, Phone: (202) 966-5445.

2.3 Concrete Pad

The concrete pad and aggregate base shall be in conformance with Section 02611 of these specifications.

2.4 Pavers

Pavers when specified on the approved plans, shall match the adjacent sidewalk and be as specified in Section 02612 and on the plans.

PART 3 – EXECUTION

- 3.1 The Contractor is responsible for the pick-up and delivery of the Metro passenger shelter unit from the Washington Metropolitan Area Transit Authority. Three weeks prior to installation, contact the Arlington County, Department of Environmental Services, Planning Division at 228-3681 to arrange for pick-up and directions.

- 3.2 The unit is to be mounted on a 4-inch thick concrete pad on a 3-inch compacted aggregate base. Construct concrete pad in accordance with Section 02611. When pavers are specified on approved plans, lay pavers in accordance with Section 02612. Match elevation of pavers or concrete pad with adjacent sidewalk and provide 1/4-inch/ft positive drainage to street. Extend anchor bolts from concrete base pad through pavers to mount on shelter brackets.
- 3.3 Install bus shelter in accordance with the approved plans and the details provided in these specifications.
- 3.4 Paint the Metro bus shelter in accordance with Section 09900 and manufacturer's application instructions.

PART 4 - MEASUREMENT AND PAYMENT

Bus shelters shall be measured as each. Payment will 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.

EXHIBIT F

Arlington County

Infrastructure Design and Construction Standards

BUILDING DESIGN - VERTICAL INFRASTRUCTURE

Document Version 2016.0104

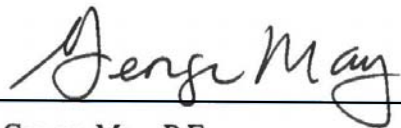


DEPARTMENT OF ENVIRONMENTAL SERVICES
FACILITIES & ENGINEERING

FACILITIES DESIGN AND CONSTRUCTION
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DOCUMENT AMENDMENT HISTORY

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INTRODUCTION

INTRODUCTION

The development of the Arlington County Infrastructure Design and Construction Standards is the product of a County inter-departmental task force headed by the Department of Environmental Services (DES) and joined by the Departments of Community Planning, Housing & Development (CPHD), Fire, Department of Parks and Recreation (DPR), Technology Services (DTS) and the County Managers Office (CMO).

The Arlington County Infrastructure Design and Construction Standards provide private and County professional design staff and community groups with a uniformly accepted comprehensive resource for promoting higher quality infrastructure design and construction. It is intended that these standards supplement existing federal, state and local legislation, standards, codes, policies and industry best practices, rather than replace them.

These standards are divided into two categories, Building Design (Vertical Infrastructure) standards and Horizontal Infrastructure standards and are intended for use in the design and construction of internal County initiated, managed, designed and constructed vertical and horizontal infrastructure projects. These standards are designed to be a flexible living document that will grow with the changing environment. Continued development of these standards will ensure that the County continues to be recognized as a world class urban environment for all citizens.

The Building Design Standards formally establishes and standardizes the minimum requirements that shall be met for all work in the design and construction of elements for Arlington County initiated projects.

The County commits to the use of these standards; additionally the County is receptive to new products and innovative ideas that may not be incorporated in these standards. By simultaneously broadening our horizons and establishing clear standards we will be able to deliver County initiated projects that provide design excellence for all public and private entities that carry out work related to public infrastructure. These standards provide ample room for choice on innovative ideas based on established engineering standards and professional judgment.

DESIGN GOALS

DESIGN GOALS

<p>Design for Access: The County is committed to supporting the principles of Universal Design in all projects and ensuring a truly accessible environment through compliance with ADA requirements.</p>
<p>Design for Context: Design should refer to the surrounding context including the history, land use, landmarks and preserve the unique character of neighborhoods. The design must be guided by civic consciousness and social responsibility in order to inspire in the County and maintain status as a world class urban environment.</p>
<p>Design for Cost Effectiveness: Public works design requires a cost effective design approach incorporating life-cycle analysis in the selection of materials and systems.</p>
<p>Design for Energy Efficiency: Emphasize leadership in energy efficiency through architectural and engineering design, materials, and equipment selection and construction methods.</p>
<p>Design for Excellence: High performance features within County initiated projects add value to the County's assets in addition to helping to protect the environment.</p>
<p>Design for Innovation: A balance must be achieved between the desire for innovative design and the realities of traditional operating and maintenance practices. Durability, ease of maintenance and material innovation are encouraged</p>
<p>Design for Livability: Expanding the use of public open space can facilitate social, civic and economic interactions. Design to encourage physical activity for all ages and populations by making walking, bicycling and transit attractive and convenient.</p>
<p>Design for Safety: Life safety is the highest design goal for public Buildings. Layout, materials, systems and processes shall be selected or specified to go beyond code compliance.</p>
<p>Design for Sustainability: provide designers, planners and residents the tools to create a more durable, environmentally friendly and attractive infrastructure. The design should also reflect a clear understanding of the County's facilities operations, maintenance practices and project goals. It should also contribute to environmental health with features that reduce storm water runoff and add greenery.</p>

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LEGEND

LEGEND

LEGEND	
Syntax Format	Description
Abbreviation/Acronym (AIA)	Abbreviation is a shortened form of a word or phrase. An acronym is an abbreviation formed from the initial components in a phrase or a word. Refer to Appendix A - LIST OF ABBREVIATIONS, pg. A-88 for denotation.
Brand Name (Product) Brand Name(s)	A word, name, symbol, etc., especially one legally registered as a trademark, used by a manufacturer or merchant to identify its products distinctively from others of the same type and usually prominently displayed on its goods, in advertising, etc.
Brand Name - Category – 1. Or Equal	A company, manufacturer or model used as a basis of design by the County to establish specifications of a product or service. Equal substitutions are acceptable with approval.
Brand Name - Category - 2 Preferred Manufacturer(s)	A company, manufacturer or model preferred by the County to be a supplier of a product or service. Equal substitutions are acceptable with approval.
Brand Name - Category – 3 No Substitutions	A company, manufacturer or model designated by the County to be the sole supplier of a product or service.
Brand Name - Category – 4 Not Acceptable	A brand, company, manufacturer or model designated by the County not to be a supplier of a product or service.
Brand Name Model <i>Brand Name Model</i>	A style or design of a particular product
Building Elements Building Element	Components of a Building, i.e. boilers, Windows, bricks,
Definitions (Defined Term) Registered Design Professional	Words and terms shall for the purposes of this document have the meanings shown in Appendix E- DEFINITIONS (Defined Terms), pg. E-118
Approved Change Amendment No. 1	Revision from last document. See AMENDMENT NO 1 – APPROVED CHANGES , pg. i for additional information.
Referenced Standards Code of Virginia	Applicable building regulations, standards, specifications and policies referred to in the Arlington County Infrastructure Design and Construction Standards – Building Design - Vertical Infrastructure (Doc Version 2015.1204) (ACIDCS-BD-VS). The reference standards listed contains the building regulations that must be complied with when

LEGEND

LEGEND	
Syntax Format	Description
	constructing a new building, structure, or an addition to an existing Building. They must also be used when maintaining or repairing an existing Building or renovating or changing the use of a Building or structure. Refer to Appendix B - APPLICABLE STANDARDS & SPECIFICATIONS, pg. B-90 for listing.

1 GENERAL REQUIREMENTS – V01000**1.1 GENERAL****1.1.1 Description**

This section identifies minimum requirements that shall be met for all design and construction of elements for Arlington County Building Design Standards.

1.1.2 Applicable Arlington County Standards, Specification and Policies

including, but not limited to, those listed in Table 1.1.2

Table 1.1.2
Applicable Arlington County Standards, Specification and Policies^a
Administrative Regulation 4.1 – Governing the Submittal of Site Plans in Arlington County (June 2013)
Arlington County Government Department of Technology Services Network Infrastructure Standards (6/19/2015)
Arlington County Building Energy Performance Targets for County-owned and – managed buildings
Arlington County Code (Code of the County of Arlington County, Virginia) (ACC)
Arlington County Construction Standards and Specifications (ACCSS)
Arlington County Construction Standards and Specifications (ACCSS)
Arlington County DPR Design Standards (In Development)
Arlington County Government Street Light Policy and Planning Guide June 2006
Arlington County Infrastructure Design and Construction Standards – Building Design - Horizontal, Infrastructure
Arlington County Landscape Standards January 2010
Arlington County Policy for Integrated Facility Sustainability - August 19, 2008 ("Green Building" Policy)
Arlington County Public Art Policy
Arlington County Standards for Planting and Preservation of Trees on Site Plan Projects
Public Art Program – Guidelines for Site Plan Projects 7/24/2013
Stormwater Manual: A Guide to Stormwater Requirements for Land Disturbing Activities in Arlington County
Arlington County Tree Replacement Guidelines
Arlington County Department of Public Works Retaining Wall Policy December 9, 2002
Arlington County Zoning Ordinance (ACZO)
County Public Facility Review Committee, Civic Design Principles

Note ^a Location of documents with County Project Officer.

1.1.3 Applicable Standards and Specifications

Refer to Appendix A_- LIST OF ABBREVIATIONS

1.1.4 Quality Assurance

- 1.1.4.1 Companies specializing in the manufacture of the products specified in the project specifications shall have a minimum of (ten) 10 years of documented experience.

Companies with less than (ten) 10 years of documented manufacturing experience shall be approved by the county on a case by case basis. Manufacturers and model numbers are listed in the specifications to establish a standard of quality and design. Any substitution of products not listed in the specification must be approved by the Registered Design Professional of record and the County. The Registered Design Professional shall specify requirements for Installers’ experience, Fabricators qualifications, Single Source responsibilities and design criteria.

- 1.1.4.2 The Registered Design Professional shall carefully review the County General Conditions and coordinate all design specifications with these County requirements. Any conflicts or proposed modifications impacting standard County sections shall be brought to the Arlington County Project Officer's attention for a decision.

1.1.5 Submittals

The following description is intended to serve as a minimum requirement for submittals and each specification section will state specific requirements for submittals. The submittals shall include Manufacturers’ Installation instructions, Manufacturers’ standard details, Layout and installation details, Detail sections of composite members of specified assemblies, Design mixes for concrete, Anchors and reinforcement, Mounting heights for hardware and fixtures, Glazing and Maintenance Data,

1.2 DESIGN

Nothing in the Arlington County Building Design Standards shall be construed as waiving or granting exceptions to any element of state or local building codes, the Arlington County Code or the Arlington County Zoning Ordinance as applicable to the specific project. Any conflicts between these guidelines and the governing local, state, or federal codes shall be brought to the immediate attention of the County.

1.2.1 Design for Access

- 1.2.1.1 All interior spaces, associated hardware, and exterior construction shall comply with the Americans with Disabilities Act (ADA) requirements as per Table 1.2.1.1.

Table 1.2.1.1 Applicable Standards and Specifications
Americans with Disabilities Act (ADA) Title II Regulation for State and Local Governments 28 CFR Part 35
Americans with Disabilities Act (ADA) Title III Regulation for Places of Public Accommodation and Commercial Facilities 28 CFR Part 36
ADA Standards for Accessible Design 2010
DOT Regulation for Transportation Services 49 CFR Part 37
Department of Justice (DOJ)
Department of Transportation (DOT)
United States Access Board
Uniform Federal Accessibility Standards (UFAS)
ICC A117.1-2009 Accessible and Usable Buildings and Facilities Standard

1.2.2 Design for Context

1.2.2.1 All buildings shall be designed to achieve the goals outlined within the County Public Facility Review Committee, Civic Design Principles.

1.2.3 Design for Cost Effectiveness

1.2.3.1 Building Assessments

An invasive Building assessment is required for any Building the County may potentially purchase or take over operations from a non-County entity. The Building assessment shall be performed by a Registered Design Professional. The Registered Design Professional shall hire an MEP or any other expert they deem necessary to provide an accurate assessment of existing conditions. *The* building assessment shall include applicable CSI divisions such as and not limited to invasive inspection of the Building envelope, structure, architectural, mechanical, electrical, plumbing, life safety, fire protection, fire alarm, security and ADA accessibility systems by individuals that specialize in those fields. The assessment shall include a cost estimate of the repairs.

1.2.3.2 Electronic Project Management Information System (PMIS)

Registered Design Professional shall coordinate specification to provide contractor’s mandatory use of an electronic Project Management Information System (PMIS) called e-Builder for the purpose of communication, transparency, accountability, document management, review of documents and shared collaboration in accordance with Table 1.2.3.2. The website, www.e-Builder.net, is an internet based software system with controlled access through licensed accounts. The software is designed for contract management between the County and the Contractor to act in accordance with their respective roles.

Table 1.2.3.2 Owner’s Project Requirements Electronic Project Management Information System (PMIS)
<p>e-Builder License: The County will provide three total licenses to the Contractor; one each for the project manager, assistant project manager and clerical administrator. The Contractor may at their expense purchase additional licenses from e-Builder which the County will allow access to the contract. The three named parties will be provided to the County within 3 working days of the signed Agreement. In the event of personnel changes experienced by the Contractor, the licenses can be re-assigned by the Contractor with approval of the County. Upon completion of the contract the three licenses will be removed from Contractor. The County will provide support to the Contractor for the successful migration of the contract data to an electronic storage system of the Contractor’s choosing and at the Contractor’s expense.</p>
<p>Access and Software: Recommended base minimum desktop standard to maintain optimal performance for an operating system is: Windows XP SP3+ or Mac OS X. See more information at: www.e-builder.net/support/optimization for supported internet browsers and required browser plug-ins. The Contractor shall be responsible for possessing the materials and broadband internet connection for accessing the website to fully comply with the specifications</p>

Table 1.2.3.2 Owner’s Project Requirements Electronic Project Management Information System (PMIS)
<p>Purpose And Use: The primary purpose of the website is to facilitate electronic communication between the Registered Design Professional Contractor and County. The PMIS electronic system allows enhanced reporting capabilities through e-Builder whereby providing transparency, visibility, and collaboration to the County and the Contractor for more timely and responsive partnering. The e-Builder website will manage RFIs, contract documents, submittals, shop drawings, working drawings, meeting minutes, issue log and other forms of documentation and communication required by the contract documents and at the discretion of the County. This functionality of e-Builder will allow Contractor participants to create and upload all submittals, shop drawings, working drawings, RFI’s, issue log entries and any other contract documents for review. Review and approval of all submittal documents will occur in e-Builder with all participants notified of the results of reviews via e-Builder email notifications. Participants shall interface with e-Builder on a regular basis to ensure they are aware of current information. The capabilities of the website will allow participants to track the progress of all submittals and documents under review and any other collaborative features, such as, meeting minutes. Additional functions and exceptions of the website may be made on a case by case basis at the County’s discretion. In the case of an emergency where the timeframe of a review does not allow it to be processed through e-Builder the Contractor will be required to retroactively document the submission and approval process through e-Builder. No confidential information shall be placed on e-Builder. Information residing on the website is the property of the County. The County reserves the right to revoke access to the website for unauthorized or inappropriate use and dissemination of user passwords.</p>
<p>Submittals shall be submitted in Adobe Acrobat PDF format sized to print 11 inches by 17 inches or 8.5 inches by 11 inches. Each party uploading submittals and other shall ensure it is legible. A minimum resolution of 300 dpi is recommended. Shop drawings submittals requiring the Registered Design Professional’s review stamp shall contain white space sized 3 inches horizontally by 2.5 inches vertically for the stamp and shall be located in the same spot on each page in a given submittal. Submittal schedule and review period shall follow Specification Section titled SUBMITTAL PROCEDURES along with Invitation to Bid Construction Schedule. Submittals without a defined review period in the Standard Specifications shall be 30 calendar days.</p>
<p>Method Of Measurement And Basis Of Payment: Costs for complying with Section 1.2.3.2, Electronic Project Management Information System (PMIS) shall be considered incidental to the Agreement and no separate payment will be made.</p>

1.2.4 Design for Energy Efficiency

1.2.4.1 The following Building types shall have Aggregate Site Energy Intensity Targets as per Table 1.2.4.1.

Table 1.2.4.1 Aggregate Site Energy Intensity Targets	
Building Type	Btu/sq. ft. (per year)
Office	70,000
Fire Station/public safety	85,000
Residential	70,000
Community center	70,000
Library	50,000
Other	(to be determined on a case by case basis)
Specialty	(to be determined on a case by case basis)

These targets should be seen as interim upper limits on energy intensity for new construction, and as such should supplement – but not supersede – existing policy guidance given to architects and engineers such as LEED Silver certification and designing to meet EPA Energy Star® performance (where appropriate). However, the County may be compelled to design and build structures that use much less energy than these targets, due to the evolving and strengthening LEED energy requirements. In some cases, the identified targets may not be able to be met for every single building, but reaching the target in aggregate for each group is feasible.

1.2.5 Design for Excellence

- 1.2.5.1 All buildings shall be designed, constructed and operated in accordance with the Stormwater Manual: A Guide to Stormwater Requirements for Land Disturbing Activities in Arlington County.

1.2.6 Design for Innovation

- 1.2.6.1 Selection Criteria for use of Green Roof
In the design phase of the project, the Registered Design Professional and the certified landscape architect shall use the initial criteria as per Table 1.2.6.1 to determine which projects will be considered for a Green Roof and report their findings and recommendations in a feasibility study to the Arlington County Project Officer.

Table 1.2.6.1 Selection Criteria for use of Green Roof
County-owned building.
Project is planned for a flat roof installation
The project site must be in an area in need of the potential benefits Green Roofs can provide.
Demonstrate the decrease cost to Stormwater Management in the areas of water quantity, quality and erosion control.
Demonstrate the improvement in Energy Efficiency

1.2.7 Design for Safety

- 1.2.7.1 A storage room identified as Facility Maintenance Storage shall be provided and sized to house attic stock and maintenance equipment for given Building and the energy management computer workstation if provided. Locate room near mechanical, electrical, or sprinkler room. A minimum of one 6’ x 8’ facility maintenance storage closet shall be provided per Building floor. On floors where the gross floor area exceeds 25,000 sq. ft. additional closets shall be provided for each additional 25,000 sq. ft. of gross floor space, or parts thereof.
- 1.2.7.2 The Building Design Specifications shall include a requirement for the acquisition and storage of, required service and maintenance equipment as part of the overall project. An example of one such area that should be addressed is for the inclusion of the procurement and storage of a scissor lift when a Building design incorporates high ceilings areas that cannot be serviced by maintenance personnel with an 8’ ladder. The County will provide the size of equipment (scissor lift) and model number so that storage area requirements and access to and through the door/s can be determined by Registered Design Professional.

1.2.8 Design for Livability

- 1.2.8.1 Public Art: The Arlington County Public Art Policy authorized the Arlington Commission for the Arts and staff to develop sets of Guidelines outlining the practices and methods for commissioning public art in County-initiated, Developer-initiated, and Community-initiated projects. The Policy states that art should be integrated into architecture, urban design, and the planning of infrastructure at the earliest design stage to create exciting, appealing, and harmonious public spaces. Administrative Regulation 4.1 – Governing the Submittal of Site Plans in Arlington County (June 2013) requires applicants to meet with the County's Public Art staff prior to filing a Site Plan application. Refer to the Guidelines for Site Plan Projects

1.2.9 Design for Sustainability

- 1.2.9.1 All Buildings shall be designed, constructed and operated to achieve at least a US Green Building Council’s Leadership in Energy and Environmental Design (LEED) silver certification.
- 1.2.9.2 The Registered Design Professional shall have a LEED certified member on staff.

1.2.10 Document Organization and Format

- 1.2.10.1 Project construction documents including site plans shall provide the following information shown in Table 1.2.10.1. This list is the minimum submission requirement and is not all-inclusive.

Table 1.2.10.1 Information Provided in Construction Documents
Soil boring logs and locations
Building square footage and gross floor square footage
Use group classification
Type of construction

Table 1.2.10.1 Information Provided in Construction Documents
Height of Building in feet and stories
Building floor plans including firewalls and tenant separation
Site area (acres)
Street width and access to the Building
The offset distance from the curb to the Building
The location and size of existing and proposed water mains
The location of all existing and proposed <i>Fire Hydrants</i>
Available water pressure and flow capability, static pressure, residual pressure, flow in GPM
Type of fire suppression or detection equipment to be provided
Location and size of underground fire lines
Location of fire department Siamese connections
U-values for walls, roof/ceiling, door and window
Design roof and floor loads, soil bearing value and structural material strengths
Door, Windows and finish schedules; lighting fixture and equipment schedules
Building address
North arrow on all plan sheets for all submissions
Arlington County project number, contract number, and signature block
Site Plans for all disciplines shall be at industry accepted engineering common scale, and shall be oriented the same way on all plan sheets
For Buildings too large to fit on a single plan sheet, provide a key plan on all plan sheets.
All architectural and related engineering discipline drawings shall exhibit a graphic scale
All measurement shall be in US Customary Units
Room Numbering Standard starting at the main Suite entry (100, 200...) for each floor and working clockwise around the floorplan with a 3 digit number. Each stairwell should be labeled “A”, “B”... to correspond to the Arlington County Fire Prevention Code. Room numbering system will be the basis for the fire annunciator panel.

1.2.11 Electronic Drawing Documents

All civil, architectural, structural, electrical, mechanical, and plumbing floor plans (including reflected ceiling plans), as a minimum, shall be designed using a computer aided design (CAD) system. CAD files will be turned over to the county on DVD at the completion of the design. The Registered Design Professional shall use *AutoCAD, Release 2015* or later. Quality control of plans shall include overlaying CAD floor plans to check for conflicts and

shall be the responsibility of the Registered Design Professional. AutoCAD layering convention shall conform to AIA, Autodesk and County standards. All specifications and addenda shall also be included on the DVD in Microsoft Word format.

1.2.12 Adobe PDF Deliverables:

- 1.2.12.1 Drawings: One (1) consolidated file per discipline bookmarked and layered for CAD export.
- 1.2.12.2 Specifications: One (1) consolidated file per volume bookmarked per specification section and named informatively.

1.2.13 Design Development Phase

The Registered Design Professional shall submit cut sheets for the major equipment pieces which form the basis for design at the Design Development stage. The cut sheets must identify equipment dimensions, and the Registered Design Professional shall provide detailed plan and section views (1/4" = 1' or larger scale) dimensioned to show the major equipment, duct work and piping located at mechanical spaces. Detail plans must reflect that adequate space and clearances are provided for inspection, maintenance and replacement access, and all major mechanical equipment.

1.2.14 Building Load letters and Plans

The Registered Design Professional shall send Building load letters and plans to the electric and gas companies at the Design Development Phase or comply with submission requirements of the utility companies within the jurisdiction.

1.2.15 Bid Documents

- 1.2.15.1 All bid document drawings (mylars) are to be sealed, signed and dated (on all sheets) by an Registered Design Professional registered in the Commonwealth of Virginia prior to printing of the bid sets.
- 1.2.15.2 The Architect shall be responsible for submitting and tracking project plans through the County plan review process and for making all required corrections, inserts, re-submissions.

1.2.16 Specification Standards

- 1.2.16.1 The specifications shall provide for a full one-year warranty period for all Heating, Ventilation and Air Conditioning (HVAC) systems and associated controls and a five-year warranty on all compressors. The warranty shall start when the Building is accepted by County.
- 1.2.16.2 Specifications shall be the most current version of PC-compatible Microsoft Word following the Construction Specification Institute (CSI) MasterFormat™, 2012 Edition format and be specific regarding codes intended to be met. Sections of specifications that are performance specifications must be clearly identified as such.

1.2.17 Internal Inspection of Building Drain and Building Sewer (lateral)

- 1.2.17.1 The Registered Design Professional shall require in the specification sections for the Contractor to perform the Closed Circuit Television (CCTV) internal inspection of the entire length of the Building Drain and Building Sewer (lateral). The requirements for the inspection shall be in accordance with Table 1.2.17

Table 1.2.17 Requirements for (CCTV) internal inspection of Building Drain and Building Sewer (lateral)
The Contractor shall use National Association of Sewer Services Companies (NASSCO) certification as the standard for evaluation, data collection, and reporting for all CCTV inspections.
CCTV operators must be certified by NASSCO and must have passed the National Association of Sewer Services Companies (NALP).
CCTV inspections will be performed on the entire length of the private sewer lateral, from the connection to the sewer main to the connection at the building cleanout.
The Contractor shall perform CCTV sewer inspection work as necessary to thoroughly document the condition of all sewers, service lateral connections, and manhole corbel, barrel and cone-sections in the study area. The sanitary sewer and service laterals shall be carefully inspected to determine alignment, grade variations, separated joints, location and extent of any deterioration, breaks, obstacles, obstructions, debris, quantities of infiltration/inflow and the locations of service connections.
The quality of all work specified in this section shall meet or exceed the requirements of the National Association of Sewer Services Companies (NASSCO) Recommended Specifications for Sewer Collection System Rehabilitation (latest edition).

1.3 PRODUCTS

1.3.1 Sole Source Specification:

Any product(s) that are specified to be proprietary, or limited to less than three acceptable products, for which no equal products or substitutions are acceptable, must be identified to the County. Justification for the proprietary or sole source specification must be provided.

2 SITE WORK – V02000

2.1 GENERAL

2.1.1 Description

This standard identifies minimum requirements that shall be met for all site work in the design and construction of elements for Arlington County Building Design Standards.

2.1.2 Related Arlington County Standards, Specification and Policies

including, but not limited to, those listed in Table 2.1.2

Table 2.1.2 Related Arlington County Standards, Specification and Policies
American Society for Testing and Materials (ASTM)
Arlington County Code (Code of the County of Arlington County, Virginia) (ACC)
Arlington County Construction Standards and Specifications - 02100 Clearing and Grubbing to 02951 Boring and Jacking
Arlington County Construction Standards and Specifications - 03100 Concrete Formwork, Reinforcement and Materials
Arlington County Construction Standards and Specifications - 03400 Precast Concrete
Arlington County DPR Design Standards
Arlington County Government Street Light Policy And Planning Guide January 2008
Arlington County Landscape Standards January 2010
Arlington County Tree Replacement Guidelines
Arlington County Department of Public Works Retaining Wall Policy December 9, 2002
Arlington County Zoning Ordinance (ACZO)
Designing Sidewalks and Trails for Access – Part II: Best Practices Design Guide
Building Design - Horizontal Infrastructure - H-3.1 Driveway Entrances
Building Design - Horizontal Infrastructure - H-3.2 Curb Ramps
(Amendment No. 1 omitted this standard)
ICC International Building Code/2012
Standards for Planting and Preservation of Trees on Site Plan Projects
US Green Building Council’s Leadership in Energy and Environmental Design (LEED) green building rating system
Virginia Department of Transportation (VDOT) Road and Bridge Standards 2008 edition

2.1.3 Applicable Standards and Specifications

including, but not limited to, those listed in Table 2.1.3

Table 2.1.3 Applicable Standards and Specifications

American Society for Testing and Materials (ASTM)
American with Disabilities Accessibility Guidelines for Public Rights-of-Way (PROWAG)
American with Disabilities Accessibility Guidelines for Public Rights-of-Way (ADAAG)
Designing Sidewalks and Trails for Access – Part II: Best Practices Design Guide
ICC International Building Code/2012
The Illuminating Engineering Society of North America (IES)
(Amendment No. 1 omitted this standard)
(Amendment No. 1 omitted this standard)
US Green Building Council’s Leadership in Energy and Environmental Design (LEED) green building rating system
Virginia Uniformed Statewide Building Code 2012 (USBC)

2.1.4 Quality Assurance

2.1.4.1 Reserved

2.1.5 Submittals

2.1.5.1 The Registered Design Professional shall identify, in the specification sections, manufacturer’s products, descriptions, energy efficiency, performance criteria, materials, components, fabrication, source quality control, finish, and accessory materials pertaining to all Site Work and construction.

2.1.5.2 All street markings, including fire lanes, and signage locations for all public and private access and travel ways shall be marked on a signage and markings plan as part of the site works plan set.

2.2 DESIGN

2.2.1 Description

All site design must conform to the requirements identified within the Arlington County Infrastructure Design and Construction Standards – Building Design - Horizontal, Infrastructure and the current version of the Arlington County Construction Standards and Specifications.

2.2.2 Drainage

2.2.2.1 All storm sewer systems shall be designed for the 10 year storm event, all storm sewer pipes shall have a minimum slope of 0.5%.

2.2.2.2 Drainage systems shall be designed to convey water to a natural watercourse or to an existing storm drainage facility on or off site.

2.2.2.3 Overland relief shall be provided so that Buildings will not be flooded during major storms. Overland relief shall be evaluated using the 100-year storm.

2.2.2.4 The drainage system, including overland relief, shall be designed to account for flows from both on site and off site areas.

2.2.2.5 Any drainage to adjacent properties shall be equal to or lesser than existing discharge.

- 2.2.2.6 Corrugated Metal Pipe (CMP) shall not be used in storm water drainage systems on County facilities.
- 2.2.2.7 All basements shall have a sump pump installed. Sump pumps shall not discharge onto walkways or travel lanes (including gutters). Sump pumps shall discharge directly into a storm sewer or a properly engineered drainage facility. In some cases consideration for the installation of a sump pump may be needed for certain crawl spaces.
- 2.2.2.8 No Building or parts of Buildings, including overhangs and footings, retaining walls, or other Building structures shall be constructed or placed within, or encroach upon, County storm drainage easements or on County property where an easement would normally be required.

2.2.3 Grading:

- 2.2.3.1 Buildings must be situated and the site graded such that no flooding will occur even if there is a local failure (i.e. pipe collapse) of the storm water system.
- 2.2.3.2 Grading will be designed to provide convenient access to the storm sewer and sanitary sewer facilities for maintenance and use.
- 2.2.3.3 All grassed areas shall have a minimum slope of 2%.
- 2.2.3.4 No clearing or grading shall occur until the County approves the Erosion and Sediment Control plan.

2.2.4 Storm Water Management

All Storm Water Management (SWM) facilities shall be designed in accordance with Table 2.2.4

Table 2.2.4 Storm Water Management
Arlington County Code - Chapter 26 - Utilities (26-5)
Arlington County Code – Chapter 48 – Floodplain Management
B-90 – Chapter 57 – Erosion and Sediment Control
Arlington County Code – Chapter 60 – Stormwater Management
Arlington County Code – Chapter 61 – Chesapeake Bay Preservation Ordinance
Arlington County Infrastructure Design and Construction Standards – Building Design - Vertical Infrastructure (Doc Version 2015.1204) (ACIDCS-BD-VS)
Stormwater Manual: A Guide to Stormwater Requirements for Land Disturbing Activities in Arlington County
(Amendment No. 1 omitted this standard)
Virginia Stormwater BMP Standards and Specifications
Virginia Stormwater Management Handbook
Virginia Stormwater Management Regulations (Section 4 VAC 50-60 Virginia Administrative Code)

- 2.2.4.1 Impervious Cover Reduction - Vegetated roofs and pervious pavement systems are encouraged for most applications to get credit for reduction in impervious area needed for treatment.

2.2.5 ADA

All site design shall comply with the requirements of the American with Disabilities Act (ADA).

2.2.6 Landscape Development:

Landscape design plans shall be prepared by a licensed Landscape Architect in the Commonwealth of Virginia.

- 2.2.6.1 Soil Media – County approved soil media for sodded areas, planting beds or planters shall be provided.
- 2.2.6.2 Plant Selection - The selection of plant materials will, in general, be made from the list outlined in Part 8 of the Arlington County Landscape Standards. Plant materials appropriate for the particular site and location should be reviewed and selected to promote long term survival and ease of maintenance. Common names of plants shall be included in the planting schedule for the site. The County may approve the use of additional species on a project by project basis
- 2.2.6.3 Planting and Preservation of trees - shall be in accordance with Arlington County's Standards for Planting and Preservation of Trees on Site Plan Projects. All existing trees must be inventoried and accurately identified by species, size and location on plans. All reasonable steps must be taken to preserve existing trees on site unless they are found to be hazardous or in significant decline. Tree preservation plans must be reviewed and approved by a DPR Urban Forester. Trees which must be removed shall be replaced according to Arlington County Tree Replacement Guidelines.
- 2.2.6.4 Locations for trees and shrubs must be coordinated with utilities, utility easements and conduits for street/site lighting and sight distance requirements.
- 2.2.6.5 All trees, shrubs and lawns shall be warranted by the Contractor for one year from the date of acceptance of the project by the County. Upon completion of the warranty period, the County and the Contractor shall conduct a final walk-through of the site to ensure all plantings and lawn areas (grass) are acceptable.
- 2.2.6.6 Landscaping at all SWM must be coordinated with and approved by the Arlington County Project Officer. Arlington County Project Officer to coordinate with the Environmental Management Bureau in DES. No plants or landscaping shall be placed where they will interfere with the drainage patterns or where they will block access to storm water facilities.
- 2.2.6.7 All new or disturbed drainage swales shall to be sodded or seeded, mulched and stabilized with biodegradable mat or fabric.
- 2.2.6.8 Specifications for seeding must include straw mulch, hydro seeding media or a comparable material to protect seed during germination period.

2.2.7 Screening

- 2.2.7.1 If screening fencing or walls are required, they shall comply with Arlington County Zoning Ordinance requirements.

2.2.8 Walls

If block, masonry, stone or rubble walls are used they shall be constructed to comply with County standards, the Arlington County Department of Public Works Retaining Wall Policy December 9, 2002 and the Arlington County Zoning Ordinance.

2.2.9 Pavement Design

- 2.2.9.1 All bituminous pavement shall be designed and constructed in accordance with the Arlington County Construction Standards and Specifications – 02600 Bituminous Roadway Pavements and 02601 Bituminous Hiking, Biking and Jogging.
- 2.2.9.2 *Pavers* used in an **ADA** required access route is Not Acceptable.
- 2.2.9.3 The use of permeable pavement treatments is encouraged and shall be determined on a case by case basis.
- 2.2.9.4 Provide a full length concrete pavement extension at the dumpster pad for refuse collection trucks. Include bollards at rear and sides of dumpster location.

2.2.10 Site Lighting

- 2.2.10.1 All site parking lighting shall be designed to Illuminating Engineering Society (IES) standards.
- 2.2.10.2 The site lighting design layout is to be incorporated into the site plan by the Registered Design Professional.
- 2.2.10.3 Exterior site lighting shall comply with the requirements for light pollution control.

2.2.11 General Requirements

- 2.2.11.1 The Contractor shall retain a testing agency to perform all site work testing and inspections more than five feet (5') outside the Building footprint. Contractor shall not use the same inspection firm as the County retains for special inspections.
- 2.2.11.2 Water meter shall be sized and installed in accordance with the Arlington County Construction Standards and Specifications – 02550 Water Mains and Appurtenances and approved by the Department of Environmental Services - Water Sewer and Streets Bureau.
- 2.2.11.3 Consideration shall be given to pavement and screening of all utility meters.
- 2.2.11.4 All public and private easements, proposed and existing, shall be shown on the site plan. The Architect shall prepare and submit to the County stamped mylar originals for all on-site and off-site easement plats for review and approval.
- 2.2.11.5 Building corners are to be tied to property lines by displaying set back distances.
- 2.2.11.6 A paved surface from all emergency exits to an area of refuge shall be provided.

2.2.12 Sidewalks and Trails

- 2.2.12.1 A minimum of two feet (2') is required between the trail edge and any vertical obstructions such as trees, utility poles, signs, or other obstacles.
- 2.2.12.2 Side slopes adjacent to sidewalks and trails shall not exceed 2:1 unless protected by an approved pedestrian guard rail.

2.2.12.3 Corrugated Metal Pipe (CMP) in storm pipes associated with sidewalks and trails is Not Acceptable.

2.3 PRODUCTS

2.3.1 Reserved

3 CONCRETE – V03000

3.1 GENERAL

3.1.1 Description

This standard identifies minimum requirements that shall be met for all concrete in the design and construction of elements for Arlington County Building Design Standards.

3.1.2 Related Arlington County Standards, Specification and Policies

including, but not limited to, those listed in Table 3.1.2

Table 3.1.2 Related Arlington County Standards, Specification and Policies
Arlington County Construction Standards and Specifications - 03100 Concrete Formwork, Reinforcement and Materials
Arlington County Construction Standards and Specifications - 3400 Precast Concrete

3.1.3 Applicable Standards and Specifications

including, but not limited to, those listed in Table 3.1.3

Table 3.1.3 Applicable Standards and Specifications
Construction Specification Institute (CSI)
American Society for Testing and Materials (ASTM)
ICC International Building Code/2012
Precast/Prestressed Concrete Institute (PCI)
US Green Building Council’s Leadership in Energy and Environmental Design (LEED) green building rating system

3.1.4 Quality Assurance

- 3.1.4.1 Project specifications shall require that all structural precast or architectural precast elements be manufactured at a precast plant which is a certified member of the Precast/Prestressed Concrete Institute (PCI) and is operated under the supervision of a PE licensed in the state of manufacture.

3.1.5 Submittals

- 3.1.5.1 The Registered Design Professional shall provide a list and or specification sections of all manufacturers, products, descriptions, performance criteria, materials, components, embedment, fabrication; admixtures and additives; liquid cure/ seal systems; grout; vapor retarders; vapor barrier; proportioning; mixing; source quality control; finish; and accessory materials pertaining to concrete work and construction.
- 3.1.5.2 Project specifications shall require the Contractor to provide shop drawings for all cast-in-place, structural precast and architectural precast concrete, and all mix designs and connection details, which are signed and sealed by a PE, licensed in the Commonwealth of Virginia, as required by the ACI. Any documents which are required by the ACI to

be signed and sealed by a PE which are not identified as a requirement of the Contractor in the specifications shall be considered to be a requirement of the Registered Design Professional and the Structural Engineering Consultant.

3.2 DESIGN

3.2.1 Design Guidelines

- 3.2.1.1 Concrete exposed to freeze / thaw shall have a minimum air content of 4.5%.
- 3.2.1.2 Concrete slabs (exclusive of mud slabs) shall receive a minimum of a float finish; if indicated to be broomed, the slab shall be floated and then broomed.i
- 3.2.1.3 Tolerances: The County requires proper forming, placement and finishing in accordance with Table 3.2.1.3

Table 3.2.1.3 Owner’s Project Requirements for Concrete Tolerances	
Sizes of sleeves, floor openings, and wall openings: Centerline of sleeves, floor wall openings, +/-1/2”.	
Finished Slab Surfaces	
Scratch Finish: For surfaces to receive concrete floor topping or mortar setting beds for tile and other bonded applied cementitious finish flooring material: Depressions between high spots shall not exceed 1/4” under a 10-foot straightedge.	
Float Finish: For surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing: Depressions between high spots shall not exceed 5/16” under a 10-foot straightedge.	
Trowel Finish: For surfaces to be exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system: Achieve level surface plane so that depressions between high spots do not exceed 1/8” under a 10-foot straightedge.	

- 3.2.1.4 Floor Leveling: The Contractor, at his own expense, shall provide floor leveling, to the satisfaction of the County, in areas where the tolerances in Table 3.2.1.3 are not achieved.

3.2.2 Vapor Retarders over Concrete

- 3.2.2.1 Always follow local codes and manufacturer’s instructions for acceptable vapor retarders.
- 3.2.2.2 Test concrete for moisture. For concrete slabs with a calcium chloride reading of greater than 3 lbs, a relative humidity reading of greater than 75%, or a calcium carbide (CM) rating of greater than 2.5%, the Contractor, at his own expense shall install an impermeable vapor retarder with a perm rating of less than .15 perm. Adding a vapor retarder is not required on installations over slabs with a calcium chloride reading of 3 lbs or less, a humidity reading of 75% or less, or a calcium carbide (CM) rating of 2.5% or less.

3.3.1 CALCIUM CHLORIDE - REINFORCED CONCRETE PIPE/DRAINAGE STRUCTURES

3.3 PRODUCTS**3.3.1 Calcium Chloride - Reinforced Concrete Pipe/Drainage Structures**

Calcium chloride in concrete used for reinforced concrete pipe or drainage structures is Not Acceptable as per VDOT.

3.3.2 Expansion Joint - Building structure

Where concrete work abuts the Building structure, plans will specify that the expansion joint will be caulked with a caulking that contains polyisocyanate prepolymer.

4 MASONRY – V04000

4.1 GENERAL

4.1.1 Description

This standard identifies minimum requirements that shall be met for all masonry in the design and construction of elements for Arlington County Building Design Standards.

4.1.2 Related Arlington County Standards, Specification and Policies

including, but not limited to, those listed in Table 4.1.2

Table 4.1.2 Related Arlington County Standards, Specification and Policies
Arlington County Construction Standards and Specifications - 03000 Concrete
Building Design – Vertical Infrastructure, Chapter 3 - CONCRETE – V03000 (see pg. 3-16)

4.1.3 Applicable Standards and Specifications

including, but not limited to, those listed in Table 4.1.3

Table 4.1.3 Applicable Standards and Specifications
ICC International Building Code/2012
American Society for Testing and Materials (ASTM)
Masonry Institute of America (MIA)
US Green Building Council’s Leadership in Energy and Environmental Design (LEED) green building rating system

4.1.4 Quality Assurance

4.1.4.1 Reserved

4.1.5 Specifications Requirements

4.1.5.1 The Consultant shall identify, in the specification sections, manufacturer’s products, descriptions, performance criteria, materials, components, embedment, fabrication; admixtures and additives; grout; vapor retarders; proportioning; mixing; source quality control; finish; and accessory materials pertaining to concrete work and construction.

4.1.5.2 Project specifications shall require the Contractor to provide shop drawings for all masonry elements, mix designs and connection details. These drawings and calculations shall be signed and sealed by a PE licensed in the Commonwealth of Virginia. Additionally, the construction documents and specifications shall identify locations for masonry panel mock ups to be built during construction phase of the project. These mock ups will be reviewed and approved by the county.

4.1.5.3 Project specifications shall state that Contractor is not authorized to proceed with manufacture or procurement of masonry elements or mortar until all related shop

drawings, mix designs, and color samples are approved; and any required mock-ups are constructed and approved.

4.2 DESIGN

4.2.1 Masonry Building Elements

All masonry Building elements shall be designed and installed in accordance with all applicable codes and standards and reviewed and approved by the County.

4.2.2 Additions and alterations to existing structures

Additions and alterations to existing structures shall be designed with matching mortar color, joint type, masonry color and texture, and masonry coursing pattern for all exposed masonry elements. Rake joints are Not Acceptable.

4.2.3 All exterior brick shall be 3000 PSI, Grade SW.

4.2.4 Minimum Compressive Strength Mortar

Mortar shall comply with ASTM C270 with minimum compressive strength of 750 PSI (higher compressive strength to be specified by mortar type as required). Contractor is required to hire a testing lab to take and test mortar cubes.

4.2.5 Glass Block

4.2.5.1 Glass block on exterior walls is Not Acceptable, without written approval of the County.

4.3 PRODUCTS

4.3.1 Reserved

5 METALS – V05000

5.1 GENERAL

5.1.1 Description

This standard identifies minimum requirements that shall be met for all metal in the design and construction of elements for Arlington County Building Design Standards.

5.1.2 Related Arlington County Standards, Specification and Policies

including, but not limited to, those listed in Table 5.1.2

Table 5.1.2 Related Arlington County Standards, Specification and Policies
Arlington County Pre-Construction Manual (May 1, 2012)

5.1.3 Applicable Standards and Specifications including

including, but not limited to, those listed in Table 5.1.3

Table 5.1.3 Applicable Standards and Specifications
American Society for Testing and Materials (ASTM)
American Welding Society (AWS) Standards (American Welding Society)
ICC International Building Code/2012
US Green Building Council’s Leadership in Energy and Environmental Design (LEED) green building rating system

5.1.4 Quality Assurance

5.1.4.1 Reserved

5.1.5 Submittals

5.1.5.1 The Registered Design Professional shall identify, in the specification sections, manufacturer’s products, descriptions, performance criteria, materials, components, fabrication, source quality control, finish, and accessory materials pertaining to metal work and construction.

5.1.5.2 Project specifications shall require the Contractor to provide shop drawings for all structural and architectural steel design, connection details and calculations which shall be signed and sealed by a PE licensed in the Commonwealth of Virginia.

5.2 DESIGN

5.2.1 Design Guidelines

5.2.1.1 All structural elements and connections falling under this section shall be designed and installed in accordance with all applicable codes and standards and reviewed and approved by the County. All design and calculations performed shall be under the supervision of a PE licensed in the Commonwealth of Virginia; and, all structural steel drawings and calculations shall be signed and sealed by the PE.

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- 5.2.1.2 Structural steel designs and drawings shall conform to all requirements of the ASTM.
 - 5.2.1.3 Where practicable, steel connections are to be designed in such a manner as to avoid being classified as a critical structure; i.e., bolted connections are to be constructed as turn of the nut. Moment/rigid connections are to be avoided.
 - 5.2.1.4 The Registered Design Professional shall identify in the Specification that the Contractor shall touch up paint and/or primer after erection of steel or other metals.

5.2.2 ASTM Requirements

- 5.2.2.1 Project specifications shall specifically require the Contractor to comply with all requirements of the ASTM where applicable. Any requirements of the ASTM and ICC-IBC which are not specifically identified as a requirement of the Contractor shall be considered to be a requirement of the Registered Design Professional and the Structural Engineering Consultant.

5.2.3 Welder Certification Requirements

- 5.2.3.1 All welders must be certified by American Welding Society (AWS). Contractor must submit copies of certifications for all welders before the welders will be permitted to work on the project.

5.3 PRODUCTS

5.3.1 Reserved

6 WOODS AND PLASICS – V06000**6.1 GENERAL****6.1.1 Description**

This standard identifies minimum requirements that shall be met for all woods and plastics in the design and construction of elements for Arlington County Building Design Standards.

6.1.2 Related Arlington County Standards, Specification and Policies

including, but not limited to, those listed in Table 6.1.2

Table 6.1.2
Related Arlington County Standards, Specification and Policies
Arlington County Construction Standards and Specifications - 6100 Structural Timber and Lumber

6.1.3 Applicable Standards and Specifications

including, but not limited to, those listed in Table 6.1.3

Table 6.1.3
Applicable Standards and Specifications
American Society for Testing and Materials (ASTM)
Architectural Woodworking Institute (AWI)
ICC International Building Code/2012
US Green Building Council's Leadership in Energy and Environmental Design (LEED) green building rating system

6.1.4 Quality Assurance

6.1.4.1 Reserved

6.1.5 Submittals

6.1.5.1 The Registered Design Professional shall identify, in the specification sections, manufacturer's products, descriptions, performance criteria, materials, components, fabrication, source quality control, finish, and accessory materials pertaining to all wood and plastic work and construction.

6.1.5.2 Project specifications shall require the Contractor to provide shop drawings for all structural wood and plastic design, connection details and calculations which shall be signed and sealed by a PE licensed in the Commonwealth of Virginia.

6.2 DESIGN**6.2.1 Millwork**

- 6.2.1.1 Counter tops in wet areas or in areas where they will be exposed to water shall be made of waterproof materials. Laminate counter tops are only acceptable in areas where the activities taking place will not expose the counters to excessive amounts of water and other types of liquids. Hard surface counter tops shall be used in all heavy usage areas such as Library circulation counters and receptionist counters etc. Counter tops shall be either cabinet supported or have steel or stainless steel front leg support. Counter tops of 36 inches or less in height shall have continuous structural support. Any span greater than 4' shall have supports spaced at no less than 30 inches. Counter top supports shall be design to conform to all accessibility standards.
- 6.2.1.2 All millwork and cabinetry shall be specified to be custom grade, as a minimum, as defined by the Architectural Woodworking Institute (AWI).

6.2.2 Wood

- 6.2.2.1 All surfaces of solid wood used for finishes at interior spaces shall be sealed.
- 6.2.2.2 Wood paneling shall have expansion strips built-in. Particleboard shall not be specified in high humidity spaces and wet areas such as pools, shower rooms, locker rooms, etc.

6.3 PRODUCTS**6.3.1 Countertops, Splashes and Window Sills:**

The preferred product for horizontal and trim fabrications for use in public use rest rooms, Kitchens, and other high use areas is a solid surface material in accordance with Table 6.3.1

Table 6.3.1		
Brand Name Product(s) for the Countertops, Splashes and Window Sills:		
Building Element	Brand Name Model	Brand Name - Category
<u>Countertops, splashes and windowsills</u> ^a	Corian®	Preferred Manufacturer(s)
	Corian® Solid Surfaces	
	Formica®	
	Formica® Solid Surfacing	
	HI-MACS®	
	HI-MACS® Acrylic Solid Surface	

Note ^a Windowsills: Provide 1/2" thick solid surface on wood shim blocking with 1 1/2" Apron edge.

7 THERMAL AND MOISTURE PROTECTION - V07000

7.1 GENERAL

7.1.1 Description

This standard identifies minimum requirements that shall be met for all thermal and moisture protection in the design and construction of Building Element for Arlington County Building Design Standards.

7.1.2 Related Arlington County Standards, Specification and Policies

including, but not limited to, those listed in Table 7.1.2

Table 7.1.2 Related Arlington County Standards, Specification and Policies
Arlington County Policy for Integrated Facility Sustainability - August 19, 2008 ("Green Building" Policy)

7.1.3 Applicable Standards and Specifications

including, but not limited to, those listed in Table 7.1.3

Table 7.1.3 Applicable Standards and Specifications
American Society for Testing and Materials (ASTM)
Cool Roof Rating Council (CRRC)
ICC International Building Code/2012
National Roofing Contractors Association (NRCA)
Occupational Safety and Health Administration (OSHA)
US Green Building Council’s Leadership in Energy and Environmental Design (LEED) green building rating system

7.1.4 Quality Assurance

7.1.4.1 Reserved

7.1.5 Submittals

The Registered Design Professional shall identify, in the specification sections, manufacturer’s products, descriptions, performance criteria, materials, components, fabrication, source quality control, finish, and accessory materials pertaining to all thermal and moisture protection work and construction.

7.2 DESIGN

7.2.1 Design Guidelines

- 7.2.1.1 A metal coping system is preferred over a stone or precast coping system. The County must specifically approve use of a stone or precast coping as architecturally required.
- 7.2.1.2 Gypsum board for exterior soffits is Not Acceptable.
- 7.2.1.3 Exterior Insulation and Finish Systems (EIFS) is Not Acceptable.

7.2.2 Vent Flashing

Vent Flashing shall be used at pipe/conduit column penetrations. All pitch pockets shall be fabricated from stainless steel or copper, be half-filled with non-shrink grout and a pourable sealer, and shall comply with NRCA recommendations.

7.2.3 Roof Design

- 7.2.3.1 Roof drain design shall be coordinated with roof ballast Specification to ensure that ballast does not clog the drains. Roof drains shall be properly sized with adequate size piping for the roof area being serviced. Screens shall be provided at all roof drains.
- 7.2.3.2 Provide a fixed *Roof Hatch Railing System* with a permanent means of fall protection for roof hatch openings and attach directly to the roof hatch cap flashing. Hatch rail system shall comply with the requirements of OSHA and Arlington County safety requirements. Provide standard self-closing and latching gate feature and hardware to ensure that the opening is protected at all times. Rails shall have High visibility safety color and UV and corrosion resistant construction with a twenty-five year warranty. Rails shall be round pultruded reinforced fire retardant yellow fiberglass treated with a UV inhibitor.
- 7.2.3.3 All roofs shall be designed with a fall protection/tie back system as stated by **OSHA**.

7.2.4 Green Roofs

- 7.2.4.1 The design of Green Roofs shall be done in coordination between the Registered Design Professional and a Certified Landscape Architect.
- 7.2.4.2 *Landscape Industry Certified Technician – Exterior (CLT-E)* shall preform the installation of the *Green Roof*.
- 7.2.4.3 Green Roofs shall have a sloped greater than 2% and less than 10%.
- 7.2.4.4 For Green Roofs, the following upstand and perimeter heights ^a shall be in compliance with Table 7.2.4.4

Table 7.2.4.4 Upstand and perimeter heights for Green Roofs
Upstand height for adjacent building parts and penetrations: minimum of 8 in.
Upstand height for roof edges: minimum of 8 in.

- Note ^a** Upstand height is measured from the upper surface of the Green Roof system build up or gravel strip.
- 7.2.4.5 Upstands, perimeters, joints and roof edges shall be protected against root penetration.
 - 7.2.4.6 The Registered Design Professional shall identify, in the specification sections root resistant waterproofing as determined from the "Procedure for investigating resistance to root penetration at green-roof sites" by the FLL (The Landscaping and Landscape Development Research Society).
 - 7.2.4.7 Roof penetrations (e.g. water connections, building parts for the usage of the roof area, etc.), when possible, should be grouped in order to keep roof penetration to a minimum.
 - 7.2.4.8 Refer to Section 15.3.2 *Plumbing Equipment*, Table 15.3.2, page 15-68 for requirements of Hose Bibb.

7.3 PRODUCTS

7.3.1 Design Guidelines

- 7.3.1.1 All roof warranties shall include a no dollar limit clause. The County shall determine the length of warranty on the basis of the roof type.
- 7.3.1.2 All Metal Roofs shall be EPA Energy Star® labeled
- 7.3.1.3 All flat/low slope roofs shall be both EPA Energy Star® labeled and Cool Roof Rating Council CRRC rated as a Cool Roof.
- 7.3.1.4 Low slope roofs must meet the Solar Reflectance Index (SRI) criteria as outlined by LEED.

7.3.2 Roof Pavers

- 7.3.2.1 White or grey pavers shall be provided on built up roofs to service mechanical equipment. Paver type and installation shall comply with roofing system manufacture requirement. Non-curb mechanical equipment shall be supported by platforms with metal columns and umbrella flashings. Height of column shall be a minimum of 8" above finished roof elevation

7.3.3 Roof Hatch Railing System

Brand Name(s) for Building Element in accordance with Table 7.3.3 The Specification shall identify a minimum of three (3) Brand Names (manufactures) that comply with the Owner’s Project Requirements used for the Invitation to Bid, unless the Brand Name Category listed as No Substitutions.

Table 7.3.3 <i>Brand Name Product(s) for the Roof Hatch Railing System</i>			
Building Element	Brand Name(s)	Brand Name Model	Brand Name - Category
Roof Hatch Railing System	Bilco®	<i>Bil-Guard® Hatch Railing System</i>	Preferred Manufacturer(s)

8 DOORS AND WINDOWS – V08000**8.1 GENERAL****8.1.1 Description**

This standard identifies minimum requirements that shall be met for all doors, Windows and roof hatches in the design and construction of elements for Arlington County Building Design Standards.

8.1.2 Related Arlington County Standards, Specification and Policies

including, but not limited to, those listed in Table 8.1.2

Table 8.1.2 Applicable Standards and Specifications
Arlington County Policy for Integrated Facility Sustainability - August 19, 2008 ("Green Building" Policy)

8.1.3 Applicable Standards and Specifications

including, but not limited to, those listed in Table 8.1.3

Table 8.1.3 Applicable Standards and Specifications
American Society for Testing and Materials (ASTM)
American with Disabilities Accessibility Guidelines for Public Rights-of-Way (PROWAG)
ICC International Building Code/2012
North American Fenestration Standard/Specification for Windows, Doors and Skylights (AAMA/WDMA/CSA 101/I.S.2/A440, NAFS)
American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA): ANSI/BHMA A156.18: Materials and Finishes
Builder Hardware Manufacturers Association-(BHMA)
US Green Building Council's Leadership in Energy and Environmental Design (LEED) green building rating system

8.1.4 Quality Assurance

8.1.4.1 Reserved

8.1.5 Submittals

8.1.5.1 The Registered Design Professional shall identify, in the specification sections, manufacturer's products, descriptions, performance criteria, materials, components, fabrication, source quality control, finish, and accessory materials pertaining to all door and window work and construction.

8.2 DESIGN**8.2.1 Windows**

- 8.2.1.1 Windows shall be protected with drip caps to keep rain from entering the walls.
- 8.2.1.2 The use of steel sash windows is Not Acceptable.
- 8.2.1.3 All new or replacement windows shall utilize thermal-pane glass, with thermo break sash.
- 8.2.1.4 The review by a case-by-case basis for the replacement of windows in a historic Buildings.
- 8.2.1.5 Provide screens for operable windows.
- 8.2.1.6 Protection of Openings:
Openings in fire rated barriers shall be protected according to International Building Code, **NFPA 80**, and **NFPA 90A**. Doors in such openings shall be normally closed, unless equipped with electromagnetic door hold open devices arranged to close upon activation of the fire alarm system and smoke detectors installed within 15 ft. of both sides of the door. Fire shutters shall be provided to protect openings in fire rated barriers designed to be normally open. Shutters shall be designed to close upon activation of a smoke detectors within 15 ft. of both sides of the shutter. Such detectors shall close all shutters within a fire barrier served. Closing speed shall be in accordance with **NFPA 80**. Fire dampers shall be installed in fire rated barriers in accordance with **NFPA 90A**. Fire rating glazing, where used, shall meet applicable safety and fire standards.
Note: Shutter includes rolling steel fire doors as well as service counter doors.
- 8.2.1.7 Glazing shall be compatible with the energy modeling of the Building.
- 8.2.1.8 Fire Rated Glazing:
The fire rated glazing shall meet the requirements for safety glazing in “Hazardous locations”. Hazardous locations are areas specifically defined in the safety glazing chapter of the Building code, in section 2406.1. As examples, “hazardous locations” include vision panels in doors, sidelites adjacent to doors, and large fixed panels near walking surfaces. The term “area subject to human impact load” is broader than the code definition of a hazardous location” and is relevant when glazing is used in an athletic facility, gyms, multipurpose rooms used as gyms, and similar types of facilities. These areas shall meet CPSC Category II Safety glazing standard. Traditional wired glass will NOT meet the requirements of CPSC Category II safety glazing standards.

8.2.2 Doors

- 8.2.2.1 The review by a case-by-case basis for the replacement of doors in a historic Buildings.
- 8.2.2.2 Overhead Doors shall be designed with governors and access panels. Additional structural support shall be provided on overhead doors and shall be shown on plans.
- 8.2.2.3 When doors are equipped with automatic openers, the activation shall be hard wired.
- 8.2.2.4 In Fire Houses, access doors for apparatus bays shall be *Electric Operated Four Fold Doors*. Refer to Building Design – Vertical Infrastructure, Chapter 16 - ELECTRICAL - V16000, pg. 16-69 for on *Brand Name(s)* Category.

8.2.3 Architectural Door Hardware

- 8.2.3.1 *Panic Hardware* should have removable core cylinders to match the Building Master Keying System. Registered Design Professional shall coordinate specification to

provide **ADA Compliant** panic hardware to ensure that a minimum door opening width is maintained. Refer to Chapter 8, DOORS AND WINDOWS – V08000, Section 8.3.1 *Architectural Door Hardware* pg.8-31 for *Brand Name Product(s)*.

- 8.2.3.2 All doors shall have floor mounted door stops or wall mounted door stops with adequate blocking in areas that have gypsum wall board.
- 8.2.3.3 Hinges at all doors shall be ball bearing type. Different hinges may be approved for use on a case by case basis.
- 8.2.3.4 New *Architectural Door Hardware* – renovations: for partial renovations, all finished hardware shall match the existing where possible in finish, style and keyway in order to maintain continuity
- 8.2.3.5 *Architectural Door Hardware* and materials shall comply with ANSI A-156.18-87 Materials and Finishes / BHMA 1301. Finishes shall be in accordance with Table 8.2.3

Table 8.2.3 Architectural Hardware Finish Designations			
ANSI/BHMA Code	Description	Base Material	Nearest Former U.S. Equivalent
626	Satin chromium plated	Brass, Bronze	US26D
630	Satin Stainless Steel	Stainless steel 300 series	US32D
605	Bright brass, clear coated	Brass	US3
613	Dark Oxidized Satin Bronze, Oil Rubbed	Bronze	US10B

8.2.4 Keying System

- 8.2.4.1 The Keying System should be compatible with existing Schlage *Master* Keying System with 'C' Keyway.
- 8.2.4.2 Registered Design Professional shall coordinate keying schedule with the Arlington County Project Officer, the using agency and Facilities Management Bureau. Contractor shall sort, label, and tag all keys; set up key cabinet with index; and review with the Arlington County Project Officer.
- 8.2.4.3 *Registered Design Professional* shall coordinate specification to provide Brand Name(s) (manufacturers) standard embossed keys of nickel silver to ensure durability as per Table 8.2.4.3 in the in the following quantities:

Table 8.2.4.3 Owner's Project Requirements for Key Quantities	
Description	Quantity
Grand Master Key	Per area serviced - 12 each
Master Keys per set	10 per floor

Permanent Control key	12 per level
Refer to Chapter 17 FIRE PROTECTION V17000, Section Key Box pg. 17-82 for additional requirements	

8.3 PRODUCTS

8.3.1 Architectural Door Hardware

Brand Name(s) for Building Element in accordance with Table 8.3.1 The Specification shall identify a minimum of three (3) Brand Names (manufactures) that comply with the Owner's Project Requirements used for the Invitation to Bid, unless the Brand Name Category listed as No Substitutions.

<i>Table 8.3.1 Brand Name Product(s) for the Architectural Door Hardware</i>		
<i>Building Element</i>	<i>Brand Name(s) Brand Name Model</i>	<i>Brand Name - Category</i>
Door Closers - Floor type - ADA Compliant	Rixson	Or Equal
Door Closers - Floor type	Rixson	Or Equal
Door Closers - Surface Mounted - ADA Compliant	LCN	Or Equal
Door Closers - Surface Mounted	LCN	Or Equal
Finished Hardware-01	Schlage 'D' Series 'C' Keyway a	No Substitutions
Finished Hardware-02	Corbin CL3300 Series Keyway 4L a	No Substitutions
Lockset - ADA Compliant	Schlage D Series, Rose Design levers a	No Substitutions
Panic Hardware	Von Duprin	No Substitutions

Note ^a Finished hardware shall be furnished with Six (6) pin keys and in series unless otherwise indicated in Specifications.

8.3.2 Doors

Brand Name(s) for Building Element in accordance with Table 8.3.2 The Specification shall identify a minimum of three (3) Brand Names (manufactures) that comply with the Owner's Project Requirements used for the Invitation to Bid, unless the Brand Name Category listed as No Substitutions.

Table 8.3.2 <i>Brand Name Product(s) for the Doors</i>			
Building Element	Brand Name(s)	Brand Name Model	Brand Name - Category
Electric Operated Four Fold Doors	Door Engineering and Manufacturing, LLC		Preferred Manufacturer(s)

9 FINISHES – V09000

9.1 GENERAL

9.1.1 Description

This standard identifies minimum requirements that shall be met for all internal finishes in the design and construction of elements for Arlington County Building Design Standards.

9.1.2 Related Arlington County Standards, Specification and Policies

9.1.2.1 Reserved

9.1.3 Applicable Standards and Specifications

including, but not limited to, those listed in Table 9.1.3

Table 9.1.3 Applicable Standards and Specifications
US Green Building Council’s Leadership in Energy and Environmental Design (LEED) green building rating system

9.1.4 Quality Assurance

9.1.4.1 Reserved

9.1.5 Submittals

9.1.5.1 Reserved

9.2 DESIGN

9.2.1 Lath & Plaster

9.2.1.1 Lath and plaster work shall be limited to the repair or renovation of interior areas where required to maintain historically significant features and it is impractical to replicate or repair using gypsum board or similar materials.

9.2.2 Gypsum Board

9.2.2.1 If a gypsum fire-rated assembly is provided, the number must be specified. If a gypsum board ceiling is designed, access panels shall be provided for maintenance access. Panels shall be provided for all maintained elements. If installation of the access panels compromises the aesthetics of the ceiling, either relocate the maintained elements to an accessible ceiling or change the design of the ceiling. Water-resistant gypsum board shall be specified for wall and ceiling use in bathroom and locker room areas. Cementitious Board or equal product shall be used in shower areas and wet areas around lavatories.

9.2.3 Ceramic Tile.

9.2.3.1 Restrooms shall be ceramic tile on the floor and up to a minimum of Five (5) feet on all wet walls, unless otherwise approved by the Arlington County Project Officer.

9.2.4 Flooring

- 9.2.4.1 Prior approval shall be obtained from the Arlington County Project Officer on all types of flooring and carpeting used in the facilities. All carpeting specified in the building shall meet the LEED standards for carpet.
- 9.2.4.2 Before the Contractor proceeds with any work, the floor substrate surface must be inspected and any visible defects on the surface such as cracks, bumps, rough areas or variations in levelness must be reported in writing to the Arlington County Project Officer.
- 9.2.4.3 **Concrete subfloors:**
Concrete subfloors to receive floor finish including but not limited to carpet, vinyl, wood or cork must be smooth and level within a tolerance of toveled finish as per Table 3.2.1.3
- 9.2.4.4 Flooring installation shall not commence until the Building is enclosed and all other trade have completed their work.
- 9.2.4.5 The Contractor shall allow time in the schedule to comply with project completion date for new concrete subfloors to cure a minimum of 28 days prior to installing flooring or 4 weeks for every 1” thickness of slab whichever is greater.
- 9.2.4.6 The Contractor shall allow all flooring materials to acclimate to site temperature prior to their use and installation
- 9.2.4.7 The Contractor Maintain a stable room and subfloor temperature prior to installation (before performing moisture tests), during the installation and min. 48 hours after the installation. The required temperature range is 65° F to 86° F. The required ambient humidity control level is between 35 to 55%.
- 9.2.4.8 Concrete substrates must be fully cured and free of any hydrostatic and/or moisture problems. Moisture and alkalinity tests must be performed on all concrete substrates, under in-service conditions. The Contractor shall turn on the HVAC system to ensure stable conditions during testing and installation. The pH level should be in the range of 7 to 10. Moisture vapor emission content of the concrete slab must not exceed the tolerance of the adhesive specified when tested according to ASTM F1869 (anhydrous calcium chloride for moisture vapors from concrete), and relative humidity of concrete slab must not exceed the tolerance of the adhesive specified when tested according to ASTM F2170 (in-situ probes for relative humidity in concrete slab). The Contractor, at his own expense, shall provide the necessary corrections for the requirements noted above, to the satisfaction of the County.

9.2.5 Wall Covering

- 9.2.5.1 Upon approval by the Arlington County Project Officer, provide wall covering on the wall in lieu of semi-gloss latex paint in main corridors and/or paths of egress travel with the exception of fire stairwells.

9.2.6 Ceilings

- 9.2.6.1 Where finished ceilings are required, they shall be gypsum board or acoustical ceiling grid type. All specialty ceilings shall be approved by the Arlington County Project Officer in advance. All acoustical ceiling tile systems shall be 2' x 2' or 2' x 4'. Acoustical ceiling tiles located in high humidity areas shall have appropriate density

and moisture resistance to prevent sagging. Spline ceilings are not acceptable. Ceilings in Kitchen and food preparation areas shall be 2’ x 2’ tiles with a moisture resistant finish. If 2’ x 2’ metal tiles are used, provide with fiberglass insulation encased in plastic.

9.2.7 Paint

Painting of Interior Surfaces shall be in accordance with Table 9.2.7:

Table 9.2.7 Painting of Interior Surfaces	
Building Element	Paint Type
Ceilings	Flat latex ^a
Doors and frames	Semi-gloss latex unless doors are a natural stain ^a
Walls	Eggshell latex ^a

Note ^a One (1) coat of primer and two (2) coats of finish paint is required for all walls, ceilings, doors and frames.

9.2.7.1 All paints, glues and adhesives shall meet the LEED standard for low-VOC products.

9.2.8 Attic Stock

9.2.8.1 Wall Covering, Floor Covering, Carpets and Ceiling Tiles:
Attic stock for wall covering, floor covering, carpets and ceiling tiles shall be of the same dye lot or production run and a minimum of 5% of each type and color lot shall be provided. If 5% is less than a standard box or roll, then a full box or roll shall be supplied. All attic stock shall be labeled with the Building and location of use.

9.2.9 Maintenance Access

9.2.9.1 Any ceiling system utilized shall be accessible if there are maintained elements above it. If access to maintained elements cannot be relocated above an accessible ceiling, then a 24” x 24” or 2’ x 4’ access ceiling panel shall be provided. Prior approval shall be obtained from the Arlington County Project Officer for all other sizes.

9.2.10 Cleanability

9.2.10.1 Any Kitchen designated by code as a commercial type Kitchen shall have hard surface finishes that are smooth and able to be cleaned without damaging the surface finish. The County is to review and approve all Kitchen finishes.

9.3 PRODUCTS

9.3.1 Paints, Glues and adhesives:

Brand Name(s) for Building Element in accordance with Table 9.3.1 The Specification shall identify a minimum of three (3) Brand Names (manufactures) that comply with the Owner’s Project Requirements used for the Invitation to Bid, unless the Brand Name Category listed as No Substitutions.

Table 9.3.1 <i>Brand Name Product(s) for the Paints, Glues and adhesives:</i>
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Building Element	Brand Name(s)	Brand Name Model	Brand Name - Category
Paints, Glues and adhesives	Benjamin Moore Duron Sherwin-Williams		Preferred Manufacturer(s)

10 SPECIALTIES – V10000

10.1 GENERAL

10.1.1 Description

This standard identifies minimum requirements that shall be met for all specialties in the design and construction of elements for Arlington County Building Design Standards.

10.1.2 Related Arlington County Standards, Specification and Policies

including, but not limited to, those listed in Table 10.1.2

Table 10.1.2 Related Arlington County Standards, Specification and Policies
Arlington County Government Department of Technology Services Network Infrastructure Standards (6/19/2015)
Building Design – Vertical Infrastructure, Chapter 9 - FINISHES – V09000 (see pg. 9-33)
Building Design – Vertical Infrastructure, Chapter 16 - ELECTRICAL - V16000 (see pg. 16-69)
Arlington County Code - Chapter 8.1 - Fire Prevention Code – April 28, 2009 (Arlington County Fire Prevention Code)
Arlington County Policy for Integrated Facility Sustainability - August 19, 2008 ("Green Building" Policy)

10.1.3 Applicable Standards and Specifications

including, but not limited to, those listed in Table 10.1.3

Table 10.1.3 Applicable Standards and Specifications
29 CFR 1910.157 (c) (1) - Portable Fire Extinguishers
American National Standards Institute (ANSI)
American with Disabilities Accessibility Guidelines for Public Rights-of-Way (PROWAG)
US Green Building Council’s Leadership in Energy and Environmental Design (LEED) green building rating system
Virginia Uniformed Statewide Building Code 2012 (USBC)
Virginia Statewide Fire Prevention Code (SFPC)

10.1.4 Quality Assurance

10.1.4.1 Reserved

10.1.5 Submittals

10.1.5.1 Reserved

10.2 DESIGN

10.2.1 Fire extinguishers

- 10.2.1.1 Depending on the Building type, fire extinguishers shall be fitted in accordance with the Virginia Uniformed Statewide Building Code 2012 and the Arlington County Code and all accessibility standards. The initial charging date tagged on all fire extinguishers shall be the date of substantial completion. Recessed fire extinguishers shall be mounted to meet 2010 Standards and ANSI standards.
- 10.2.1.2 Fire Extinguishers shall be placed for a maximum travel distance of 75 feet in any direction to a unit.
- 10.2.1.3 Signage shall be located above the extinguisher to "point" to the FE location and visible at 360 degrees of view at whatever height is required for the extinguisher to be seen at the maximum distance, and comply with 29 CFR 1910.157 (c) (1) - Portable Fire Extinguishers.

10.2.2 Partitions

- 10.2.2.1 All bathroom partitions shall be ceiling and/or wall hung with structural steel framing. Details shall be provided for approval by the Arlington County Project Officer as part of the construction design approval process. Line of sights from entry door to urinals and to mirror reflections shall be checked to ensure privacy. Toilet partitions and screens shall be constructed of water proof materials.

10.2.3 Building Interior and Exterior Signage

- 10.2.3.1 The Registered Design Professional shall identify, in the specification sections a room signage package in compliance with the Room Numbering Standard in Section 1.2.10 Document Organization and Format Table 1.2.10.1, page 1-6.
- 10.2.3.2 On all plans, each room in the facility shall be labeled or numbered to facilitate maintenance and emergency response. The plans shall note the need for the Contractor to supply and install all necessary signage for Certificate of Occupancy. All sign types shall meet all accessibility standards and shall be approved by the Arlington County Project Officer prior to installation. The County shall provide a sign package that identifies the labeling of room by function and activity. Shop drawings shall be approved by the County prior to the order of any material.
- 10.2.3.3 The street address number shall be provided, clearly visible on the front of the Building.

10.2.4 Janitor Closets

- 10.2.4.1 A minimum of one 6' x 8' janitor's closet shall be provided per Building floor. On floors where the gross floor area exceeds 25,000 sq. ft. additional closets shall be provided for each additional 25,000 sq. ft. of gross floor space, or parts thereof.
- 10.2.4.2 All janitors' closets shall be in accordance with Table 10.2.4.2

Table 10.2.4.2
Janitor Closets
All Janitors' closets shall be sprinkled.

Table 10.2.4.2 Janitor Closets
Walls shall be tiled to a height of 6' or ¾ the height of the wall, which ever is greater. Walls above the tile shall be painted or sealed concrete block.
Floors shall be slip resistant, sealed concrete.
A 110-volt GFI protected outlet must be provided in all janitors' closets
Shelving shall be provided. Specifications and drawings for shelving suitable for the types of materials to be stored shall be submitted for approval
All janitorial closets shall be provided with an industry standard floor mop sink with a service faucet with both hot and cold domestic water. The service faucet shall be equipped with a hose adapter and a vacuum breaker.

10.2.5 Communication Room (OPR)

Refer to the Building Design – Vertical Infrastructure - COMMUNICATION ROOM STANDARDS (Appendix D) pg. D-112 and the Arlington County V- 16000 Electrical section for information on Communication Room design criteria.

10.2.6 Mechanical and Electrical Equipment

All mechanical or electrical equipment located above a suspended ceiling shall be labeled/ identified with a name plate at the suspended ceiling. Fire alarm devices located above a suspended ceiling must have a nameplate identifying the device at the appropriate suspended ceiling location and at the point of access to the device if different from the suspended ceiling.

10.3 PRODUCTS

10.3.1 Toilet Accessories

Unless otherwise directed, by the Arlington County Project Officer all restrooms shall be designed to include the following accessories as per Table 10.3.1:

Table 10.3.1 Toilet Accessories
Jumbo roll toilet tissue holder
Roll towel dispenser
Free standing trash receptacle
Stainless steel wall mounted soap dispenser (Each sink shall have one soap dispenser).
Stainless steel toilet seat cover dispenser
Combination napkin/tampon disposal in women stalls (include appropriate disposal in ADA compliant stalls)
ADA compliant purse shelf in men and women stalls
Coat hook in each stall centered on the inside of the stall door
A minimum of one mirror
One Baby changing station in each restroom intended for general public use

11 EQUIPMENT – V11000**11.1 GENERAL****11.1.1 Description**

This standard identifies minimum requirements that shall be met for all equipment in the design and construction of elements for Arlington County Building Design Standards.

11.1.2 Related Arlington County Standards, Specification and Policies

including, but not limited to, those listed in Table 11.1.2

Table 11.1.2 Related Arlington County Standards, Specification and Policies
Arlington County Policy for Integrated Facility Sustainability - August 19, 2008 ("Green Building" Policy)

11.1.3 Applicable Standards and Specifications

including, but not limited to, those listed in Table 11.1.3

Table 11.1.3 Applicable Standards and Specifications
American National Standards Institute (ANSI), Z358.1-2009, Emergency Eyewash and Shower equipment
Federal Occupational Safety and Health Administration Standard 29 CFR 1910.151
Globally Harmonized System of Classification and Labelling of Chemicals (GHS)
US Green Building Council's Leadership in Energy and Environmental Design (LEED) green building rating system

11.1.4 Quality Assurance

11.1.4.1 Reserved

11.1.5 Submittals

11.1.5.1 Reserved

11.2 DESIGN**11.2.1 Isolation Valves**

11.2.1.1 Provide individual isolation valves (shut off valves) to isolate each washing machine from the piping system for maintenance, alterations and repair work.

11.2.2 Exhausts for Dryers

The Registered Design Professional shall coordinate design of exhausts for dryers with dryer manufacturer. All exhaust dryer ducts including, screws, rivets, straps and anchors shall be constructed with stainless steel, including electric dryers. All vents greater than 7.5' in lengths shall be doubled walled as approved.

11.2.3 Floor Drains

The Registered Design Professional shall provide floor drains at all public restrooms and at laundry rooms. Pitch floor drains such that the drain is at the lowest point as identified by the USBC.

11.2.4 Voltages requirements for washing machines and dryers

The Registered Design Professional shall coordinate voltages for washing machines and dryers between electrical plans, specifications, schedules, and disconnects.

11.2.5 Equipment Plans:

The Registered Design Professional shall coordinate equipment plans for any Kitchen equipment closely with electrical power drawings to ensure consistency between power requirements and power provided. Use gas appliances wherever gas service is available.

11.2.6 Appliances

- 11.2.6.1 All appliances shall be high energy efficiency type and shall carry the EPA Energy Star® label designation where applicable. Utilize gas-fired clothes dryers whenever gas service is available.
- 11.2.6.2 Commercial washing machines and fire department gear washing machines shall be bolted to a raised housekeeping slab; and be provided with vibration isolators, as required. Any washing machines which are to be located on an elevated, structural slab must be analyzed for harmonic impacts in conjunction with the structural plans, and the appropriate vibration isolation or dampening provided.

11.2.7 EMERGENCY EYEWASHES (Plumbed Units Only):

This section presents the minimum requirements for eyewash and shower equipment for the emergency treatment of the eyes or body of a person exposed to hazardous substances. It covers the following types of equipment: emergency showers and eyewash.

- 11.2.7.1 Emergency plumbed eyewash equipment shall be provided for all work areas where, during routine operations or foreseeable emergencies, the eyes of an employee may come into contact with a substance which can cause corrosion, severe irritation, or permanent tissue damage or is toxic by absorption (see table below). Where a Safety Data Sheet **SDS** for the materials used specifies the use of an eyewash in case of eye contact. All work areas where formaldehyde solutions in concentrations greater than or equal to 0.1% are handled.
- 11.2.7.2 The County considers the following to be substances which can cause corrosion, severe irritation, or permanent tissue damage, or which are toxic by absorption:
 - 11.2.7.2.1 Substances classified by the manufacturer or distributor according to the Globally Harmonized System of Classification and Labelling of Chemicals as Category 1 (serious eye damage) or Category 2A (irritant) eye hazards.
 - 11.2.7.2.2 Substances identified by the manufacturer or distributor as causing corrosion, severe irritation, or permanent tissue damage to the eyes.
 - 11.2.7.2.3 Substances identified by the manufacturer or distributor as toxic by skin absorption.

11.2.8 Emergency Showers:

- 11.2.8.1 A plumbed emergency shower shall be provided for all work areas where, during normal operations or foreseeable emergencies, areas of the body may come into contact with a substance which is corrosive or severely irritating to the skin or which is toxic by skin absorption (see table below). Where an **SDS** for the materials used specifies the use of an eyewash in case of eye contact. All work areas where formaldehyde solutions in concentrations greater than or equal to 0.1% are handled.
- 11.2.8.2 The County considers the following to be substances which are corrosive or severely irritating to the skin or which are toxic by skin absorption:
- 11.2.8.2.1 Substances classified by the manufacturer or distributor according to the Globally Harmonized System of Classification and Labelling of Chemicals (**GHS**) as Category 1 (skin corrosion) or Category 2 (skin irritation) skin hazards.
 - 11.2.8.2.2 Substances identified by the manufacturer or distributor as corrosive or severely irritating to the skin.
 - 11.2.8.2.3 Shops, laboratories and janitor closets and other spaces using and handling hazardous substances will generally require eyewash and safety showers. Janitor closets and other spaces using bleach and other chemical disinfectants will generally require eyewash and safety showers.
- 11.2.8.3 Location
- 11.2.8.3.1 Emergency eyewash and shower equipment shall be on the same level as the hazard and accessible for immediate use in locations that require no more than 10 seconds for the injured person to reach. The path of travel must be free of obstructions. If both eyewash and shower are needed, they shall be located so that both can be used at the same time by one person.
 - 11.2.8.3.2 Locate Emergency Equipment In Accessible Locations That Required No More Than 10 Seconds To Reach And Within 100 Feet Of The Hazard. When The Hazard Is Highly Corrosive, Such As A Strong Acid Or Caustic, The Equipment Should Be Within 10 Feet Of The Hazard.
 - 11.2.8.3.3 The route to get to emergency units must have no change in elevation i.e. steps or uneven ground). Passage through no more than one doorway, and no pathway objects.
 - 11.2.8.3.4 Consult with Arlington County Project Officer and end user to determine emergency equipment locations, quantities, type and combinations (shower/eyewash, shower, etc.)
 - 11.2.8.3.5 Locate centerline of emergency equipment a minimum of 7 feet from electrical or mechanical equipment (i.e. transformers, compressors and similar items), equip electrical outlets within 6 feet with a Ground Fault Circuit Interrupter (**GFCI**).
- 11.2.8.4 Locate isolated ball valves (3 required) within cabinet.
- 11.2.8.5 Where the possibility of freezing conditions exist, protect equipment from freezing or install freeze protected equipment.

- 11.2.8.6 An alarm system may have to be installed when the emergency units are installed in remote areas or in hazardous locations where there are few people. HSR-5 and the user will make this determination.
- 11.2.8.7 Corrosion resistant material if emergency equipment is installed in harsh environments.
- 11.2.8.8 **Mixing Valves:** Emergency showers with plumbing shall have temp-controlled mixing valves

11.2.9 Signage and Visibility

- 11.2.9.1 The path of travel shall be clearly identified with signage. Emergency Eyewash and shower locations must be identified with a highly visible sign positioned so the sign is visible within the area served by eyewash and shower equipment. The areas around the eyewash or shower must be well lit.
- 11.2.9.2 A large contrasting spot (32” diameter) should be painted on, embedded in, or affixed to the floor directly beneath the shower to indicate its location and the area that must be kept free from any obstruction.

11.2.10 Prohibitions around equipment

No electrical apparatus or receptacles (electrical outlets) shall be located within a zone measured 3 feet horizontally and 8 feet vertically of eyewash stations or showers. If a 120-volt outlet or receptacle is present within 6 feet of an eyewash or shower, it shall be equipped with a Ground Fault Circuit Interrupter (GFCI).

- 11.2.10.1 Shut-off valves: The water supply to showers and/or shower/eyewash combination units should be controlled by a ball-type shutoff valve which is visible and accessible to shower testing personnel in the event of leaking or failed shower head valves. If shut off valves are installed in the supply line for maintenance purposes, provisions shall be made to prevent unauthorized shut off.
- 11.2.10.2 Floor Drains: Where feasible, floor drains should be installed below or near safety showers, with the floor sloped sufficiently to direct water from the shower into the Sanitary Sewer Drain.

11.3 PRODUCTS

11.3.1 Emergency Eyewashes & Showers

Brand Name(s) for Building Element in accordance with Table 11.3.1 The Specification shall identify a minimum of three (3) Brand Names (manufactures) that comply with the Owner’s Project Requirements used for the Invitation to Bid, unless the Brand Name Category listed as No Substitutions.

Table 11.3.1 <i>Brand Name Product(s) for the Emergency Eyewashes & Showers</i>			
Building Element	Brand Name(s)	Brand Name Model	Brand Name - Category
<u>Emergency Eyewashes</u>	Bradley, Encon, Guardian, Haws, Lab Safety		Preferred Manufacturer(s)

Table 11.3.1 <i>Brand Name Product(s) for the Emergency Eyewashes & Showers</i>			
	Supply, Speakman & Watersaver		
Emergency Showers	Bradley Encon Guardian Haws Speakman Watersaver		Preferred Manufacturer(s)
Thermostatic Mixing Valves	Bradley Encon Lab Safety Supply Lawler		Preferred Manufacturer(s)

12 FURNISHINGS (SYSTEM FURNITURE) - V12000

12.1 GENERAL

12.1.1 Description

This standard identifies minimum requirements that shall be met for all systems furniture in the design and construction of elements for Arlington County Building Design Standards.

12.1.2 Related Arlington County Standards, Specification and Policies

including, but not limited to, those listed in Table 12.1.2

Table 12.1.2
Related Arlington County Standards, Specification and Policies
Arlington County Policy for Integrated Facility Sustainability - August 19, 2008 ("Green Building" Policy)

12.1.3 Applicable Standards and Specifications including

including, but not limited to, those listed in Table 12.1.3

Table 12.1.3
Applicable Standards and Specifications
US Green Building Council's Leadership in Energy and Environmental Design (LEED) green building rating system

12.1.4 Quality Assurance

12.1.4.1 Reserved

12.1.5 Submittals

12.1.5.1 Reserved

12.2 DESIGN

12.2.1 Design Guidelines

12.2.1.1 All systems furniture will be specified, ordered and provided by Arlington County. The Registered Design Professional is responsible for coordinating electrical requirements and locations for connections on floor plans.

12.2.1.2 The *Registered Design Professional* shall identify, in the *Specification* that the Contractor is responsible for the final electrical connection of the systems furniture whip to the electrical junction box.

12.2.2 County Office & Workstation Requirements

shall be in accordance with Table 12.2.2.

Table 12.2.2 County Office & Workstation Requirements		
Category Title	Square Footage	Configuration
Group A – Department Director	240	Fixed Wall Office
Group B – Department Deputy Director & Division Director	180	Fixed Wall Office
Group C - Asst. Director & Bureau Chief	120	Fixed Wall Office
Group D - Supervisor	100	Systems Furniture Workstation w/Door or Fixed Wall Office w/Door ^a
Group E - Professional Staff	80 ^b	Systems Furniture Workstations
Group F – Clerical & Administrative	64 ^b	Systems Furniture Workstations
Group G - Inspectors and Field Staff	48	Systems Furniture Workstations
Group H - Temporary & Shared Computer Workstations	36	Systems Furniture Workstations

Note a Type of office will be designated by Department Director during planning.

Note b Exceptions for size and type of components will be determined during planning based on job requirements and at the discretion of the Department Director.

12.3 PRODUCTS

12.3.1 Systems Furniture

Brand Name(s) for Building Element in accordance with Table 12.3.1 The Specification shall identify a minimum of three (3) Brand Names (manufactures) that comply with the Owner’s Project Requirements used for the Invitation to Bid, unless the Brand Name Category listed as No Substitutions.

Table 12.3.1 Brand Name Product(s) for the Systems Furniture		
Building Element	Brand Name(s) Brand Name Model	Brand Name - Category
Systems Furniture	Knoll – Horizon Dividend	No Substitutions

13 SPECIAL EQUIPMENT - V13000**13.1 GENERAL****13.1.1 Description**

This standard identifies minimum requirements that shall be met for all special equipment in the design and construction of elements for Arlington County Building Design Standards.

13.1.2 Related Arlington County Standards, Specification and Policies

including, but not limited to, those listed in Table 13.1.2

Table 13.1.2
Related Arlington County Standards, Specification and Policies
Arlington County Policy for Integrated Facility Sustainability - August 19, 2008 ("Green Building" Policy)

13.1.3 Applicable Standards and Specifications including

including, but not limited to, those listed in Table 13.1.3

Table 13.1.3
Applicable Standards and Specifications
American Society for Testing and Materials (ASTM)
ICC International Building Code/2012
US Green Building Council's Leadership in Energy and Environmental Design (LEED) green building rating system

13.1.4 Quality Assurance

13.1.4.1 Reserved

13.1.5 Submittals

13.1.5.1 The Registered Design Professional shall identify, in the specification sections, manufacturer's products, descriptions, performance criteria, materials, components, fabrication, source quality control, finish, and accessory materials pertaining to all special equipment work and construction.

13.2 DESIGN

All access control systems shall be reviewed and approved by Inspection Services Division (ISD) prior to implementation.

13.2.1 Security Access and Surveillance

13.2.1.1 All Security system solutions shall be turn-key, fully functioning systems at the time the County takes possession to include all programming (card activation, time zone, video analytic, etc.) desired by end user.

13.2.1.2 All security systems shall be considered critical systems and be equipped with battery backup, uninterruptible power supply, and connected to emergency power if available. Refer to Building Design – Vertical Infrastructure, Chapter 16 - Generator & Transfer Switches, pg. 16-71 for additional information.

- 13.2.1.3 The Security Access (SA) system shall monitor and control access throughout the facility. The SA system shall also monitor and provide access control to the facility. The system shall include the following as indicated in Table 13.2.1.3.

Table 13.2.1.3 Security Access and Surveillance
Card readers to control access at specified facility entrances.
Card readers to control access to selected lobby areas, offices, equipment rooms, etc.
Appropriate additional hardware at each door controlled by SA system (request to exit devices, flush-mount door contacts, appropriate locking hardware, etc.) to ensure proper operation of SA system. . Fail secure locking hardware (electric strikes or electric latch retraction) Preferred Manufacturer(s): Von Duprin; HES or Adams Rite.
A SA System Database in the facility to maintain records of all movements through controlled areas.
A SA system Database in the facility to maintain records of all faulty alarms.
Controllers with the ability to be connected to SA system server and workstations via LAN.
The SA System is Andover Controls to be completely compatible with Andover Continuum, No Substitutions
HID Corporate 1000 format proximity cards.

13.2.2 Closed Circuit Television

The Closed Circuit Television (CCTV) system shall provide surveillance of facility entrances and any interior areas deemed appropriate by the -Department of Technology Services (DTS) The system shall include the following as indicated in Table 13.2.2

Table 13.2.2 Closed Circuit Television (CCTV) system
Provide Fixed Dome Cameras for both interior and exterior locations with appropriate enclosures/mounting for each (To include thermostatically controlled heater, window defroster/defogger, sun shroud, viewing window wiper and insulation blanket along with any accessories which may be required for a complete environmental camera system where necessary.) The camera system shall be able to transmit/receive video and data over a single coaxial cable. Cameras shall be specified upon performance criteria to accomplish the desired task specified for each camera installed. Minimum of 480 lines resolution and low lux day/night capability required. Preferred Manufacturer(s) include: Panasonic, Pelco and Bosch.
A digital video recorder shall be provided for unattended recording, accessing and control of cameras on the system. Supplied accessories include a keyboard, mouse, and rack mounting adaptors. Software shall allow for monitoring over a TCP/IP (100 BaseT) network and shall be provided with the Digital Video Recorder. DVR should support

13.2.3 INTRUSION DETECTION (ID) SYSTEM

<p>Table 13.2.2 Closed Circuit Television (CCTV) system</p>
<p>basic functions such as recording on motion, motion detection sensitivity adjustment, and full control of PTZ cameras from any workstation over the network.</p>

13.2.3 Intrusion Detection (ID) System

- 13.2.3.1 The Intrusion Detection System (ID) shall provide additional surveillance for after-hours monitoring of the facility entrances (especially any that are not on the Security Access System) and areas deemed appropriate by end-user. The ID System shall be monitored by the County’s contracted monitoring company. The system shall include the following as indicated in Table 13.2.3.1

<p>Table 13.2.3.1 Intrusion Detection (ID) system</p>
<p>Intrusion detection panel with dual-line dialer listed that allows for communication with central monitoring.</p>
<p>MINIMUM of one command keypad to be located at appropriate employee entrance(s) as indicated by end-user.</p>
<p>Door contacts and motion sensors (minimum dual technology) and/or glass break sensors to protect all facility entrances and interior areas as deemed appropriate.</p>

13.3 PRODUCTS

13.3.1 Security Access and Surveillance

Brand Name(s) for Building Element in accordance with Table 13.3.1 The Specification shall identify a minimum of three (3) Brand Names (manufactures) that comply with the Owner’s Project Requirements used for the Invitation to Bid, unless the Brand Name Category listed as No Substitutions.

<p>Table 13.3.1 Brand Name(s) for Security Access and Surveillance</p>		
Building Element	Brand Name(s) Brand Name Model	Brand Name - Category
Network/Digital Video Recorders	Pelco DX series with DS control point Client software	No Substitutions
Intrusion Detection (ID) system	Bosch Radionics Radionics 9000 series with compatible accessories	No Substitutions

14 CONVEYING SYSTEMS - V14000

14.1 GENERAL

14.1.1 Description

This standard identifies minimum requirements that shall be met for all conveying systems in the design and construction of elements for Arlington County Building Design Standards.

14.1.2 Related Arlington County Standards, Specification and Policies

14.1.2.1 Reserved

14.1.3 Applicable Standards and Specifications

including, but not limited to, those listed in Table 14.1.3

Table 14.1.3 Applicable Standards and Specifications
American Society for Testing and Materials (ASTM)
American Society of Mechanical Engineers (ASME) – Handbook on Safety Code for Elevators and Escalators (ASME A17.1/CSA B44-2013)
American with Disabilities Accessibility Guidelines for Public Rights-of-Way (PROWAG)
ICC International Building Code/2012
National Elevator Industry (NEII) – Building Transportation Standards and Guidelines (NEII®-1)
US Green Building Council’s Leadership in Energy and Environmental Design (LEED) green building rating system
Washington Metropolitan Area Transit Authority (WMATA)

14.1.4 Quality Assurance

14.1.4.1 Reserved

14.1.5 Submittals

14.1.5.1 The Registered Design Professional shall identify, in the specification sections, manufacturer’s products, descriptions, energy efficiency, performance criteria, materials, components, fabrication, source quality control, finish, and accessory materials pertaining to all Conveying Systems work and construction.

14.2 DESIGN

14.2.1.1 The County shall determine on a case by case basis if a designated “Freight Elevator” with direct and convenient access to a loading dock or freight entrance will be required. The exact requirements for elevators will be determined during the design phase.

14.2.1.2 Full maintenance service and inspections shall be provided, by the installer on all elevators and any other conveying systems, during the one year warranty period and for an additional year beyond the one-year warranty period.

14.2.1.3 A sump pump pit shall be provided within the elevator shaft (elevator pit). The installation shall include the sump pump, all associated piping, oil separator and all other items associated to comply with existing codes.

- 14.2.1.4 Shunt trip disconnect shall be installed on the wall adjacent to the elevator machine room. An appropriate lock out mechanism shall be provided to comply with existing codes. Location of the remote shunt trip disconnect shall be indicated in the elevator machine room.
- 14.2.1.5 Protective cages for light fixtures shall be provided in elevator machine rooms.
- 14.2.1.6 The emergency elevator ADA compliant phone shall be provided, installed, wired and tested by the elevator Contractor.
- 14.2.1.7 Elevator Battery Backup
The elevator in the event of a power failure for facilities without a source of backup power (standby Generator) will be equipped with a battery backup system. Upon activation of backup, the elevator is recalled to the exit floor, when the doors open the elevator shall shut off.

14.3 PRODUCTS

14.3.1 Reserved

15 MECHANICAL \PLUMBING - V15000**15.1 GENERAL****15.1.1 Description**

This standard identifies minimum requirements that shall be met for all mechanical and plumbing applications in the design and construction of elements for Arlington County Building Design Standards.

15.1.2 Related Arlington County Standards, Specification and Policies

including, but not limited to, those listed in Table 15.1.2

Table 15.1.2 Applicable Standards and Specifications
Arlington County Zoning Ordinance (ACZO)
Arlington County Code (Code of the County of Arlington County, Virginia) (ACC)
Arlington County Policy for Integrated Facility Sustainability - August 19, 2008 ("Green Building" Policy)
Building Design – Vertical Infrastructure, Chapter 16 - ELECTRICAL - V16000 (see pg. 16-69)
Arlington County Building Energy Performance standard

15.1.3 Applicable Standards and Specifications

including, but not limited to, those listed in Table 15.1.3

Table 15.1.3 Applicable Standards and Specifications
Advanced Energy Design Guide for Small Office Buildings (AEDGSOB)
American Society for Testing and Materials (ASTM)
American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)
American Society of Mechanical Engineers (ASME)
EPA Energy Star®
ICC International Mechanical Code/2012
ICC International Plumbing Code/2012
National Electrical Manufacturers Association (NEMA)
US Green Building Council's Leadership in Energy and Environmental Design (LEED) green building rating system

15.1.4 Quality Assurance

- 15.1.4.1 The County may retain an independent HVAC Commissioning Authority to review mechanical plans and specifications during design, review submittals and perform site inspections during construction, and to conduct complete commissioning of HVAC systems and controls in the heating and cooling modes as required by Arlington County.

15.1.5 Submittals

15.2.1 REGISTERED DESIGN PROFESSIONAL COORDINATION

15.1.5.1 Reserved

15.2 DESIGN**15.2.1 Registered Design Professional Coordination**

- 15.2.1.1 Mechanical equipment rooms and Generators located on the ground floor and roof should be accessible from outside the Building. Door access to mechanical rooms shall be sized to allow passage of the largest piece of installed equipment as required, with double doors to be installed at a minimum. Equipment rooms shall be weatherproofed and have secured locking hardware. Mechanical equipment rooms located on the ground floor shall be provided with suitable vehicle access and a paved area shall be provided adjacent to the entrance for maintenance vehicles.
- 15.2.1.2 Roof mounted equipment shall be accessible by permanent stairs or ladders, provided with walkways from roof entry points to the equipment, and be mounted on or adjacent to level platforms providing access to all points requiring maintenance. If mechanical equipment is placed closer than 10 feet to the roof edge guardrails shall be provided.
- 15.2.1.3 All mechanical equipment located on the exterior of the Building shall be screened in accordance with the Arlington County Zoning Ordinance and the County Code where applicable. Door access to screened areas shall be sized to allow passage of the largest piece of installed equipment as required
- 15.2.1.4 A maintenance storage room shall be located adjacent to mechanical room.
- 15.2.1.5 In ceiling areas where HVAC equipment, such as Variable Air Volume Boxes, need to be located, Registered Design Professional shall provide appropriate ceiling heights such that equipment can be maintained with no greater than an 8' step ladder.
 - 15.2.1.5.1 All HVAC equipment (such as VAV boxes) required to deliver service to high ceiling areas, shall be located in adjacent areas where an 8' foot step ladder can be used to maintain equipment.
 - 15.2.1.5.2 Special attention and coordination shall be given to space being used as return plenum to minimize air movement restrictions caused by items such as recessed lighting, sprinkler, plumbing, low and high voltage electrical conduit, and any other items located above the ceiling.
 - 15.2.1.5.3 The Registered Design Professional and MEP shall coordinate and monitor the installation of all ceiling mounted equipment and data, communications and audio visual systems to ensure they will have the minimum clearances required by the manufacturer and electrical codes.
 - 15.2.1.5.4 Duct design and spaces above ceilings shall be given special attention so as to keep as low an aspect ratio as possible, so that their design will improve the HVAC sustainability and meet LEED design intent.
 - 15.2.1.5.5 An exception to equipment location due to architectural and design priorities and/or existing site conditions shall be considered and approved on a case by case basis by the Arlington County Project Officer.
- 15.2.1.6 Building attic spaces used as air return plenums shall be designed and tested to limit air leakage. The Registered Design Professional and Mechanical Engineer shall develop performance requirements to be demonstrated during construction. Double ceilings and sound damping shall be provided when Building attic spaces are used as air return

15.2.1 REGISTERED DESIGN PROFESSIONAL COORDINATION

plenums. In cases where the use of the attic as a plenum is not practical, a double ceiling or ducted return air system shall be provided.

15.2.1.7 Electrical Generators

Generators less than 150kW in size, other than those that serve Fire Stations, shall be fueled by natural gas where available. All other Generators shall be fueled by ultra low sulfur fuel oil (Diesel). Generator runtime shall be determined on a project by project basis. Fuel ports and fill pipes shall be industry standard. It is preferred that Generators be installed at ground level. In the case where this is not practicable, only natural gas Generators shall be installed on roof tops. Refer to Building Design – Vertical Infrastructure, Chapter 16 - ELECTRICAL - V16000, pg. 16-69 for all electrical design criteria of Generators.

15.2.1.8 House Keeping Pads: A concrete pad shall be provided for each piece of floor mounted mechanical and electrical equipment.

15.2.1.8.1 Concrete House Keeping Pad for ground mounted equipment shall be oversized by a minimum of 6 inches beyond equipment frame on all sides and a minimum of 4” inches high.

15.2.1.8.2 Concrete House Keeping Pads for Generators located outside of a Building shall be oversized by a minimum of 24 inches beyond equipment frame on all sides and a minimum of 4 inches high.

15.2.1.8.3 Provide House Keeping Pad with half-inch chamfer on all exposed edges, placed and finished smooth and level to ensure proper and continuous support for the bearing surfaces of equipment.

15.2.1.8.4 Consult with the structural engineer to determine if a thickened floor slab under base is required.

15.2.1.8.5 The design criteria for load requirements of pad and subfloor equals the total operating equipment weight by the overall length, width and thickness of the House Keeping Pad. Structural Engineer shall provide for the design of reinforced concrete for the House Keeping Pad and anchoring to structural slab or sub-floor.

15.2.1.8.6 All House Keeping Pad reinforcing shall be to **ACI** standards for minimum area and concrete coverage.

15.2.1.8.7 The concrete used in the House Keeping Pad is 3000 psi min, standard weight.

15.2.1.8.8 All House Keeping Pads located in interior spaces shall have a Type 2A – Floated Finish. All House Keeping Pads located outside the Building shall have a Type 3 - Broom Finish.

15.2.1.8.9 Provide for **OSHA** compliant safety floor warning marking with safety color code (yellow/black striping) for marking physical hazard (tripping) at perimeter of House Keeping Pad.

15.2.1.9 Service Platforms

A maintenance access platform shall be provided for all roof top equipment (e.g. Generators, chillers, roof top units) that is either mounted on dunnage or elevated above the roof. The platform must be designed and installed to allow for proper maintenance

access and code compliant clearances to safely work on equipment. Steps with proper safety railing shall be provided for access to all platforms installed for safe access to roof top mounted equipment. All screening around roof top equipment shall be provided with double doors of the proper material and design to match the screening with the means to secure with lock and latch. The service platform shall not prevent access to other equipment for maintenance (e.g. valves, fittings, junction boxes). Provide lighting to the service area as needed for maintenance.

15.2.1.10 Pool covers

Interior pools shall be covered after open hours to provide reduced evaporation of water into the space and provide energy savings in conditioning the space.

15.2.2 Submission Requirements

15.2.2.1 The designer shall prepare ¼ in = 1 ft scale equipment layout drawings for the mechanical equipment room and any roof mounted equipment. The layout drawings shall show all equipment, both footprint and door swing and manufactures recommended maintenance clearances using the basis of design for equipment sizing, ducting, piping, valves, cable tray and conduit routing, fire protection, lighting, housekeeping pads' size and location and all other appurtenances in the room. Piping, duct and valves will be shown to scale with thermal insulation if applicable

15.2.2.2 The design shall provide for code-mandated and manufacturers recommend clearances around all equipment, but in no case shall be less than 36 inches. Only for renovations and no minimum clearance requirement, clearances less than 36 inches will be considered due to architectural and design priorities and/or existing site conditions on a case by case basis by the Arlington County Project Officer. Drawings shall indicate layout and clearances for the largest and heaviest equipment included in the design and specifications. At a minimum, the Registered Design Professional team shall design around three manufacturers.

15.2.2.3 The design shall indicate, in plan view and as appropriate in elevation at each submission, required accessibility clearances to all mechanical equipment, control panels, valves, pump motors and other items such as walk ways, cat walks and access doors etc. requiring access. Valves shall be located within 48 inches of floor or be equipped with chain actuator. 9

15.2.2.4 Registered Design Professional shall use DOE's EnergyPlus Version 8.3.0 whole building energy simulation program to conduct a life-cycle cost analysis for mechanical system selection, optimized Building orientation, architectural shading methods, Building envelope characteristics, and day lighting options during the Schematic/Design Development phases. The County and Registered Design Professional shall meet to determine what options shall be evaluated and to review costs/benefits of various design alternatives. The Registered Design Professional shall provide the County an annual energy budget based upon the computer simulation.

15.2.2.5 The Registered Design Professional shall confirm design conditions at schematic design phase in the project and submit all heating and cooling load calculations for review by the Arlington County Project Officer.

15.2.2.6 Provide an operating data points list and sequence of operations for each project to be reviewed in detail during the design phases by the Arlington County Project Officer.

15.2.2.7 Riser Diagrams

Riser diagrams are required for the following systems installed within the Buildings: Soil, waste and vent; cold water; hot water; gas and fuel gas. Riser diagrams may be shown flat or in isometric projection. Diagrams include story heights, size of all horizontal and vertical piping, fixture numbers being served, and means of connection between fixtures and the stacks and mains. Each system shall be complete and continuous.

15.2.3 Plumbing

- 15.2.3.1 Regarding the plumbing system, the following Owner's Project Requirements shall be included in the specifications in accordance with Table 15.2.3.1:

Table 15.2.3.1 Plumbing System Owner's Project Requirements
Clean outs - Sanitary Sewer: Provide accessible sanitary sewer clean-outs in all locker rooms and rest rooms.
Clean outs - Sanitary Sewer: Provide sanitary sewer clean-outs at each building penetration of sanitary sewer trunk lines.
Cooling Towers: Any Building requiring <u>Cooling Towers</u> shall be evaluated to determine if separate metering of make up water supply is cost effective or desirable for other reasons.
<u>Drinking Fountains</u> : shall have a bottle filling station
Faucets: All faucets to meet EPA Water Sense standards. Self-closing metering faucets shall not be specified unless required by code. Single lever is preferred. Plastic handles/knobs Not Acceptable. Provide repair kit for any non-standard type plumbing fixtures, flush valves and faucets.
Flush Valves: All flush valves to be properly matched to specified urinal or water closet. Flush valves for urinals to be specified as 0.5 gpf. Flush valves for water closets to be specified as 1.5 gpf. Provide repair kit for any non-standard type plumbing fixtures, flush valves and faucets.
Heat Trace: listed thermostatically controlled electric heat trace tape system shall be provided for water lines located in unconditioned spaces.
Hose Bibb: Provide Hose Bibbs connections outside the building and near rooftop mechanical equipment, cooling tower drains, blowdown to sanitary sewer. Hose Bibbs on the exterior of the building shall be frost proof and shall have keyed access.
<u>Hose Bibb</u> requirement for Green Roofs: Provide Hose Bibb at key locations around roof to allow maintenance workers to water plants on a regular basis. Provide paving, ballast or roof protection pads immediately surrounding the Hose Bibbs to avoid damage to roof membrane from maintenance activities. Consideration shall also be given to allow sufficient space between planted areas for hose movement.

**Table 15.2.3.1
Plumbing System Owner's Project Requirements**

Infrared Sensors: In cases where infrared sensors are specified they shall be hard wired in automatically activating lavatories, urinals or water closets. All fixtures shall be low flow and shall be able to be manually operated.
<u>Isolation Valves</u> : Domestic water shut-off (isolation) ball type valves shall be installed where shown on drawings, to isolate individual plumbing fixtures, groups of plumbing fixtures, individual rest rooms, each piece of equipment, each branch take-off from mains and at the base of each riser to permit shut down of the fixture or equipment element without affecting the remainder of the Building. Isolation ball type valves shall be provided at each floor in an accessible chase. Provide access to valves in janitor's closets adjacent to rest rooms where applicable.
<u>Mixing valves - Temperature-actuated</u> : shall be installed at sink faucets to reduce water temperatures to defined limits shall comply with ASSE 1017. Such valves shall be installed at the hot water source. Provide repair kit for any non-standard type plumbing fixtures, flush valves and faucets.
Piping - Condensate: Condensate pumps are Not Acceptable. All condensate drain piping shall be gravity flow. Provide condensate drains with traps and removable plugs for clean-out.
Piping - Condensate: In all cases for external equipment, condensate piping shall be terminated at a storm drain or directly outside; and the piping securely anchored to the floor. Minimum condensate piping size shall be 3/4".
Piping: All piping shall be properly insulated to minimize heating and cooling costs and condensation problems. All roof drain piping shall be insulated. All pipe insulation joints must be properly sealed.
Piping: No plumbing or sprinkler piping shall be installed over top of electrical panels or equipment, unless in compliance with NEC current edition.
Piping: On remodeling projects where piping is being capped, remove abandoned piping back to active mains. This will avoid dead legs of stagnant water.
Toilet areas: shall be provided with and serviced by a 3 feet wide plumbing chase to facilitate maintenance.
Underground Storage Tanks (UST): Double wall, urethane coated steel. Act 100U, Type II, and approved by .58 for underground storage of motor fuel. Double wall welded steel with a primary (internal) tank and a secondary (external) tank. UST shall include quick release filler neck, water tight raised access to filler neck, and shall support accessory equipment including drop tubes, two tank sumps, and submersible removable pumps. UST design shall allow for continuous monitoring of the interstitial spaces between the two walls and the two manways. Refer to 15.3.1 - Mechanical Equipment for Owner's Project Requirements for Brand Name Product(s).

Table 15.2.3.1
Plumbing System Owner's Project Requirements

Urinals shall be waterless type except those installed in fire station living areas. All urinals shall be made of Vitreous China and be low flow. An exception may be granted for the use of stainless steel on a case-by-case basis. Provide repair kit for any non-standard type plumbing fixtures, flush valves and faucets.
Valves all valves 2" and smaller should be ball type valves.
Water Closets: The water closet shall be properly matched to the specified flush valve. Water closets to be made of vitreous china. An exception may be granted for the use of stainless steel on a case by case basis. Provide repair kit for any non-standard type plumbing fixtures, flush valves and faucets.
The <i>Registered Design Professional</i> shall require in the specification sections the <i>Contractor</i> to perform specific plumbing commissioning tasks prior to County's acceptance of substantial completion. The <i>Contractor</i> shall run all plumbing fixtures for a minimum of 30 minutes continuously to demonstrate sanitary lines are clear of debris to allow for adequate flow. This demonstration shall be witnessed by the Arlington County Project Officer or designee. The <i>Contractor</i> shall also provide video documentation to the County of all sanitary lines 3" or larger to the building sanitary sewer lateral. Any sanitary blockages discovered during commissioning shall be the <i>Contractor's</i> responsibility to remediate.

15.2.4 Heating, Ventilation and Air Conditioning System Selection

- 15.2.4.1 The Registered Design Professional shall coordinate with the Arlington County Project Officer prior to selection of the mechanical system.
- 15.2.4.2 Where Building size and use require complex multi-zone comfort systems, central plant configurations are preferred. In such cases, the basis of the heating and cooling system shall incorporate the following:
- 15.2.4.2.1 Basis for HVAC system's design shall include consideration for a four-pipe system.
 - 15.2.4.2.2 Temperature controls shall be electronic (DDC).
 - 15.2.4.2.3 Chillers shall be located in an enclosed mechanical room at grade level unless otherwise approved by the County.
 - 15.2.4.2.4 Air Handling Units shall be located in mechanical rooms unless otherwise approved by the County.
 - 15.2.4.2.5 Design shall not allow for boiler operation when outside air temperature is above 80 degrees.
 - 15.2.4.2.6 Design shall not allow for chiller operation when outdoor air temperature is below 50 degrees and free cooling shall be applied.
 - 15.2.4.2.7 Any space that requires 24/7 cooling must use a DX system.
- 15.2.4.3 In less complex Buildings, roof top units with natural gas heat (where available) and DX cooling with expansion valves shall always be used.

15.2.5 HEATING, VENTILATION AND AIR CONDITIONING DESIGN CRITERIA

- 15.2.4.4 In all cases, DX units shall have multiple compressors or unloading capabilities to remove moisture under low load conditions. When available in the market any unit greater than 10 ton shall include a VFD to match blower speed to load.
- 15.2.4.5 VAV or VRV/VRF systems shall be used for indoor comfort control. Exception for VRV/VRF split wall-mounted units in rooms under 200 Sq. Ft.
- 15.2.4.6 Constant volume systems used for variable occupancy spaces such as meeting and conference rooms are Not Acceptable
- 15.2.4.7 Where natural gas is not available, packaged air to air heat pump units with 100% electric back up shall be used.

15.2.5 Heating, Ventilation and Air Conditioning Design Criteria

Optimal design will emphasize energy efficiency, accessibility and maintainability.

- 15.2.5.1 Energy Efficiency
 - 15.2.5.1.1 The Registered Design Professional shall use all code approved methods to reduce occupant loads to match actual conditions.
 - 15.2.5.1.2 For libraries the square footage of permanent stacks shall be removed prior to applying occupants per square foot code requirements.
 - 15.2.5.1.3 Occupant averaging, room volume, transfer air techniques or other approved code methods shall be used to optimize fresh air requirements. This is mandatory for all meeting rooms, conference rooms, or other assembly areas.
- 15.2.5.2 Building systems shall be designed to minimize continuous noise (“background noise”) within a space. Use the ASHRAE Handbooks for acoustical design guidelines and parameters.
- 15.2.5.3 Cooling equipment shall be sized to match actual Building occupant load conditions.
- 15.2.5.4 Central plant equipment shall be sized for the Building peak, not the sum of the zone peaks.
- 15.2.5.5 If packaged **DX** equipment is used, they shall have multiple steps of cooling and heating to meet part load conditions for proper humidity control.
- 15.2.5.6 HVAC systems shall be designed to maintain indoor humidity levels in cooling mode to 50% ($\pm 5\%$) for regularly occupied spaces. Maximum humidity levels in regularly occupied spaces shall not exceed 55% at any time.
- 15.2.5.7 HVAC system zones shall be provided for different functional areas and to allow for night use in appropriate areas.
- 15.2.5.8 Systems shall be designed with capacity reduction capabilities for spaces where the design loads may vary significantly from actual loads.
- 15.2.5.9 CO2 sensors shall be incorporated to minimize outside air requirements while maintaining acceptable CO2 levels.
- 15.2.5.10 Systems shall be designed to maintain the following temperature settings.

<p>Table 15.2.5.10 System Temperature Settings</p>
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Building Type	Occupied	Unoccupied
General Office Space Heating	72°F	55°F
General Office Space Cooling	75°F	85°F
Warehouses/Enclosed Garages/Apparatus Heating	60°F	60°F

- 15.2.5.11 Outside Air Design Parameters (temperatures) for General Building Areas.

Table 15.2.5.11 Outside Air Design Parameters
Winter 14°F
Summer 95°F/50% Relative Humidity
Verify design temperatures with ASHRAE Standards.

- 15.2.5.12 The Building thermal envelope shall, as a minimum, be designed as follows:

Table 15.2.5.12 Building Thermal Envelope Criteria	
Building Type	Occupied
Whole Window U-Factor	0.40 Maximum
Average Wall U-Factor	0.06 Maximum
Soffit/Floors U-Factor	0.05 Maximum
Roof U-Factor	0.03 Maximum
	0.03 Maximum in storage/equipment room

- 15.2.5.13 Exterior envelope should also have interior and exterior vapor barriers, and entire thermal envelope must be sealed to the exterior, including attic and plenum spaces.
- 15.2.5.14 Warehouses, garages and Fire Station Apparatus Bays shall be provided with infrared tube heating systems and ventilation systems as appropriate and should not be air-conditioned.
- 15.2.5.15 HVAC equipment with energy recovery shall use air-to-air heat exchangers; use of energy recovery wheels will be considered on a case by case basis by the County.
- 15.2.5.16 Omitted
- 15.2.5.17 Air filtration systems shall be designed to meet the minimum standard. All equipment with MERV 13 or greater filters shall have pleated pre-filters. Fiberglass as a means of filtration are Not Acceptable. Special filtration requirements for areas such as computer rooms and laboratories shall be reviewed by the County on a case by case basis.
- 15.2.5.18 Cooling Tower Drains and Blowdowns shall be piped and discharged to sanitary sewer.

15.2.6 Accessibility and Maintainability

All HVAC equipment shall be installed to provide minimum space clearance around equipment per manufacturer's recommendation or applicable building codes, whichever is more stringent.

- 15.2.6.1 Where possible mechanical rooms shall be placed on the ground level, at an outside wall with maintenance vehicle parking spaces and loading zone immediately adjacent

15.2.7 HEATING, VENTILATION AND AIR CONDITIONING SPECIFICATIONS

to the mechanical room door. All major HVAC equipment would be located in or near the mechanical rooms.

- 15.2.6.2 Access to equipment on the roof shall be passing through the interior of the *Building* in accordance with Table 15.2.6.2.
- 15.2.6.3 Equipment located on the roof or in the attic shall be accessible in accordance with Table 15.2.6.3.

Table 15.2.6.3 Accessibly Requirements For Equipment Located On Roof	
Equipment Category	Requirement
Equipment under 20 tons	A Ship Ladder for equipment under 20 tons with a minimum Roof Hatch size of 36" x 30"
Equipment 20 tons or larger	A staircase with double-doors at top and bottom landings. Staircases are preferable for roof access in all cases. The width of the staircase shall be equivalent to the width of the double doors.
Equipment for Multi-story Buildings	An Elevator shall be provided for all equipment located on the roof designed for multi-story Buildings.
Maintenance Access Platforms	Provide maintenance access platforms with a minimum width of 36" for controls or equipment/components greater than 30" above floor or roof level.

- 15.2.6.4 A ladder shall be installed with all roof hatches. The roof hatch shall have the capability of being secure and locked from the ground.
- 15.2.6.5 Equipment hanging above ceiling or in attic shall have a working platform with appropriate safety rails.
- 15.2.6.6 Access panels or doors must be provided for any equipment located in all wall or ceiling spaces that may require maintenance, repairs, or modifications.
- 15.2.6.7 All equipment, smoke detectors, heat detectors, etc., which are located above a suspended ceiling must be clearly labeled at the appropriate location on the ceiling.
- 15.2.6.8 If roof mounted A/C units are used a power receptacle shall be provide at the location of the installed equipment.

15.2.7 Heating, Ventilation and Air Conditioning Specifications

- 15.2.7.1 *Boilers* – The Registered Design Professional shall compose the Specification in accordance with the requirements of Table 15.2.7.1.

15.2.7 HEATING, VENTILATION AND AIR CONDITIONING SPECIFICATIONS

Table 15.2.7.1 <i>Boiler Owner's Project Requirements</i>	
Equipment Category	Requirement
Boiler Type	Only condensing type boilers shall be provided.
Boiler Controls	Boiler controls that do not allow water temperature resetting from the BAS are Not Acceptable.
Boilers Larger than 250,000 BTU	Boilers with an input larger than 250,000 BTU should the modulating type to minimize on-off cycling.
Combustion Efficiency Test	Combustion Efficiency Test - Burner should be tuned up for maximum performance, including correct nozzle size, flame shape, and air damper adjustment for minimum excess air. Performance should be verified via written results of an instrumented combustion efficiency test, including test data net stack temperature, percentage CO ₂ or O ₂ oil smoke spot or percentage CO, and total combustion efficiency percentage.
Outside Air Reset	Outside Air Reset of system supply water temperature shall provide to maintain a constant temperature inside the boiler above the condensing temperature to reduce wear caused by expansion, contraction, and condensation.

- 15.2.7.2 Provide two extra changes for each type filter. Install new filters prior to testing and balancing, and another new set at Substantial Completion in addition to the two spare sets.
- 15.2.7.3 The temperature control system and the energy management control system shall be manufactured by Siemens or Trane No Substitutions.
- 15.2.7.4 Provide wall mounted (framed and covered with Plexiglas) control diagrams in all boiler and mechanical rooms.
- 15.2.7.5 All valves shall be numbered with brass tags and referenced to operational instructions.
- 15.2.7.6 All chillers shall have non-CFC refrigerant.
- 15.2.7.7 All HVAC equipment shall be specified to operate using CFC-free refrigerants
- 15.2.7.8 All motors are to be NEMA™ premium efficiency type.
- 15.2.7.9 All ductwork and piping that will gain or lose energy to/from the surrounding atmosphere, or may cause condensation problems, shall be properly insulated to minimize energy costs and condensation problems. All pipe insulation joints must be properly sealed.
- 15.2.7.10 Listed thermostatically controlled electric heat trace tape system shall be provided for water lines located in unconditioned spaces.
- 15.2.7.11 Use of butterfly valves for equipment or piping isolation is Not Acceptable.

15.2.8 ENERGY MANAGEMENT AND CONTROL SYSTEMS (EMCS)

- 15.2.7.12 All open loop water-cooled chillers shall have condensers that are shell and tube heat exchangers.
- 15.2.7.13 Refrigerant Piping Shall be hard copper (exceptions must be approved by Arlington County Project Officer).
- 15.2.7.14 Use of Triple duty valves is prohibited.

15.2.8 Energy Management and Control Systems (EMCS)

- 15.2.8.1 The EMCS network architecture shall consist of three levels of networks:
 - 15.2.8.1.1 The Management level shall utilize BACnet/IP over Ethernet to the EMCS Automation Server and/or Arlington County VIRTUAL SERVER.
 - 15.2.8.1.2 The Automation level network shall be BACnet/IP over Ethernet. The Native BACnet controllers for the central plant and large infrastructure air handlers shall reside on the BACnet/IP network.
 - 15.2.8.1.3 The Floor level network shall be BACnet over MS/TP or manufacturer standard protocol FLN/TEC network will be accepted. It shall be network to all of the DDC controlled equipment on a floor or in a system and network to a router that connects to the Automaton level BAS backbone.
- 15.2.8.2 In all Buildings, a Direct Digital Control (DDC) system EMCS shall be installed in a lockable cabinet. EMCS devices must be BACnet BTL Products. BACnet native controllers and BACnet for TEC shall not be specified by engineer or accepted as part of submittals by Contractors. TEC can be specified to communicate through the manufacturer's standard protocol. The EMCS shall be remotely accessible from the Facilities Management Bureau (FMB) remote access computer and server located at 1400 North Uhle Street, Suite 603, Arlington, VA 22201. FMB's remote access computer and separate server shall be upgraded as to fully access the EMCS. This includes software to allow for complete control of all points. Remote access capabilities shall include ability to view system graphics, and monitor, control, and configure HVAC system and its properties.
- 15.2.8.3 EMCS shall have graphics including Floor-level graphics with links to equipment for each Building system. Graphics shall be reviewed for approval by the County during the submittal process.
- 15.2.8.4 The EMCS shall have the capability of full control of all thermostats and the ability to release them to local control if necessary.
- 15.2.8.5 The energy management and control system shall monitor and control lighting, HVAC operations and conditions, alarm abnormal conditions and index control modes and provide AHU optimized start/stop operations, and provide reporting and trend logs. The specific system requirements shall be reviewed with the County during design.
- 15.2.8.6 The plans and specifications for the EMCS and mechanical system must include a detailed points list showing all monitor and control points and identify all required software and hardware, and must also include a sequence of operations for major equipment and systems. Sequence of operations shall be provided on the drawings in lieu of in the specifications.
- 15.2.8.7 The EMCS must be capable to perform the following functions:

-
- 15.2.8.7.1 Monitor and Alarm Selected Conditions: Space temperature; Space Humidity; Outside Air Temperature (OAT), Outside Air Humidity (RH), Pressure; Flow; On/Off, Start/Stop Status; Safety Control Status (Fire, Freeze, Smoke).
 - 15.2.8.7.2 Initiate Selected Control Sequences: AHU/Chiller/boiler/pump; Start/Stop; Occupied/unoccupied modes; Optimized Equipment Start/Stop operation, monitor total Building electric usage and provide demand limiting routines as determined by the County.
 - 15.2.8.8 The EMCS server/network shall not be directly involved in the local loop controls, and the local loops shall continue to operate if the EMCS server/network fails.
 - 15.2.8.9 All EMCS components shall have surge suppression devices. All EMCS programming components shall have battery backup.
 - 15.2.8.10 The EMCS must be capable of alarming to, and be communicated and programmed by any compatible personal computer via the County's LAN. EMCS shall be expandable and be compatible with the electronic equipment controls. EMCS must have a security password/code for system entry and programming. A network RJ45 jack shall be provided for network communications over the County's LAN.
 - 15.2.8.11 Specifications shall require Contractor to provide necessary interface equipment for the EMCS system including individual equipment interface. The local interface devices shall be a PC with lockable cabinet. The local PC shall have the ability of complete and full control over the components and points of the EMCS. Provide submittal for interface device hardware and software to confirm system configuration and operating system for approval by the County. Remote processing units shall be capable of communicating with the local terminal. Provide licensed software for the EMCS. The system shall be connected to the County's server for the specified system. Provide disk copy of graphics package and programming software and install at County's central EMCS control station.

15.2.9 Commissioning

- 15.2.9.1 Requirements for an HVAC system commissioning process shall be included in the scope of work for the Registered Design Professional, Mechanical Engineer, and the construction contract. An independent Commissioning Authority may be hired by the County. The ASHRAE standard guidelines for commissioning shall serve as the basis for all HVAC commissioning and the guidelines will be tailored to the specific requirements of the project. Random sampling shall be used for commissioning of VAV boxes. A minimum of 20 VAV boxes, but no less than 40% of the total VAV boxes shall be checked by the commissioning Authority. If 10% of those inspected are found to be non-functioning then no less than 50% of the total number of VAV boxes shall be inspected. All AHU, chillers, boilers, RTU's and HVAC pumps and controls systems shall be checked by the commissioning Authority.
- 15.2.9.2 The Registered Design Professional and Mechanical Engineer and Commissioning Authority will perform reviews of the HVAC system design from a commissioning perspective at all review phases of the design process, and will cooperate fully with the County's Commissioning Authority throughout the design review process as applicable. Review by the County will not relieve the Registered Design Professional and

- Mechanical Engineer of their responsibility to deliver a functional system that complies with the design intent.
- 15.2.9.3 The contract specifications must clearly spell out the responsibilities of the General Contractor and all appropriate sub-Contractors relative to commissioning, and shall also define the role of the Commissioning Authority.
- 15.2.9.4 The Architect and Mechanical Engineer will coordinate and cooperate fully with the County's Commissioning Authority (if applicable) and with County representatives throughout the actual HVAC system commissioning process prior to and subsequent to system acceptance. The Registered Design Professional and Mechanical Engineer will provide all design and or system information that is requested by the commissioning team members and will respond to all comments from the Commissioning Authority from design through system acceptance.
- 15.2.9.5 An instructional session shall be held after systems are functional to familiarize Arlington County professional and technical staff with the design and construction of the system. A Schedule shall be set up during the warranty period for operational problem solving ("shake down") meetings as needed. Total instruction which includes classroom and operational training shall be provided by the design engineer and installing Contractor. This instruction shall not be less than sixteen hours in duration. Contractor shall video record all instructional sessions and provide the DVD to the County.
- 15.2.9.6 Prior to substantial completion, the Arlington County Project Officer shall be notified of when water and air system balancing is scheduled so County technical staff may observe operational procedures.
- 15.2.9.7 All open loop water-cooled chillers shall have condensers that are shell and tube heat exchangers.
- 15.2.9.8 Housekeeping Pads
A concrete House Keeping Pad shall be provided for each piece of floor mounted mechanical equipment.
- 15.2.9.9 Concrete housekeeping pads for ground mounted equipment shall be oversized by a minimum of 36 inches on all sides of the equipment and a minimum of 4" inches high.

15.3 PRODUCTS

15.3.1 Mechanical Equipment

Brand Name(s) for Building Element in accordance with Table 15.3.1 The Specification shall identify a minimum of three (3) Brand Names (manufactures) that comply with the Owner's Project Requirements used for the Invitation to Bid, unless the Brand Name Category listed as No Substitutions.

Table 15.3.1 Brand Name Product(s) for the Mechanical Equipment		
Building Element	Brand Name(s) Brand Name Model	Brand Name - Category
<u>Air Handler</u>	Buffalo, Carrier, McQuay and Trane	Preferred Manufacturer(s)
Baseboard Heaters	Trane without Dampers	Or Equal
<u>Building Automation Systems</u>	Siemens	No Substitutions
Chillers	Carrier, Climacool, McQuay, MultiStack, Trane and York	No Substitutions
Condensing Boilers	Aerco, Triangle Tube Viessmann and Weil-McLain (based on technical specs including turndown ratio)	No Substitutions
Cooling Towers	Baltimore Aircoil, Evapco and Marley	No Substitutions
Domestic WTR Booster	Bell & Gossett Bronze Construction	Or Equal
EMCS	Siemens Trane	No Substitutions
<u>Fire dampers</u>	Air Balance Inc. Greenheck Fan Corporation Ruskin Company	Or Equal
Fire Station Diesel Exhaust Extraction System	Plymovent	No Substitutions
<u>Lockable cabinet</u>	Global Mobile Security computer black Model No. T9A706669BK	Or Equal
Pumps	Bell & Gossett	Or Equal
Rooftop Units	AAON, Carrier, McQuay and Trane	No Substitutions
Underground Storage Tanks (<u>UST</u>)	Highland Tank & Manufacturing Company, Inc.	Or Equal

Table 15.3.1 <i>Brand Name Product(s) for the Mechanical Equipment</i>		
Building Element	Brand Name(s) Brand Name Model	Brand Name - Category
Variable Speed Drives	ABB Magnetek Reliance Electric Toshiba	Or Equal
<u>VAV Boxes</u>	Titus & Trane	Or Equal

15.3.2 Plumbing Equipment

Brand Name(s) for Building Element in accordance with Table 15.3.2 The Specification shall identify a minimum of three (3) Brand Names (manufactures) that comply with the Owner's Project Requirements used for the Invitation to Bid, unless the Brand Name Category listed as No Substitutions.

Table 15.3.2 <i>Brand Name Product(s) for the Plumbing Equipment</i>		
Building Element	Brand Name(s) Brand Name Model	Brand Name Category
Dry Sprinkler Valves	Victaulic	Or Equal
Faucets	American Standard, Kohler and Moen	No Substitutions
Flush Valves	Sloan and Zurn	No Substitutions
Flush Valves – Automatic	Sloan	No Substitutions
Frost Free Hydrants	Josam Woodford	Or Equal
Garbage Disposals	Insinkerator (I.S.E.)	Or Equal
Vitreous China Fixtures	American Standard Kohler Moen Toto	Or Equal
Water Closets	American Standard, Kohler, Moen & Toto	No Substitutions
<u>Water Coolers:</u>	Elkay, Halsey & Taylor®	No Substitutions
Waterless Urinals	Waterless Co. Inc.	No Substitutions

16 ELECTRICAL - V16000**16.1 GENERAL****16.1.1 Description**

This section identifies minimum requirements that shall be met for all electrical applications in the design and construction of elements for Arlington County Building Design Standards.

16.1.2 Related Arlington County Standards, Specification and Policies

including, but not limited to, those listed in Table 16.1.2

Table 16.1.2 Applicable Standards and Specifications
Arlington County Zoning Ordinance (ACZO)
Arlington County Code (Code of the County of Arlington County, Virginia) (ACC)
Arlington County Building Energy Performance Targets for County-owned and – managed buildings
Arlington County Government Street Light Policy and Planning Guide
Arlington County Government Department of Technology Services Network Infrastructure Standards (6/19/2015)
DAS TECHNICAL SPECIFICATIONS (see Appendix C, page C-92)

16.1.3 Quality Assurance

16.1.3.1 Reserved

16.1.4 Applicable Standards and Specifications

including, but not limited to, those listed in Table 16.1.4

Table 16.1.4
EPA Energy Star®
ICC International Building Code/2012
ICC International Energy Conservation Code/2012
The Illuminating Engineering Society of North America (IES)
National Electric Code (NEC)
National Fire Protection Association (NFPA)
NFPA 70E-2012
Occupational Safety and Health Administration (OSHA)
OSHA 1910.333,335
US Green Building Council's Leadership in Energy and Environmental Design (LEED) green building rating system

16.1.5 Submittals

16.1.5.1 The Registered Design Professional shall identify, in the specification sections, manufacturer's products, descriptions, energy efficiency, performance criteria,

16.2.1 REGISTERED DESIGN PROFESSIONAL COORDINATION

materials, components, fabrication, source quality control, finish, and accessory materials pertaining to all Electrical work.

- 16.1.5.2 On a case by case basis the County will determine if the project specifications shall require the Contractor to provide drawings for all electrical work and load calculations which shall be signed and sealed by a PE licensed in the Commonwealth of Virginia.

16.2 DESIGN

16.2.1 Registered Design Professional Coordination

- 16.2.1.1 New services where possible a three-phase four wire 277/480 volt main service is preferred. A circuit breaker coordination study shall be provided with the final sizing of the service. All Building wiring shall comply with the requirements of the current version of the National Electrical Code (NEC). Breakers shall not be the kind that trip on a power loss unless this is specifically required by code.
- 16.2.1.2 Trapeze mounted transformers *are* Not Acceptable.
- 16.2.1.3 Main Switchboard/Switchgear or the Main Distribution Panel (MDP) and sub panels shall be provided with at least 25% spare capacity and spaces for future use.
- 16.2.1.4 Specifications shall require installation of electric demand meters/monitors as part of the Building Automation System.
- 16.2.1.5 Electrical Distribution
The Registered Design Professional shall compose the Specification in accordance with the requirements of Table 16.2.1.5.

Table 16.2.1.5 Electrical Distribution - Owner's Project Requirements	
Building Element	Requirement
Cable - Metal-Clad (armored)	The use of metal-clad (armored) cable is only acceptable at equipment and/or fixture terminations.
Cable - Metal-clad and plenum-rated	The use of metal-clad and plenum-rated cable is only acceptable in minor renovations in concealed locations and with approval of Arlington County Project Officer.
Conductor – Electrical	The use of aluminum cable/wire as an electrical conductor is Not Acceptable. Provide only copper cable/wire.
Conduit - Electrical	All electrical conduit including low voltage shall run in rigid conduit or electric metallic tubing (EMT).

- 16.2.1.6 Dedicated data and Communication Room shall be provided separate from the electrical rooms or supply closets. No electrical transformers or distribution panels shall be permitted in data or Communication Room. All data and Communication Rooms shall be provided with receptacles that are powered by the emergency Generator circuit if available.
- 16.2.1.7 The Registered Design Professional shall confirm design conditions at schematic design phase in the project and submit all electrical load calculations for review by the

16.2.2 SUBMISSION REQUIREMENTS FOR ELECTRICAL DRAWINGS

Arlington County Project Officer. The County and Architect/Engineer shall meet to determine what options shall be evaluated and to review costs/benefits of various design alternatives. The Registered Design Professional shall provide the County an annual energy budget based upon computer simulations.

16.2.1.8 Motor’s efficiency shall be Premium Efficiency.

16.2.2 Submission Requirements for Electrical Drawings

16.2.2.1 Specifications shall require the designer to prepare 1/4 inch = 1 foot scale equipment layout drawings of all electrical and data/communications closets/rooms.

16.2.2.2 Specifications shall require the installing Electrical *Contractor* to provide 1/4 inch = 1 foot scale layouts of all electrical and Communication Rooms with actual equipment sizes.

16.2.2.3 The layout drawings shall show all equipment, using the basis of design for equipment sizing, showing Switchboard/Switchgear, Main Distribution Panel (MDP), panel boards and transformers, cable tray and conduit routing, fire protection, lighting and all other appurtenances in the room.

16.2.2.4 The design shall provide for code-mandated and manufacturers recommend clearances around all equipment, but in no case shall be less than 36 inches. Only for renovations and no minimum clearance requirement, clearances less than 36 inches will be considered due to architectural and design priorities and/or existing site conditions on a case by case basis by the Arlington County Project Officer. Drawings shall indicate layout and clearances for the largest and heaviest equipment included in the design and specifications. At a minimum, the Registered Design Professional team shall design around three manufacturers.

16.2.2.5 The design shall indicate, at each submission, required accessibility clearances and all structural supports for all electrical equipment, control panels and other items such as walk ways, cat walks and access doors etc requiring access. Panels shall be mounted so that access to breakers does not require a ladder.

16.2.2.6 Indicate on each panel schedule as “Fed from -----“. This designation shall be required to be shown on typed panel schedules posted on the panels in the field by the installing electrical Contractor.

16.2.2.7 Arc Flashing Prevention: Provide Arc Flashing analysis and proper labeling of the electrical equipment and clearances marked on the floor complying with **OSHA** 1910.333,335 and **NFPA** 70E-2012.

16.2.3 Generator & Transfer Switches

16.2.3.1 The Registered Design Professional shall include a Generator in the design of new a building or a significant renovation of an existing Building and in addition to Building code requirement when the facility contains the Building Elements or systems listed in Table 16.2.3.1

Table 16.2.3.1 Requirements for a Generator
Buildings that provide space for the Office of Emergency Management (OEM) with an emergency support function or shelter in place.

**Table 16.2.3.1
Requirements for a Generator**

Buildings with a Safe Haven operation
Fire Stations
If the Building is for County Network a Hub Site.
Network Operations Center (NOC)
Refrigerators and freezers used by DHS, OEM, ACFD and ACPD that store blood, emergency food supplies, medical supplies and equipment related to emergency supply for water.

- 16.2.3.2 When a Generator is required for a new Building or a significant renovation of an existing Building and in addition to Building code requirements, the Building Elements & Systems listed in Table 16.2.3.2 shall be connected to the Generator and to meet load demands.

**Table 16.2.3.2
Building Elements & Systems Connected to Generator**

BAS/EMCS Systems
Closed-circuit television (CCTV)
Communication Room HVAC equipment (Refer to pg. D-112 , BDVI, Appendix D - COMMUNICATION ROOM STANDARDS)
Distributed Antenna System (DAS) (Refer to pg. C-92, BDVI, Appendix C - DAS TECHNICAL SPECIFICATIONS)
Door access system
<u>Elevators</u>
Emergency lighting in Transformer Vaults, Switchgear Rooms, Elevator Machine Rooms and Mechanical Rooms.
Emergency Services: Building Elements, Systems including HVAC and all other electrical loads defined by the County for Buildings that provide space for Office of Emergency Management (OEM) with an operational function for Emergency Services
Emergency Shelters and “Shelter in place” Buildings
Fire sprinkler system (for pumps and other equipment), if required by code
Fire Stations: All Building loads with County approved load diversity factor
Freeze Protection: All heating system pumps, and related control systems to maintain freeze protection.
Life Safety and Fire Alarm Systems including emergency lighting, exit lighting and fire alarm system power supplies

Table 16.2.3.2 Building Elements & Systems Connected to Generator	
	Network Routers if the network is used to monitor fire alarm systems
	Security System
	Security systems and power supplies for building (Refer to pg. 13-48, BDVI Chapter 13 SPECIAL EQUIPMENT - V13000)
	Sewer ejector pumps
	Smoke exhaust fans
	Sump pumps
	Telephone switches (where applicable)
	Wheelchair lifts

- 16.2.3.3 The emergency Generator system where applicable, shall be designed such that load shedding is not required. (The *Registered Design Professional* shall be responsible for designing the emergency and standby power Engine/Generator of sufficient capacity and rating for the anticipated maximum simultaneous load in accordance with NEC 700.5(A) and NEC 701.6.) Connected loads shall meet the code requirements and other operational requirements. Provide twenty-five percent (25%) spare capacity above the Generator safety factor to carry future loads unless directed otherwise by the County.
- 16.2.3.4 The emergency Generator system where applicable, shall be designed such that load shedding is not required. Connected loads shall meet the code requirements and other operational requirements. Provide twenty percent (25%) spare capacity above the Generator safety factor to carry future loads unless directed otherwise by the County.
- 16.2.3.5 Generators less than 150kW in size, other than those that serve Fire Stations, shall be fueled by natural gas where available. All other Generators shall be fueled by ultra low sulfur fuel oil (Diesel). Generator runtime shall be determined on a project by project basis. Fuel ports and fill pipes shall be industry standard and shall extend to location adjacent to driveway or other agreed to location with approval of Arlington County Project Officer. It is preferred that Generators be installed at ground level. In the case where this is not practicable, only natural gas Generators shall be installed on roof tops.
- 16.2.3.6 All Generator equipment located on the exterior of the Building shall be set back and screened in accordance with the Arlington County Zoning Ordinance and the Arlington County Code where applicable.
- 16.2.3.7 The Generator shall include the following items:
- 16.2.3.7.1 The Jacket Water Heater shall be provided with a set of water shutoff valves to facilitate jacket water hose and heater replacement without the necessity of draining the engine coolant system.
 - 16.2.3.7.2 The full instrumentation shall include as minimum: RPM, Engine Water Temp, Engine Oil Press., Engine Oil Temp., Fuel Level, Run Hrs. on the Generator display. Provide a “Red Mushroom Emergency Stop Button” on

16.2.3 GENERATOR & TRANSFER SWITCHES

the engine control panel. Depression of this emergency stop button shall trip the main circuit breaker.

- 16.2.3.7.3 The Generator shall have BACnet and capable of communicating with the building BAS/EMCS.
- 16.2.3.7.4 The main circuit breaker shall be provided with auxiliary contacts to indicate light and alarm “not in the auto position” on the engine control panel and the Remote Generator Annunciator Panel (RGAP) and the BMS/EMCS. The panel shall show all failures in the *Generator*. Locate the RGAP as directed by the County in an occupied location.
- 16.2.3.7.5 The Generator shall be required to meet Arlington County Noise Ordinance Requirements at the property line. The Registered Design Professional shall provide documentation to the County indicating compliance with County Ordinance.
- 16.2.3.7.6 A 60 amp single phase load center with a main circuit breaker integral to the Generator shall be specified and shown nearest to the engine control panel inside the protective housing and shall be factory hard wired for the jacket water heater, battery charger and the 20- amp duplex receptacle which shall be located on the side of the engine control panel inside the Generator housing. Provide two additional spare 15 AMP breakers one for the purpose of wiring the day tanks controls and the other for future use. Provide the remaining as spaces in the panel.
- 16.2.3.7.7 Locate the Generator exhaust as far away as is possible from the Building air intakes, but not less than twenty (20) feet. The Generator muffler shall be located inside the outdoor Generator set enclosures.
- 16.2.3.7.8 Specifications shall require the Contractor to conduct an on-site Field load bank performance test with unity power factor in accordance with NFPA-110 requirements for all new emergency Generators witnessed by the project engineer or his designee. A minimum of two day notice shall be provided to the Arlington County Project Officer to schedule the test.
- 16.2.3.7.9 Provide a 24 (twenty four) light LED RGAP. A separate 1” conduit with 28 #14 wires shall be provided from the engine control panel to the RGAP. The RGAP shall comply with the requirements of NFPA 110 with extra lights as optional on all projects as specified Table 16.2.3.7.9. Additional lights may be added as required by specific needs of the project.

Table 16.2.3.7.9
Extra Lights for LED RGAP

Light Description
Battery Charger A/C Failure Alarm
Breaker Tripped Over Current Alarm
Circuit Breaker Closed
Circuit Breaker Open
Day Tank Trouble Alarm

Table 16.2.3.7.9 Extra Lights for LED RGAP
Light Description
Engine Running
Fuel Day Tank – High
Fuel Day Tank – Low
Generator Fault (Trouble)
Generator Running
Ground Fault Alarm
High Oil Press Alarm -High
Main Breaker Switch On in Auto Position
Main Circuit Breaker “OFF” position
Oil Press Alarm - Low
Oil Press Warning - Low
Over Crank Alarm
Panel Should Also have alarm sound silence button and lamp test button
Power - Normal
Spare
Spare
Voltage Alarm - High
Voltage Alarm - Low
Water Temp Alarm – High
Water Temp Warning - low
Water Temp Warning – High

- 16.2.3.7.10 Provide a separate 1” conduit with 6 #12 wires for control wires from the ATS to the Generator Engine Control Panel for the purpose of providing start-Stop controls and any other future controls.
- 16.2.3.7.11 Multiple Automatic Transfer Switches are required at all locations where load exceeds 100 amps. All control wires shall be brought to a common junction box located nearest the Life Safety Automatic Transfer Switch and terminated on a strip inside this junction box. One set of control wires shall be connected to the Generator start-stop controls from this junction box.
- 16.2.3.7.12 All transfer switches over 200 amps shall be close transition switches.
- 16.2.3.7.13 All transfer switches shall have manual start-up for testing the Generator and manual transfer of the load. Shall also include hardware and software necessary to record event history, shall have BACnet communication capable or MODbus only if BACnet is not available from manufacturer.

- 16.2.3.7.14 The Generator and the Automatic Transfer Switch shall have a 5 year manufacturer's full parts and labor warranty. The installation Contractor shall provide a one year labor warranty with a response time of two hours, 24/7.
- 16.2.3.7.15 O&M training for Emergency & Standby Generators and Automatic Transfer Switches shall be conducted by a certified training instructor provided by the manufacturer and shall be performed onsite after startup when all the tests are completed and accepted. Training for the County's owners/ occupiers for these systems shall be at least four hours and shall be conducted by O&M Generator Maintenance Staff.
- 16.2.3.7.16 Proprietary Emergency & Standby Generator and Automatic Transfer Switch diagnostic tool shall be provided by the installer.
- 16.2.3.7.17 ATS Maintenance Bypass: Normal bypass test and service at the automatic transfer switch shall be performed without disrupting power to the load. The equipment should be capable of providing the test bypass and complete isolation of the automatic transfer switch without opening the doors of the cabinet. The panel shall be enclosed with a protective cover and be mounted separately from the transfer switch unit for safety and ease of maintenance. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance.

16.2.4 Roll Up Generators

Roll Up Generators: where the Building conditions and the Facilities Management Bureau require roll up Generator provisions, the following shall be met:

- 16.2.4.1 Roll-up Generator provisions shall be provided for Generator installations or replacements at new and existing Buildings.
- 16.2.4.2 A lockable 3 – position manual transfer switch (MTS) shall be located upstream of the ATS to allow selection between the permanent or rollup Generator.
- 16.2.4.3 A cam-lock quick-connect and all other connections enclosure suitable for outdoor use shall be provided at location adjacent to the anticipated location of the roll up Generator.
- 16.2.4.4 Property sized electrical outlets shall be provided next to the quick-connect enclosure to provide power for roll up Generator battery charger and jacket heater(s). Generator start control circuit shall be integrated with the MTS.
- 16.2.4.5 The MTS shall have provisions for position monitoring.

16.2.5 Lighting

- 16.2.5.1 Lighting shall be designed to meet current NEC ASHRAE/IES luminance levels for the appropriate space type (e.g. as foot candle levels), while also meeting current ICC International Energy Conservation Code/2012 power density limitations.
- 16.2.5.2 The mechanical and the electrical room lighting shall be on the standby emergency Generator.
- 16.2.5.3 Day lighting or indoor electrical illumination should comply with current IES recommended light levels.

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- 16.2.5.4 Occupancy sensors to automatically shut off lights for offices, conference rooms, storage rooms, gymnasiums, and other appropriate spaces shall be provided.
 - 16.2.5.5 Emergency Exit lights shall be Light Emitting Diode (LED) type.
 - 16.2.5.6 Light fixtures used as HVAC diffusers are Not Acceptable.
 - 16.2.5.7 Task lighting may be provided to supplement ambient lighting where appropriate.
 - 16.2.5.8 Decorative, accent and neon lighting unless specifically required for the space application as determined by the County on a case by case basis are Not Acceptable.
 - 16.2.5.9 Dimming systems unless specifically required for the space application as determined by the County on a case-by-case basis are Not Acceptable. If a dimming system is designed it shall be part of the Building BAS/EMCS and not a separate stand alone system.
 - 16.2.5.10 Track lights, mono, twin rail, low voltage decorative lights are not recommended and their use shall be determined by the County on a case-by-case basis.
 - 16.2.5.11 Incandescent fixtures are Not Acceptable.
 - 16.2.5.12 All fluorescent tube fixtures shall be provided with lamps and electronic ballasts. Recommended light fixtures are: 2 x 4 lay-in with parabolic louvers, three tubes (277 volts).
 - 16.2.5.13 Lighting in atrium areas or in high ceiling areas shall utilize light-emitting diode (LED) when possible. When LED fix fixtures are not suitable, use induction lighting, or fluorescent fixtures with remote ballasts located in a properly ventilated area.
 - 16.2.5.14 Remote ballasts shall be grouped in a space with sufficient size and ventilation to support the equipment and shall be readily accessible for maintenance purposes.
 - 16.2.5.15 Buildings with remote ballasts shall have a floor plan affixed to the remote ballast location showing the corresponding ballast and lamp locations and a copy shall be installed in a permanent placard in the electrical main service equipment room.
 - 16.2.5.16 Programmable ballast shall be used were appropriate.
 - 16.2.5.17 Lighting in high bay areas such as garages, gymnasiums or warehouses shall use pendant type LED lighting, induction lighting, or high output fluorescent fixtures and shall be readily accessible for maintenance purposes. Safety chains shall be provided on each fixture and cord and plug connections are preferred. Where Emergency *Generators* supply the power provide striker lights in the fixtures for instantaneous illumination in accordance with Life Safety Code requirements for emergency egress.
 - 16.2.5.18 In libraries where stack lighting is to be used, it is preferred that lights are located to facilitate access for maintenance with a 10 foot ladder.
 - 16.2.5.19 It is preferred that lighting fixtures will be accessible for maintenance with a ten-foot stepladder. Appropriate mechanical lifts with suitable in Building storage shall be provided as part of the project scope for fixtures installed in high ceiling areas or atriums and that cannot be accessed with a 10 foot ladder.
 - 16.2.5.20 Where appropriate all exterior lighting shall be controlled by photocell controls. The lighting controls, clocks and photo controls shall be located in the main electrical room. All circuits for exterior lighting shall be routed in conduit.

16.2.6 GROUNDING, BONDING AND LIGHTNING PROTECTION

- 16.2.5.21 Exterior lighting fixtures shall be dark sky type, high efficiency and have glass lenses efficiency. Exterior Lighting shall be controlled by the Building BAS/EMCS of one is installed or a time clock, astronomical type with auto adjusting to daylight saving and standard time in series with a photocell.
- 16.2.5.22 Where appropriate, the fuel site lighting and the power should be on the emergency Generator.
- 16.2.5.23 Light fixtures and sprinkler heads located in athletic facilities, gymnasiums, multipurpose rooms used as gymnasiums, and other similar types of facilities or rooms affected by ball fight or other similar activity shall provide shockproof and impact resistant features such as locking landholders, inverted tempered glass diffusers set in flush steel frames, protective cages or provide barriers to withstand impact and not be affected by ball fight or other similar activity.
- 16.2.5.24 The light fixtures in gymnasiums shall be recessed between the open steel trusses for added protection from balls and other objects.

16.2.6 Grounding, Bonding and Lightning Protection

- 16.2.6.1 Provide grounding bar for all data and Communication Rooms.
- 16.2.6.2 Contractor must submit detailed as-built drawings for the building grounding system with certification. As-built drawings must show rod sizes, locations, and configuration and connection details. The Contractor shall obtain a UL certification for the grounding system and submit a copy of the certificate to the Registered Design Professional for review and approval before final submission to the Arlington County Project Officer.
- 16.2.6.3 Contractor must submit detailed as-built drawings for the lightning protection system with UL certification. As-built drawings must show down-rod locations, conductor routing and conductor connections sites. It is the installing Contractor's responsibility to provide a bond for the lightning protection system with the main grounding grid or main grounding bar. The Contractor shall obtain a certification for the lightning protection system and submit a copy of the certificate to the Registered Design Professional for review and approval before final submission to the Arlington County Project Officer.

16.2.7 Communication Room

- 16.2.7.1 Communication Rooms for telephone, data, cable television, etc., must be separate from electrical rooms. Transformers or electrical distribution panels located in Communication Rooms is Not Acceptable.
- 16.2.7.2 Refer to the Building Design – Vertical Infrastructure - COMMUNICATION ROOM STANDARDS (Appendix D) pg. D-112, Building Design - Vertical Infrastructure Chapter 16 ELECTRICAL - V16000, Section 16.2.7 Communication Room for information on Communication Room design criteria.

16.2.8 Exterior Conduits

Shall be installed in a way that does not affect the exterior aesthetics of the Building and shall not be installed in the front of the Building. Previous authorization from the FMB is needed when installation of exterior conduits is necessary at an existing facility. Conduits shall be metallic, water tight and painted to match Building façade per manufacturer recommendations.

16.2.9 Housekeeping Pads

A concrete House Keeping Pad shall be provided for each piece of floor mounted electrical equipment.

- 16.2.9.1 Concrete housekeeping pads for ground mounted equipment shall be oversized by a minimum of 36 inches on all sides of the equipment and a minimum of 4" inches high.

16.3 PRODUCTS**16.3.1 Emergency Standby Generator**

Brand Name(s) for Building Element in accordance with Table 16.3.1 The Specification shall identify a minimum of three (3) Brand Names (manufactures) that comply with the Owner's Project Requirements used for the Invitation to Bid, unless the Brand Name Category listed as No Substitutions.

Table 16.3.1 <i>Brand Name Product(s) for the Basis of Design</i>			
Building Element	Brand Name(s)	Brand Name Model	Brand Name - Category
Automatic Transfer Switch	Asco, Caterpillar, Cutler Hammer/Onan/Cummins & Russell Electric		No Substitutions
Emergency Standby Generator	Caterpillar, Kohler, MTU & Onan/Cummins		No Substitutions
Engine	Detroit	V-12 engine	Not Acceptable

16.3.2 Electrical Main Service

Brand Name(s) for Building Element in accordance with Table 16.3.2 The Specification shall identify a minimum of three (3) Brand Names (manufactures) that comply with the Owner's Project Requirements used for the Invitation to Bid, unless the Brand Name Category listed as No Substitutions.

Table 16.3.2 <i>Brand Name Product(s) for the Electrical Main Service</i>			
Building Element	Brand Name(s)	Brand Name Model	Brand Name - Category
Main distribution panels, sub panels and disconnects	Cutler Hammer, Siemens, and Square D		No Substitutions Cutler Hammer type PB panels are preferred with bolt in breakers. The type PB panels give flexibility by accepting both bolt-in and push-in breakers. Provide one stock circuit breaker for each type installed.

Main Distribution Panels	FPE and Challenger		Not Acceptable
Motor Control Centers	General Electric, Siemens and Square D		No Substitutions

17 FIRE PROTECTION V17000

17.1 GENERAL

17.1.1 Description

This section identifies minimum requirements that shall be met for all mechanical and plumbing applications in the design and construction of elements for Arlington County Building Design Standards.

17.1.2 Related Arlington County Standards, Specification and Policies

including, but not limited to, those listed in Table 17.1.2

Table 17.1.2
EPA Energy Star®
Arlington County Code - Chapter 8.1 - Fire Prevention Code – April 28, 2009 (Arlington County Fire Prevention Code)
Arlington County Policy for Integrated Facility Sustainability - August 19, 2008 ("Green Building" Policy)
Building Design – Vertical Infrastructure, Chapter 16 - ELECTRICAL - V16000 (see pg. 16-69)
Arlington County Construction Standards and Specifications – 02550 Water Mains and Appurtenances

17.1.3 Applicable Standards and Specifications

including, but not limited to, those listed in Table 17.1.3

Table 17.1.3
Code of Virginia
EPA Energy Star®
National Fire Protection Association (NFPA)
US Green Building Council’s Leadership in Energy and Environmental Design (LEED) green building rating system
Virginia Statewide Fire Prevention Code
Virginia Uniformed Statewide Building Code 2012 (USBC)

17.1.4 Quality Assurance

17.1.4.1 Reserved

17.1.5 Submittals

17.1.5.1 Reserved

17.2 DESIGN

17.2.1 Fire Protection

17.2.1.1 Sprinkler Systems shall be designed, installed, and tested in accordance with all applicable codes and reviewed and approved by the Contractor.

- 17.2.1.2 The inspectors test valve shall be located in a readily accessible location. Provisions for discharging the water during the cyclic system test shall be made by piping the drain to the exterior of the Building.
- 17.2.1.3 Sprinkler devices, valves, etc., shall be permanently tagged noting the device and its purpose. Valves or devices that are located above accessible ceilings should be marked at the ceiling level indicating a device or valve above.
- 17.2.1.4 Dry sprinkler valves shall be installed so that a proper test, reset, and maintenance can be performed from one location. Use of dry type sprinkler systems is discouraged due to maintenance requirements.
- 17.2.1.5 The Contractor shall provide attic stock sprinkler heads and spare sprinkler head wrenches.
- 17.2.1.6 Key Box

Where required for the purpose of fire department entry, all Buildings shall provide a key box to be installed on the exterior of Building in an approved location by fire official with the exception of properties located in County designed R-5 zoning districts in accordance with Table 17.2.1.6.

Table 17.2.1.6 Key Box
Key Box – Building Interior: recessed mounted on Building and contain Building entrance keys.
Key Box – Building Exterior: Shall be located adjacent to the primary fire department entrance or entrance nearest to the fire control room. The <u>Key Box</u> shall be flush mounted no higher than 48 inches to the bottom of the box from the finished floor elevation. The key boxes must be visible and accessible and shall be installed prior to occupancy.
<p>Keys: In Buildings with fire command centers Fifteen (15) sets of common keys, which shall be located in a Key Box in the fire control room shall be provided. The keys are required for access to Building services and systems and to all storage, trash, and utility rooms, roof access doors, and doors to other secured areas.</p> <p>In all other Buildings without fire command centers: Seven (7) sets of common keys shall be provided in a Key Box placed in an interior location of the Building must be coordinated with and approved by the Arlington County Project Officer at the design phase of the project. Individual keys shall be clearly labeled as to use/function and each set of keys shall be individually tagged.</p>

- 17.2.1.7 **Operations Procedure Manual:** All structures with a fire control room or other structures as required by the County shall have an Operations Procedure Manual. The County shall approve the contents and location of the manual and the owner shall maintain the manual and update it whenever necessary.

17.2.2 Fire Alarm System

17.2.2.1 The installer of the fire alarm and Fire Suppression Systems shall provide the County with the following items in accordance with Table 17.2.2.1 at the time of acceptance of the system.

Table 17.2.2.1 Owner’s Project Requirements for Fire Alarm System	
	Three (3) complete sets of Operation and Maintenance manuals
	Parts manuals and list of local vendors for the system
	Six (6) set of fire alarm system keys to cabinets and panels and manual stations
	As-built drawings
	As-built schematic diagrams & wiring diagrams
	Any access codes
	Electronic copy of programming of addressable panels

17.2.2.2 The installer shall maintain the color-coding established by the manufacturer throughout the system. The terminations or connections in the control panels or junction points should be clearly marked and the corresponding field wiring should be permanently tagged.

17.2.2.3 Fire alarm devices, control panel and annunciator panel must be from the same manufacturer.

17.2.2.4 The Fire Alarm Annunciator Panel (FAAP) shall be located adjacent to the primary fire department entrance.

17.2.2.5 All fire alarm devices shall be readily accessible for testing, repair and maintenance purposes. All fire alarm devices located above a suspended ceiling must be clearly labeled at the ceiling.

17.2.2.6 Smoke alarms shall be installed in structures as required by the Virginia Uniformed Statewide Building Code 2012 (USBC) and NFPA.

17.2.2.7 Dedicated Plain Ordinary Telephone Service (POTS) outlets are required for each auto-dialer and shall be labeled to indicate use.

17.2.2.8 The phone lines serving the auto-dialers shall not be hard wired; a jack shall be provided for each line to facilitate maintenance and testing.

17.2.2.9 Auto-dialer program and format codes shall be provided to the County at the acceptance of the system and a copy shall be included in the operations manual for the fire alarm system.

17.2.2.10 Projects, requiring an elevator shall be provided with a POTS outlet and be labeled to indicate use and shall not serve any other equipment.

17.2.2.11 The Fire Alarm Control Panel (FACP) and the FAAP, and auto-dialer shall be programmed and or designed to automatically reset once a trouble or fault is cleared.

17.2.2.12 The auto-dialers shall be programmed to monitor/report events.

17.2.2.13 The auto-dialer test timer test shall be programmed to perform between 6:00 A.M. and 8:00 A.M.

- 17.2.2.14 The Contractor shall arrange to receive and respond to all trouble and alarms received by the County's monitoring service prior to a building being issued a certificate of occupancy by the County.
- 17.2.2.15 The Contractor shall be responsible for paying for all fees associated with review, approval and permitting.
- 17.2.2.16 All Fire Alarm Control Panels, Auto Dialers shall have external surge suppression to protect the systems from lightning and voltage surges both from the line voltage and the phone lines.
- 17.2.2.17 Duct detector locations shall be readily accessible, and provided with an access panel for routine service and testing.
- 17.2.2.18 The name, telephone number, and account number of the current central station monitoring company shall be posted and maintained inside the FACP. If the fire alarm system is not monitored, that fact shall be posted and maintained inside the FACP.

17.2.3 Fire Department Access

- 17.2.3.1 Access for emergency vehicles shall be provided to within one hundred and fifty feet (150') of the main or principal entrance of every Building. The fire department vehicular access may be provided by a public or private street, parking lot, and/or fire lanes.
- 17.2.3.2 When Buildings are more than five (5) stories or fifty feet (50') in height, ladder truck access shall be provided to both the front and rear of the Building.
- 17.2.3.3 The access to the rear may be provided via a street, parking lot, or fire lane.
- 17.2.3.4 The inner edge of the ladder truck access way shall be no less than sixteen feet (16') and no more than thirty (30') from the exterior Building wall.
- 17.2.3.5 When fire lanes are required, they shall have a minimum width of twenty feet (20'). Fire lanes shall have curb painting and signage.
- 17.2.3.6 Emergency vehicle access ways which are over one hundred and fifty feet (150') in length and which do not accommodate through traffic shall provide adequate space for turning apparatus around. (Due to the size of the ladder truck, it is suggested that guidance be obtained from the Fire Prevention Office to determine adequate turnaround dimensions).
- 17.2.3.7 A twelve foot (12') wide access lane to within fifty feet (50') of the edge of swimming pools, with an eight foot (8') personnel gate in the fence at the point of access is required except for individually owned pools located on single family lots.
- 17.2.3.8 Emergency vehicle access ways shall accommodate a fourteen foot (14') vehicle without any obstructions including piping, conduit, lighting, signage, sprinklers, Building structure and wires, etc. Designers shall consider vertical curvature when determining these clearances.
- 17.2.3.9 Fire department vehicle access for ladder trucks shall be designed to support a 75,000 lb. (28,125 kg) vehicle and all outrigger (pad) point loads or for a nominal 450 lb./sf (21.5 kPa) uniform live load. Calculations shall be provided by a PE licensed in Virginia.

17.2.4 Fire Lanes and Signage

- 17.2.4.1 The Arlington County Code requires the installation of fire lanes as part of the public utilities requirements. The Arlington County Fire Prevention Code governs the dedication of the fire lane as well as the installation and sign specifications.
- 17.2.4.2 All fire lanes and locations of signs shall be marked on the site plan.
- 17.2.4.3 Fire Lane Designation
Under Chapter 8.1 – Section 503 of the Arlington County Code, the Office of the Arlington County Fire Department is authorized to designate fire lanes where necessary, for the purpose of preventing parking in front of, or adjacent to, *Fire Hydrants*, fire department connections and to ensure access to Buildings and structures for firefighting and rescue apparatus and in accordance with Table 17.2.4.3.

Table 17.2.4.3 Owner’s Project Requirements for Fire Lane Designation
Fire lanes shall have a minimum width of twenty feet (20’).
Fire lanes shall be installed where required by the Office of the Arlington County Fire Department. Fire lanes shall be marked with both sign and curb delineation.
Fire lanes may be used for temporary stopping or standing
Gates and barricades that are installed across a fire apparatus access road normally intended for vehicular traffic shall be installed with a fire department access system including an emergency override fire department master key switch as approved by the fire official.

17.2.5 Markings and Signs

- 17.2.5.1 Markings and signs shall meet the specifications as detailed under Chapter 8.1 – Section 503 of the Arlington County Code.

17.2.6 Location

- 17.2.6.1 Signs or markings shall be placed as follows:
 - 17.2.6.1.1 Where fire lanes run through parking areas where there is no adjacent curbing and posting of a sign is not practical, "NO PARKING FIRE LANE" may be required to be painted on the pavement in letters at least two feet (2’) high.
 - 17.2.6.1.2 Signs shall be provided at intervals of seventy-five feet (75’) with the bottom of the sign no less than seven feet (7’) from the ground unless otherwise directed by the code official.
 - 17.2.6.1.3 Curbing shall be painted within the limits of the fire lane as approved by the Arlington County Fire Department.
 - 17.2.6.1.4 When curbing is not provided, a yellow line may be required to be painted on the pavement along the perimeter and within the limits of the fire lane.

17.2.7 Hydrants and Fire Connections

- 17.2.7.1 The placement of *Fire Hydrants* requires plan approval from the Department of Environmental Services (DES).

- 17.2.7.2 All fire hydrants shall be installed in accordance with the Arlington County Construction Standards and Specifications – 02550 Water Mains and Appurtenances.
- 17.2.7.3 A minimum of ten feet (10’) clear around fire department connections and four feet (4’) around Fire Hydrants shall be maintained and shall not be obstructed by trees, shrubs, plants, structures or any other objects.
- 17.2.7.4 Fire department connections shall be located on the street front, address side of Buildings and shall be visible and accessible from the street.
- 17.2.7.5 Fire Hydrants shall be located within seventy-five feet (75’) of the fire department connections.
- 17.2.7.6 No Parking space shall be provided within fifteen feet (15’) of a Fire Hydrant located along the curb line or edge of any public or private roadway.
- 17.2.7.7 Fire Hydrants installed in parking lots shall be located within a fire lane. Provide necessary curb and/or roadway marking as required.
- 17.2.7.8 Fire Hydrants shall be located to minimize the impacts to on street curb space use. When possible hydrants may be placed in areas where on street parking would be restricted for other reasons, such as near a corner or driveway. Fire Hydrants adjacent to curb extensions curb bulbs and nubs may be placed in the extension, bulb or nub to minimize the loss of on street parking.

17.3 PRODUCTS

17.3.1 FIRE ALARM SYSTEM

Brand Name(s) for Building Element in accordance with Table 17.3.1 The Specification shall identify a minimum of three (3) Brand Names (manufactures) that comply with the Owner’s Project Requirements used for the Invitation to Bid, unless the Brand Name Category listed as No Substitutions.

<i>Table 17.3.1 Brand Name Product(s) for the FIRE ALARM SYSTEM</i>		
<i>Building Element</i>	<i>Brand Name(s) Brand Name Model</i>	<i>Brand Name - Category</i>
Fire Alarm Devices, control panels, and annunciator	Edwards, Firelite, Notifier and Silent Knight	No Substitutions
Key Box	KNOX-BOX®	No Substitutions
	<i>3200 Series^a</i>	

Note^a The KNOX-BOX® is the recognized Key Box by the Arlington County Fire Department. The Contractor through the KNOX-BOX® website at <http://www.knoxbox.com/> obtains the Key Box. The website requests the jurisdiction (enter zip code) which the box will be located and keyed to that jurisdiction.

PANELS

17.3.2 Fire Alarm Annunciator Panels

- 17.3.2.1 Only listed graphic Fire Alarm Annunciator Panels as identified in the NFPA shall be installed.
- 17.3.2.2 The basis for textural display of room numbers on the Fire Alarm Annunciator Panel shall be compliance with the Room Numbering Standard in Section 1.2.10 Document Organization and Format Table 1.2.10.1, page 1-6.

17.3.3 Fire Alarm Control Panel

All devices connected to the Fire Alarm Control Panel (FACP) shall be by the manufacturer of the FACP.

Appendix A - LIST OF ABBREVIATIONS

Abbreviation	Meaning
2010 Standards	2010 ADA Standards for Accessible Design
ACC	Arlington County Code
ACCACF	Arlington County Code Arlington County Fire Prevention Code Chapter 8.1 Fire Prevention Code – April 28, 2009
ACCSS	Arlington County Construction Standards and Specifications
ACFD	Arlington County Fire Department
ACPD	Arlington County Police Department
	Arlington County Government Department of Technology Services Network Infrastructure Standards (6/19/2015)
ADA	American with Disabilities Act
AEDGSOB	Advanced Energy Design Guide for Small Office Buildings
AIA	American Institute of Architects
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWI	Architectural Woodworking Institute
AWS	American Welding Society
AWS	American Welding Society
BAS	Building Automation System
BDVI	Building Design – Vertical Infrastructure
BACnet	Communications protocol for building automation and control networks. It is an ASHRAE, ANSI, and ISO 16484-5 standard protocol.
BMS	Building Management System (more recent terminology) Building Automation System (BAS)
CCTV	Closed Circuit Television
CLARB	The Council of Landscape Architectural Registration Boards
CMP	Corrugated Metal Pipe
CRRC	Cool Roof Rating Council
CSI	Construction Specification Institute
DAS	Distributed Antenna System
DES	Department of Environmental Services
DDC	Direct Digital Control
DOJ	Department of Justice
DTS	Department of Technology Services
EIFS	Exterior Insulation and Finish Systems
EMCS	Energy Management and Control Systems (more recent terminology) Building Automation System (BAS)
EMS	Energy Management System
EPA	United States Environmental Protection Agency
FAAP	Fire Alarm Annunciator Panel
FACP	Fire Alarm Control Panel
FMB	Facilities Management Bureau
GFCI	Ground Fault Circuit Interrupter

HID	High Intensity Discharge
HVAC	Heating, Ventilation and Air Conditioning
HVAC	Heating, Ventilation and Air Conditioning
ICC-IBC	ICC International Building Code/2012
ID	Intrusion Detection System
IES	The Illuminating Engineering Society of North America
IFC	2012 International Fire Code®
ISD	Inspection Services Division
LACP	Lateral Assessment and Certification Program
LED	light-emitting diode
LEED	US Green Building Council's Leadership in Energy and Environmental Design
MDP	Main Distribution Panel
MIA	Masonry Institute of America
MTS	Manual Transfer Switch
MODbus	MODbus is a serial communications protocol originally published by Modicon (now Schneider Electric) in 1979 for use with its programmable logic controllers (PLCs).
NALP	National Association of Landscape Professionals
NASSCO	National Association of Sewer Services Companies
NEC	National Electrical Code
NFPA	National Fire Protection Association
NOC	Network Operations Center
NRCA	National Roofing Contractors Association
OEM	Office of Emergency Management
OPR	Owner's Project Requirements
PCI	Precast/Prestressed Concrete Institute
POTS	Plain Ordinary Telephone Service
PROWAG	American with Disabilities Accessibility Guidelines for Public Rights-of-Way
RGAP	Remote Generator Annunciator Panel
SA	Security Access
SDS	Safety Data Sheet
SFPC	Virginia Statewide Fire Prevention Code
UL	Underwriters Laboratories
UPS	Uninterruptible Power Supply
USBC	Virginia Uniformed Statewide Building Code 2012
UST	Underground Storage Tanks
VAV	Variable Air Volume
VRF	Variable Refrigerant Flow
VRV	Variable Refrigerant Volume
WMATA	Washington Metropolitan Area Transit Authority

Appendix B - APPLICABLE STANDARDS & SPECIFICATIONS

Administrative Regulation 4.1 – Governing the Submittal of Site Plans in Arlington County (June 2013)
Advanced Energy Design Guide for Small Office Buildings (AEDGSOB)
American Association of State Highway and Transportation Officials (ASSHTO)
American Concrete Institute (ACI)
American Institute of Architects (AIA)
American National Standards Institute (ANSI)
American Society for Testing and Materials (ASTM)
American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)
American Society of Mechanical Engineers (ASME) – A17.1 Handbook on Safety Code for Elevators and Escalators
American Welding Society (AWS)
American with Disabilities Accessibility Guidelines for Public Rights-of-Way (PROWAG)
Americans with Disabilities Act - Accessibility Guidelines for Building and Facilities (ADAAG)
Architectural Woodworking Institute (AWI)
Arlington County Code - Chapter 8.1 - Fire Prevention Code – April 28, 2009 (Arlington County Fire Prevention Code).
Arlington County Code - Chapter 26 - Utilities (26-5)
Arlington County Code – Chapter 48 – Floodplain Management
Arlington County Code – Chapter 57 – Erosion and Sediment Control
Arlington County Code – Chapter 60 – Stormwater Management
Arlington County Code – Chapter 61 – Chesapeake Bay Preservation Ordinance
Arlington County Code (Code of the County of Arlington County, Virginia) (ACC)
Arlington County Construction Standards and Specifications (ACCSS)
Arlington County Department of Public Works Retaining Wall Policy December 9, 2002
Arlington County Infrastructure Design and Construction Standards – Building Design - Vertical Infrastructure (Doc Version 2015.1204) (ACIDCS-BD-VS) Short Description –Building Design - Vertical Infrastructure
Arlington County Infrastructure Design and Construction Standards – Building Design - Horizontal, Infrastructure Short Description - Building Design - Horizontal Infrastructure
Arlington County Government Street Light Policy And Planning Guide - January 2008
Arlington County Landscape Standards January 2010
Arlington County Public Art Policy
Arlington County Zoning Ordinance (ACZO)
Code of Virginia
Construction Specification Institute (CSI)
Cool Roof Rating Council (CRRC)
Globally Harmonized System of Classification and Labelling of Chemicals (GHS)
EPA Energy Star®
Federal Occupational Safety and Health Administration Standard 29 CFR 1910.151
ICC International Building Code/2012 (ICC-IBC)
ICC International Energy Conservation Code/2012
ICC International Fuel Gas Code/2012
ICC International Mechanical Code/2012

ICC International Plumbing Code/2012
ICC International Property Maintenance Code/2012
ICC International Residential Code/2012
ICC/ANSI A117.1/2009
The Illuminating Engineering Society of North America (IES)
2012 International Fire Code® (IFC)
Masonry Institute of America (MIA)
National Electrical Code (NEC)
National Electrical Manufacturers Association (NEMA)
National Elevator Industry (NEII) – Building Transportation Standards and Guidelines (NEII®-1)
National Fire Protection Association (NFPA)
National Roofing Contractors Association (NRCA)
NFPA National Electrical Code/2011
NFPA-13/10
NFPA-72/10
North American Fenestration Standard/Specification for Windows, Doors and Skylights (NAFS)
Occupational Safety and Health Administration (OSHA)
Precast/Prestressed Concrete Institute (PCI)
Stormwater Manual: A Guide to Stormwater Requirements for Land Disturbing Activities in Arlington County
Stormwater Manual: A Guide to Stormwater Requirements for Land Disturbing Activities in Arlington County
US Green Building Council’s Leadership in Energy and Environmental Design (LEED) green building rating system
Virginia Department of Transportation (VDOT) Road and Bridge Standards 2008 edition
Virginia Stormwater BMP Standards and Specifications
Virginia Stormwater Management Handbook
Virginia Stormwater Management Regulations (Section 4 VAC 50-60 Virginia Administrative Code)
Virginia Uniformed Statewide Building Code 2012 (USBC)
Virginia Statewide Fire Prevention Code (SFPC)
Washington Metropolitan Area Transit Authority (WMATA)

Appendix C - DAS TECHNICAL SPECIFICATIONS

Arlington County Government
Distributed Antenna System
Technical Specifications

Reference standard excerpt from Arlington County Government Department of Technology Services Network Infrastructure Standards (6/19/2015), pages 56 - 75.

Distributed Antenna System Technical Specifications

In a Resolution adopted by the Arlington County Board on October 22, 2013, the Board committed to using a standard fiber-based distributed antenna system for public safety communications. The specifications herein detail the standard system.

I. Description

- A. This technical specification describes the standards for implementation of a Distributed Antenna System (DAS) for the purpose of improving public safety wireless communications within Arlington County Government (ACG) and Arlington Public Schools (APS) facilities.

II. System Requirements

- A. **Expansion.** The DAS will be capable of supporting the following frequencies by modifying only the active components of the system. Additional components will comply with the specifications herein.

Table 1. Supported Frequencies

Band	Uplink, MHz	Downlink, MHz
Commercial 700 MHz	698-716, 776-787	728-746
700 MHz Public Safety	799-805	769-775
800 MHz Public Safety	806-824	851-869
Cellular	824-849	869-894
900 MHz	896-902	935-941
AWS	1710-1755	2110-2155
PCS	1850-1915	1930-1995
BRS/EBS	2496-2690	

- B. **Active Distribution.** Active components will be interconnected only with single-mode fiber optic cable.
- C. **Remote Management.** The DAS will provide for remote configuration, control, and monitoring of active components.
- D. **SNMP (Simple Network Management Protocol) Alarm Reporting.** The DAS will be deployed with SNMP alarm reporting technology capable of third party integration.

- E. **Power.** The DAS will be connected to a backup generator providing 8 hours of continuous power.
- F. **Approval.** The Contractor will design and implement a DAS capable of receiving approval of or certification from the wireless carrier(s) operating a respective band.

III. Substitutions

- A. Substitutions of DAS components will be accepted at the discretion of the County. A substitution that fails to meet or exceed the specifications described herein will not be considered. The Contractor will submit the following information with any request for substitution:
 - 1. Product sample (passive only; cables, connectors, etc.)
 - 2. Hardware/software manual (active only)
 - 3. Detailed product specifications
 - 4. Independent test results verifying product specifications
 - 5. Mean Time Between Failure (MTBF) data (active only)
 - 6. Written guarantee from the manufacturer that the substitution will be supported and available for 10 years from the date of system acceptance
 - 7. For components required for commercial carrier signals, written guarantee from the respective commercial carrier that the substitution is approved for use within the commercial carrier's network

IV. Contractor Qualification and Workmanship

- A. The Contractor will provide documentation demonstrating five (5) years of experience designing, installing, and commissioning DAS solutions of a similar scope and complexity.
- B. The Contractor will provide documentation demonstrating employee certification from the manufacturer of the active components of the DAS.
- C. The Contractor will comply with the latest editions of the National Electrical Code, National Electrical Safety Code, National Contractor's Association Standard of Installation, relevant local regulations, and manufacturer's instructions during the design, installation, and commissioning of the DAS.

V. Performance

- A. The DAS will meet or exceed the Minimum Downlink Receive Signal Level (RSL) as described in Table 2.

Table 2. Minimum Downlink RSL

Band	Minimum Downlink RSL, dBm
Lower 700 MHz, BRS/EBS	-75
Cellular, 900 MHz, AWS, PCS	-85
700 MHz Public Safety, 800 MHz Public Safety	-95

- B. The contractor will confirm the frequencies used and guarantee coverage for all requested frequency bands according to Table 2 prior to the installation of the DAS.
- C. The DAS will meet the requirements of Table 2 in 95% of the building, to include the stairwells, elevators, basement, and garage.
- D. The DAS will comply with the latest edition of NFPA 1.
- E. The DAS will transmit the requested frequency bands simultaneously over one passive component installation.
- F. To accommodate periodic changes within frequency bands, the DAS will be capable of reconfiguration, without additional hardware or software, to meet the requirements of Table 2.

VI. Submittals

- A. The following submittals will be delivered with the bid response.
 - 1. Component data sheets
 - a) Donor and in-building antennae
 - b) Coaxial cable, connectors, splitters, combiners, and couplers
 - c) Fiber optic cable and connectors
 - d) Bi-directional amplifier(s)
 - e) Fiber optic master unit(s)
 - f) Fiber optic remote unit(s)
 - g) Network Management unit(s)

2. Design documents
 - a) RF link budget
 - b) Overlay of system components on floor plans
 - c) Donor antenna(e) and grounding drawings
 - d) Bill of Materials (BOM)
 3. Sample Statement of Work (SOW)
 4. Sample Acceptance Test Plan (ATP)
 5. Recommended spares
 6. Warranty Documents
 - a) Manufacturer's warranty of components in Subsection VIA.1
 - b) Contractor's system warranty
 - c) Manufacturer's extended warranty
- B. The following submittals will be delivered prior to the Notice to Proceed (NTP).
1. Final RF link budget
 2. Overlay of system components on floor plans
 3. Donor antenna(e) and grounding drawings
 4. Bill of Materials (BOM)
 5. RF propagation modeling
 6. Signal to Noise Interference Ratio (SNIR) map
 7. Description of the method used to avoid the interference of uplink and downlink frequencies
 8. Maintenance Service Contract
 9. Statement of Work (SOW)
 10. Acceptance Test Plan (ATP)

- C. The following submittals will be delivered at close out.
1. As-built drawings indicating:
 - a) Donor antenna, grounding, and lightning protection details
 - b) Cable routing, splitters, couplers, and in-building antenna locations
 - c) Active component locations, layout, and configuration
 2. Test reports indicating:
 - a) Compliance with the requirements of Table 2
 - b) Sweep testing results for all coaxial cable runs
 - c) Optical Time Domain Reflectometer (OTDR) results for all fiber optic cable runs
 3. Hardware and software manuals for all active components
 4. Warranty Documents
 - a) Manufacturer's warranty of components in Subsection VI.A.1
 - b) Contractor's system warranty
 - c) Manufacturer's extended warranty

VII. Warranty

A. Manufacturer's Warranty

1. 1-year limited warranty from the date of system acceptance on active components
2. 5-year limited warranty from the date of system acceptance on splitters, couplers, and in-building antennae
3. 20-year limited warranty from date of system acceptance on coaxial cable, fiber optic cable and connectors

B. Contractor's Warranty

1. The Contractor will warrant the performance of the DAS, as described in Section V, for 1 year from the date of system acceptance.

C. Manufacturer's Extended Warranty

1. The Manufacturer will administer a follow-on program through the Contractor to provide support and service to the County. The program will cover a certified system, defined as a DAS installation performed by a certified contractor using certified components while following all the Manufacturer's installation instructions, recommendations, and best practices. The program will include:
 - a) A 20-year warranty, provided by the Manufacturer and the Contractor, on all coaxial cable, fiber optic cable, and connectors
 - b) An assurance that, during the 20-year warranty, the DAS will support current and future modulation formats in the frequency bands for which it is designed
2. The Manufacturer and Contractor, using a schedule agreed upon by the County, will remediate any failure of the DAS whether during ATP, normal use, or the upgrade of the DAS to support additional frequency bands.
3. The Manufacturer will maintain ISO Quality Control registration for the facilities that manufacturer any component of the DAS.

VIII. Components

- A. **Broadband Donor Antennas:** Broadband Donor Antennas will feature a multi-band design, accommodating Cellular, PCS, LMR and AWS frequencies in a single small antenna.
 1. **Electrical:**
 - a) Frequency bands, 806 - 960 MHz and 1710 - 2200 MHz
 - b) $VSWR \leq 1.8$
 - c) Gain: 806-960 ≥ 10.5 dBi, 1710 - 2200 ≥ 12 dBi
 - d) Maximum input power: 100 watts
 - e) Polarization: Vertical
 - f) Front-to-back ratio: 806 - 960 ≥ 18 dB, 1710 - 2200 ≥ 20 dB
 - g) Impedance: 50 Ω
 - h) Azimuth Pattern: As proposed by the manufacturer to meet the performance specifications in this Section.

2. Mechanical:
 - a) Radome material: UV-protected ABS
 - b) Pigtail cable: RG58, plenum rated
 - c) Connector: 50 Ω N Type Female
 - d) Mounting: Pole
 3. Environmental
 - a) Temperature: -40 °C to +60 °C
 - b) Lighting protection: Direct ground
 - c) Waterproof level: IP 66
 - d) Wind Speed, maximum: 125 mph
 4. Approved Manufacturer: Andrew CELLMAX-EXT-CPU or equivalent, in accordance with Section III.
- B. 700 MHz LMR Yagi Donor Antennas:
1. Electrical:
 - a) Frequency band, 746 - 806 MHz
 - b) VSWR \leq 1.5:1
 - c) Gain: \geq 1 1.1 dBi
 - d) Maximum input power: 100 watts
 - e) Polarization: Vertical
 - f) Front-to-back ratio: \geq 15 dB
 - g) Impedance: 50 Ω
 - h) Beam width, Horizontal, degrees: 60
 - i) Azimuth Pattern: As proposed by the manufacturer to meet the performance specifications in this Section.

2. Mechanical:
 - a) Connector: 50 Ω N Type Female
 - b) Mounting: Pole
 3. Environmental:
 - a) Temperature: -40 °C to +60 °C
 - b) Lighting protection: Direct ground
 - c) Waterproof level: IP 66
 - d) Wind Speed, maximum: 125 mph
 4. Approved Manufacturer: Andrew DB498-PS or equivalent in accordance with Section III.
- C. Omni-Directional Coverage: Omni-Directional Coverage antennas will feature a multiband design, accommodating multiple frequency bands in a single small antenna.
1. Electrical Band 1:
 - a) Frequency Band: 698 – 800 MHz
 - b) VSWR: \leq 1.8:1
 - c) Gain: \geq 1.5 dBi
 - d) Maximum input power: 50W
 - e) Impedance: 50 Ω
 - f) Beamwidth, Horizontal: 360° omnidirectional
 - g) Beamwidth, Vertical: 80° nominal
 - h) Return Loss: 10.9 dB
 2. Electrical Band 2:
 - a) Frequency Band: 1710 – 2700 MHz and 800 – 960 MHz
 - b) VSWR: \leq 1.5:1
 - c) Gain: \geq 1.5 dBi @ 800-960 MHz and \geq 5.0 dBi @ 1710 – 2700 MHz
 - d) Maximum input power: 50W
 - e) Impedance: 50 Ω

- f) Beamwidth, Horizontal: 360° omnidirectional
 - g) Beamwidth, Vertical: 65° nominal
 - h) Return Loss: ≤ 13.9 dB
3. Mechanical:
- a) Connector: 50 Ω N Type Female
 - b) Mounting: Thru-hole ceiling mount
 - c) Radome material: ABS, UV resistant
 - d) Pigtail cable: KSR195, plenum rated
4. Environmental:
- a) Application: Indoor
 - b) Operating Temperature: 40 °C to +60 °C (40 °F to +140 °F)
 - c) Relative Humidity: Up to 100%
5. Regulatory Compliance/Certifications: RoHS 2002/95/EC
6. Approved Manufacturer: Andrew CELLMAX-O-CPUSE or equivalent, in accordance with Section III.
- D. Directional Coverage Antennas: Directional coverage antennas will feature a multi-band design, accommodating multiple frequency bands in a single small antenna.
1. Electrical Band 1:
- a) Frequency Band: 698 – 800 MHz
 - b) VSWR: $\leq 1.8:1$
 - c) Gain: ≥ 5.0 dBi @ 698 – 800 MHz
 - d) Maximum input power: 50W
 - e) Impedance: 50 Ω
 - f) Beamwidth, Horizontal: 110° nominal
 - g) Polarization: Vertical
 - h) Return Loss: ≤ 10.9 dB

2. Electrical Band 2:
 - a) Frequency Band: 1710 – 2700 MHz and 800 – 960 MHz
 - b) VSWR: $\leq 1.5:1$
 - c) Gain: ≥ 5.0 dBi @ 800 – 960 MHz and ≥ 6.0 dBi @ 2170 – 2700 MHz and ≥ 8.0 dBi @ 1710 – 2170 MHz
 - d) Maximum input power: 50W
 - e) Impedance: 50 Ω
 - f) Beamwidth, Horizontal: 90° nominal
 - g) Return Loss: ≤ 13.9 dB
 3. Mechanical:
 - a) Connector: 50 Ω N Type Female
 - b) Mounting: 4-hole wall mounting plate
 - c) Radome material: ABS, UV resistant
 - d) Pigtail cable: RG58, plenum rated
 4. Environmental:
 - a) Application: Indoor
 - b) Operating Temperature: 40 °C to +60 °C (40 °F to +140 °F)
 - c) Relative Humidity: Up to 100%
 5. Regulatory Compliance/Certifications: RoHS 2002/95/EC
 6. Approved Manufacturer: Andrew CELLMAX-D-CPUSE or equivalent, in accordance with Section III.
- E. Fiber Optic Cable and Connectors:
1. General Specifications:
 - a) Cables will be six-strand or greater, designed for point-to-point applications as well as mid-span access, and will provide a high-level of protection for optical fiber installed in interior building environments.
 - b) Higher optical fiber count cables will utilize a sub-unitized design with color-coded subunits for easy identification.

- c) Single-mode optical fibers will be 8.3 μm and use standard colored tight-buffered construction.
 - d) The single-mode optical fiber will be dispersion-unshifted optical fiber that meets ITU-T G.652c standards.
 - e) Cable will provide optimum performance over entire wavelength range from 1260 to 1625 nanometers.
 - f) Cable will support new and emerging applications that utilize extended E band, 1360 to 1460 nanometers.
 - g) Cable will also support existing and legacy single-mode applications that traditionally operate in 1310 and 1550 nanometer regions.
 - h) Cable will deliver a cost-effective upgrade path by expanding available wavelengths by 50 percent supporting 16 Channels of coarse wave division multiplexing (CWDM) on a single optical fiber and up to 400 Channels of dense wave division multiplexing (DWDM) on a single cable.
 - i) Fire ratings: Riser, plenum, and/or LSZH
2. Approved Manufacture: CommScope Fiber Optic Cable containing TeraSpeed Single Mode Optical Fiber. As an example, P-006-DS-8W-FSUYL, 6-strand breakout cable single-mode fiber or equal in accordance with Section III.
- F. Fiber Optic Pigtails:
- 1. General Specifications:
 - a) To maintain channel integrity, optical fiber patch cords and pigtails will be fabricated to meet the performance parameters corresponding to the optical fiber cable approved product type specified below. Patch cord and pigtail plug connectors will be equipped with boots, and will have same colors as related optical fiber backbone cables, unless specified or indicated otherwise. Optical fiber patch cords and pigtails will be available with the following options as specified or indicated:
 - b) Termination types: SC-APC
 - c) Connector/cable configuration: Simplex and duplex
 - d) Fire ratings: Riser, plenum and/or LSZH
 - e) Patch cord outside diameters: 1.6 millimeters (0.063 inches) and 3.0 millimeters (0.118 inches)

- f) Pigtails: Ruggedized and tight-buffered optical fiber—0.9 millimeters (0.035 inches) outside diameter
 - g) Lengths: As specified or indicated
 - 2. Approved Manufacturer: CommScope TeraSpeed single reinforced buffered 900 μ m, LightScope ZWP single-mode fiber, angled polished connector or equivalent, in accordance with Section III.
- G. Air Dielectric, Plenum Rated Cable:
- 1. Material Characteristics:
 - a) Jacket: Halogenated, Fire-Retardant
 - b) Outer Conductor Material: Corrugated Aluminum or Corrugated Copper
 - c) Inner Conductor Material: Copper-Clad Aluminum Wire
 - 2. Electrical Characteristics:
 - a) Impedance: $50 \pm 2.0 \Omega$
 - b) Frequency Band: 1 - 8800 MHz
 - c) Peak Power Rating: $\geq 40.0 \text{ kW}$
 - 3. Mechanical Characteristics:
 - a) Diameter Over Jacket: $\leq .627 \text{ in}$
 - b) Minimum Bending Radius: $\leq 5 \text{ in}$
 - c) One Time Minimum Bending Radius: $\leq 3 \text{ in}$
 - 4. Attenuation Characteristics:

Table 3. Plenum Rated Cable Attenuation

Frequency, MHz	Attenuation, dB/100ft
150	< 0.848
450	< 1.53
800	< 2.105
2000	< 3.564

Standard Conditions: VSWR 1.0, ambient temperature 20 °C (68 °F)

- 5. Approved Manufacturer: Andrew HL4RP-50A, AL4RPV-50A or equivalent, in accordance with Section III.

H. Foam Dielectric Cable:

- 1. Material Characteristics:
 - a) Jacket: Non-halogenated, Fire-Retardant
 - b) Outer Conductor Material: Corrugated Copper
 - c) Inner Conductor Material: Copper-Clad Aluminum Wire or Copper Tube
- 2. Electrical Characteristics:
 - a) Impedance: $50 \pm 1.0 \Omega$
 - b) Frequency Band: 1/2" Nominal: 1 - 8800 MHz, 7/8" Nominal: 1 - 5000 MHz
 - c) Peak Power Rating: $\geq 40.0 \text{ kW}$
- 3. Mechanical Characteristics:
 - a) Diameter Over Jacket: 1/2" Nominal: $\leq .630 \text{ in}$, 7/8" Nominal: $\leq 1.1 \text{ in}$
 - b) Minimum Bending Radius: 1/2" Nominal: $\leq 5 \text{ in}$, 7/8" Nominal: $\leq 10 \text{ in}$
 - c) One Time Minimum Bending Radius: 1/2" Nominal: $\leq 2 \text{ in}$, 7/8" Nominal: $\leq 5 \text{ in}$
- 4. Attenuation Characteristics: 1/2" Nominal

Table 4. Foam Dielectric Cable Attenuation

Frequency, MHz	Attenuation, dB/100ft
150	< 0.815
450	< 1.447
800	≤ 1.968
2000	< 3.251

Standard Conditions: VSWR 1.0, ambient temperature 20 °C (68 °F)

5. Attenuation Characteristics: 7/8" Nominal:

Table 5. Foam Dielectric Cable Attenuation

Frequency, MHz	Attenuation, dB/100ft
150	< 0.417
450	< 0.744
800	< 1.014
2000	< 1.683

Standard Conditions: VSWR 1.0, ambient temperature 20 °C (68 °F)

6. Approved Manufacturer: Andrew LDF4-50A, FXL-540-NHR, FXL-780-NHR or equivalent, in accordance with Section III.

I. Splitters, Combiners, Couplers, Coax Jumpers and Connectors:

1. Approved Manufacturer: Andrew or equivalent, in accordance with Section III.

J. BDA: The BDA(s) will be of modular design and use digital filtering to mitigate interference and accommodate public safety radio and commercial wireless carrier coverage.

1. Characteristics

- a) Operating Temperature Range: -33 °C to +50 °C
- b) Chassis: Will be of modular design with ≥ 4 frequency bands per 19" chassis. Chassis will not exceed four Rack Units (RUs) in height.
- c) Filtering: Digital
- d) Separate Control: Each RF amplifier will be capable of adjusting and controlling power levels for each commercial wireless carrier when multiple commercial wireless carriers share a single amplifier.
- e) FCC Part 90.219 Type Classification: Class A narrowband for LMR/SMR/ESMR frequency bands
- f) Alarming: Will support both SNMP and SMS using wireless modem.
- g) Mounting Options: Will support rack, wall and pole mounting.
- h) Frequency Bands Supported: 380 - 512 MHz LMR, 769 - 806 MHz LMR, 806 - 869 MHz LMR/SMR/ESMR, 896 - 941MHz LMR/SMR/ESMR, 824 - 894 MHz Cellular, 1710 - 1755 MHz AWS, 1900 - 1950 MHz PCS

2. Compliance:
 - a) NFPA: The BDA will comply with NFPA-1 2009 Edition Annex O In-Building Public Safety Radio Enhancement Systems.
 - b) FCC: Will be FCC type certified.
 3. Approved Manufacturer: Andrew Node A or equivalent, in accordance with Section III.
- K. Fiber Optic Master Unit: The Fiber Optic Master Unit will convert radio over coax to Radio-Over-Fiber (RoF) for distribution to Fiber Optic Remote Units.
1. Characteristics
 - a) Transmission Media: Single-mode fiber at 1310 nm
 - b) Operating Temperature Range: +5 °C to +40 °C
 - c) Impedance: 50 Ω
 - d) Chassis:
 - (1) Will be of modular design capable of supporting ≥ 32 Remote Units per 19", 5 RU chassis
 - (2) Will support redundant power supplies
 - (3) Will have the capability to remotely power the Remote Units via composite fiber optic cable
 - e) Automatic Gain Control (AGC): Will provide AGC for optical loss compensation
 - f) Optical Budget: Will support ≤ 3 dB optical budget (~3 km or 2 miles)
 - g) Auxiliary Channel: Will provide an input to support 400 to 2700 MHz for future expandability
 - h) Interlink: Will support one fiber or two fibers bi-directional optical link for distances up to 20 km with a 10 dB optical budget

- i) Remote Supervision:
 - (1) Will support the TCP/IP protocol, SNMPv2, FTP, HTTP, Telnet, and be fully compatible with general purpose SNMP managers
 - (2) Remote access will be available via Point-to-Point Protocol (PPP), over circuit-switched/packet data and wired/wireless modems
 - (3) Each Active device will be manageable via a Web GUI
 - (4) Auto Mapping: Each board position will be automatically mapped during system turn-up
2. Frequency Bands Supported: 380 - 512 MHz LMR, 769 - 806 MHz LMR, 806 - 869 MHz LMR/SMR/ESMR, 896 - 941MHz LMR/SMR/ESMR, 824 - 894 MHz Cellular, 1710 - 1755 MHz AWS, 1900 - 1950 MHz PCS and 2496 - 2690 MHz BRS/EBS.
3. Approved Manufacturer: Solid Alliance Multi-Carrier or equivalent, in accordance with Section III.
- L. Fiber Optic Remote Units: The Fiber Optic Remote Unit converts the RoF signal back to radio over coax, as well as provides filtering so that multiple frequency bands can reside over the same passive cable and antenna infrastructure.
 1. Characteristics
 - a) Operating Temperature Range: +5 °C to +40 °C
 - b) Impedence: 50 Ω
 - c) Power Consumption: ≤ 105 watts, maximum

d) Output Power per Carrier at Antenna Port:

Table 6. Output Power

Band, MHz	Output Power, dBm
Analog 700	27
GSM 700	27
Analog 800 and 850	27
GSM 850 and 850	31
GSM 850 and 850 at band edges	29
iDEN 800 and 850	26
iDEN 800 and 850 at band edges	24
CDMA 800 and 850	29
CDMA 800 and 850 at band edges	27
Analog 900	29
iDEN 900	23
CDMA 1700	30
W-CDMA 1700	28
Analog 1900	31
GSM 1900	31
CDMA 1900	29
W-CDMA 1900	27

e) MTBF (excluding external power supply): $\geq 160,000$ hours

f) Physical: The Remote Unit will consist of the following:

- (1) Ingress Protection: IP31 or equivalent
- (2) Frequency Bands supported: 769 - 806 MHz LMR, 806 - 869 MHz LMR/SMR/ESMR, 896 - 941MHz LMR/SMR/ESMR, 824 - 894 MHz Cellular, 1710 - 1755 MHz AWS, 1850 - 1995 MHz PCS
- (3) Optical Port: 2xSC-APC connector (separated uplink/downlink)
- (4) Antenna Port: Single 50 Ω N type female connector
- (5) Auxiliary Ports: Two SMA female for future add-on modules

g) Uplink Noise Figure:

- (1) LMR 700, LMR 800, Cell850: ≤ 7.5 dB
- (2) LMR 700, LMR 800, Cell850 at band edges: ≤ 9.5 dB
- (3) LMR 900: ≤ 8.5 dB

(4) AWS: ≤ 7.5 dB

(5) PCS 1900 extended: ≤ 7.5 dB

2. Approved Manufacturer: Solid Alliance ROU or equivalent in accordance with Section III.

IX. Maintenance

- A. The Contractor will provide an optional 1-year maintenance contract, capable of annual renewal, covering preventative maintenance, system monitoring, spares, failure remediation, equipment repair, and response time.

X. Installation

- A. The Contractor will design, install, commission, and test the DAS according to the Manufacturer's instructions and recommendations.
- B. The Contractor will install the DAS according to the SOW as accepted by the County.

XI. Acceptance Testing

- A. The Contractor will complete the acceptance testing according to the ATP as described in Subsection VIB.10.
- B. Acceptance testing will confirm compliance with the requirements as described in Section V.

Appendix D - COMMUNICATION ROOM STANDARDS

Arlington County Government
Communications Room Standards

Reference standard excerpt from Arlington County Government Department of Technology Services Network Infrastructure Standards (6/19/2015), pages 2-7.

Arlington County Communications Room Standards

1. Location

- a. Room must be located within 295 cable feet of the most-distant communication outlets.
- b. One room per floor up to 20,000 sq. ft. floor. For large floors an effort should be made to divide the floor into sections no larger than 7,000 sq. ft. (following the building layout and/or using ordinals). The cable plant can still utilize a single communications room, but should use separate patch panels for each section.
- c. Room needs to be accessible from a hallway or exterior access
- d. Meets power and environmental requirements
- e. Sprinkler system is dry inside the room
- f. Final approval is required from DTS Network Services
- g. Dedicated to network services and not used for any other functions or purpose.

2. Size

- a. Minimum closet size is 10'x10' with an 8' ceiling, minimum closet size is determined using the following table:

Number Active Data Drops Served	Minimum Closet Size
<48	10' x 10'
48 to 144	10' x 12'
>144	10' x 16'

3. Doors

- a. Entrance doors must open out
- b. Doors are a minimum of 3'6" wide and 7' tall.
- c. Secured by Control Systems (DTS issued card access)

4. Walls\Floor\Ceiling

- a. Slab to slab required
- b. To keep dust and static electricity to a minimum in the communications rooms, use floor finishes of asphalt tile, static free linoleum tile, and concrete with cement sealers or paints. ABSOLUTELY NO CARPETING.
- c. No windows desired
- d. All wall and ceiling surfaces should be light in color.
- e. Plywood boards (4'x8'x3/4" fire retardant) mounted on wall behind equipment rack(s) capable of supporting 50 lbs. per linear foot of wall space. 16 sq. ft. at a minimum (4'x4') with 4'x8' preferred. Plywood painted to match the room. UL fire-rating symbol/stamp should be left exposed on each sheet of plywood.

5. Electrical Power\Grounding (These are general requirements; more specific details may be provided for special projects)

- a. Buildings should have a generator and centralized UPS that provides backup power to each communication room. Each communication room should be served with both utility power and UPS/generator power based on the following table.

Utility Power Per Communications Room				
Number Of Active Data Drops	Number of NEMA 5-20 Outlet	Number of NEMA 6-20 Outlets	Additional Power Requirements	
<96	4			
96 – 240	4	3	Hardwire Terminal Block 3W + G (L-L-N-G) ¹	
Generator/UPS Power Per Communications Room				
Number Of Active Data Drops	Number of NEMA 5-20 Outlet	Number of NEMA 6-20 Outlets	Additional Power Requirements	Minimum Available Watts Available per
<96	4			4,000
96 – 240	4	3		12,000

1. Not required if providing centralized UPS/Generator power.

- b. All circuits shall be installed on the top of the equipment rack and have a prominent, permanent, machine-made label indicating the electrical panel number, breaker number, and room number of the breaker panel that feeds the circuit.
- c. Outlets connected to the generator should be identified Orange in color
- d. All vertical and horizontal racking must include a bonded ground.

6. Lighting

- a. Must ensure a minimum of 50 foot candles, measured 3’ above the finished floor.
- b. A wall switch to turn room lighting on and off should be located immediately inside the door.
- c. Due to the interference it generates, fluorescent lighting should be avoided at all cost.

7. Environmental Control

- a. HVAC shall be included in the design of the closet to maintain a temperature between 72 - 85 degrees Fahrenheit. The exact BTU’s will be provided at time of bid.
- b. HVAC (24 hours per day and 365 days per year) must run separately from the building system at all times.
- c. A positive pressure shall be maintained with a minimum of one air change per hour, or as required by applicable code. When installation of active devices (heat producing equipment) is known to be required, a sufficient number of air changes shall be provided to dissipate the heat produced.
- d. HVAC units should not be installed above any computer equipment rack and a be minimum of 6 inches from the edge of a computer equipment rack
- e. No water or steam pipes should run through or above the room with the exception of a sprinkler system (if required by local fire codes).
- f. Relative humidity will be maintained between 30% and 50%. Failure to adhere to these specifications could produce serious corrosion of the copper wires used in UTP and STP.
- g. HVAC shall be provided according to the following table unless more specific information is provided:

Number of Racks	BTU/Hr (max)	BTU/Hr (de-rated)	Tons of HVAC (max rounded down)
1	6,500	4,875	½ ton
2	13,000	9,750	1 ton
3	19,500	14,625	1 ½ ton

* These figures are derived as follows: (1) Each rack has two power strips. (2) Each power strip is a separate 20A circuit. (3) Each circuit is de-rated at the breaker to 16A. (4) 16A X 120VAC = 1,920 watts per rack. (5) 1,920 watts X 3.4 = 6,528 BTU/Hr per rack. (6) 1 ton = 12,000 BTU/Hr.

8. Building Penetration\Riser Conduits\Pathways

- a. Main Telco Closet\Demarc
 - i. Closest to the street access point, whether underground or above ground.
 - ii. Maintains power and temperature parameters as stated above.
 - iii. Separate key access with easy access from outside of building.
 - iv. At least four 4" conduits from street access to interior demarc closet.
- b. Riser & Extension
 - i. Minimum 2- 4" Conduits required for vertical risers between floors.
 - ii. Satellite communication closets should be stacked in multi-floor buildings allowing vertical 4" conduits to be connected between floors.
 - iii. A 1" metallic conduit will run to each closet and provide a grounding wire.
- c. Wall Penetration
 - i. Conduits and/or sleeves shall protrude into the closets at least 1" further than the wall surface (but not more than 3").
 - ii. All penetrations shall be filled with appropriate fire blocking material to ensure compliance with fire codes.
- d. Pathways
 - i. Conduit and/or cable tray penetrations into closets shall be as close to the entrance door as is practical.
 - ii. Horizontal and Vertical conduit penetrations shall feed follow the specifications outlined in Attachment A.
 - iii. All conduits and cable trays shall be free of burrs and sharp edges. Conduits shall be fitted with smooth bushings.

9. Room Security\ Building Access

- a. Communication closet doors shall be secured using a card reader system standardized and controlled by DTS (Accutech-using a HID MicroProx Tag)
- b. Access to buildings that contain one or more communication closets must include security access for 24x7 accesses for DTS personnel.
- c. Access to buildings, including layout, instructions and security POC information will be stored in the key box in the DTS NOC.

10. Cable Standards

- a. Copper
 - i. Jacks and Face plates
 - RJ 45 jacks will be used for data. Data jacks will be yellow.
 - Face plates will be white and capable of four terminations.

- Labeling for face plates and patch panels will be machine generated and match floor plans.
- ii. Station Cable
 - Only Category 6E yellow cable will be used for data drops.
 - Only Category 6E purple cable will be used for wireless access point drops.
- iii. Riser Cable
 - One Category 3, 25-pair riser shall be installed between the MDF and each satellite IDF and terminated on an RJ45, Cat5e 110 patch panel.
- iv. Certification
 - All cable drops will be certified and results will be documented as part of acceptance process.
- v. Warranty
 - Cable and workmanship will be guaranteed for a period of one year.
- vi. Standards
 - TIA standards, practices and procedures will be adhered to at all times.
- b. Fiber (between buildings)
 - i. Single mode fiber (ISO OS1) shall be installed between buildings.
 - ii. The single mode fiber will be terminated in the buildings data center or the building's main IT closet.
 - iii. Fiber terminations shall be SC/APC connectors.
 - iv. Fiber Optic Patch Panels (FOPP) will be mounted in specified 19" communication rack or on the wall (ply wood) of main IT closets.
 - v. FOPP shall be labeled to specify location of other end of fiber.
 - vi. Spare fiber cabling shall be coiled high on the wall.
 - vii. Fiber cabling shall meet standard outdoor cabling requirements.
 - viii. See "Technical Specification for the Installation of Fiber Cabling" for specific fiber cabling installation and termination practices and material.
- c. Fiber (within building)
 - i. Multimode fiber (ISO OM3) shall be installed with a building.
 - ii. The multimode fiber will typically be installed from the main IT communication closet to the intermediate IT communication closets.
 - iii. Fiber terminations shall be SC connectors.
 - iv. Fiber Optic Patch Panels (FOPP) shall be mounted toward the top of specified 19" communication rack.
 - v. FOPP shall be labeled to specify location of other end of fiber.
 - vi. Fiber cabling shall meet standard indoor cabling requirements.
 - vii. See "Technical Specification for the Installation of Fiber Cabling" for specific fiber cabling installation and termination practices and material.
- d. Labeling
 - i. All cables, fiber centers, 66 blocks, and equipment must be labeled with machine made, permanent labels according to current labeling standards.

11. Equipment Racks

- a. At a minimum one standard 19" open equipment rack shall be installed per IT communication closet.

- b. Large communication closets (supporting >48 active network drops) will require a second equipment rack. The two equipment racks shall be placed next to each other (side-by-side).
- c. The minimum distance between front of rack and wall shall be 4'.
- d. The minimum distance between back of rack and wall shall be 4'.
- e. The minimum distance between the side of one rack and wall shall be 4'.
- f. Vertical cable management shall be installed on each side of the equipment racks, including down the middle of two equipment racks sitting side-by-side.
- g. Horizontal cable management should be installed above and below each 24-port patch panel.
- h. Ladder rack shall be installed between equipment rack and wall. At a minimum from the conduit egress to the top of the rack
- i. Equipment rack must be secured at the top with a ladder or other device
- j. Equipment racks shall be bolted to the floor.
- k. Equipment racks shall be grounded.
- e. Acceptance of closet & Installation of Network Equipment
 - a. DTS requires 30 days prior to customer going live to burn in equipment
 - b. Substantial completion is not sufficient unless everything above is completed

Appendix E - DEFINITIONS (Defined Terms)**A**

A/E means Architect and Engineer.

Abutting means to border upon.

Access easement means an easement created for the purpose of providing vehicular or pedestrian access.

ADA Compliant: means that a product is within the regulations set forth by the Americans with Disabilities Act.

Adjacent means near but not necessarily touching.

Aisle means a passageway for vehicles within a parking garage or area, other than a driveway.

Alley means a public right of way not designed for general travel and primarily used as a means of vehicular and pedestrian access to the rear of abutting properties. An alley may or may not be named.

Appurtenances means subordinate but necessary accessory; in plumbing, for instance, the fittings, valves, traps, etc., that are necessary to complete a house drain.

Architect means a person licensed by the Commonwealth of Virginia to practice architecture.

Asphalt concrete means a concrete composition in which asphalt is used as a binder. Asphalt concrete is a material often used for roadway pavement.

Attached Single-Family Dwelling means any building containing exactly two (2) dwelling units. Most commonly refers to the units which are side by side, with a common wall and roof or an apartment on two (2) floors or levels, including duplex or semidetached dwelling.

Arlington County 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 *Registered Design Professional* or other person employed by the County to perform construction services administration, design services, or project oversight.

B

Backfilling means to replace earth, etc., previously excavated, commonly into a trench or pier excavation, around and against a basement foundation.

Base course means the layer of aggregate, oil-treated aggregate, treated soil, or soil-aggregate that rests upon the Subbase or, if no Subbase, upon the sub grade.

Basis of Design (**BOD**) is the documentation of the primary decision-making process and assumptions behind design decisions made to meet the owner's project requirements. The basis of design describes the systems, assemblies, conditions and methods chosen to meet the owner's projects requirements.

Building Automation System

Building Design Standards means the current version of the Arlington County Infrastructure Design and Construction Building Design (Vertical Infrastructure) Standards.

Building Element: Components of a Building, i.e. boilers, Windows, bricks.

Brand Name(s): A word, name, symbol, etc., especially one legally registered as a trademark, used by a manufacturer or merchant to identify its products distinctively from others of the same type and usually prominently displayed on its goods, in advertising, etc.

Brand Name Category: The category of a company, manufacturer or model used as a basis of design by the County to establish specifications of a product or service. There are four categories, 1) Or Equal, 2) Preferred Manufacturer(s), 3) No Substitutions and 4) Not Acceptable.

Brand Name Model: A style or design of a particular product.

Building means a structure that has a roof and walls and stands more or less permanently in one place also includes the term "structure" and "premises".

C

Certified Landscape Architect A Landscape Architect, registered or licensed to practice professional Landscape Architecture, as defined by the statutory requirements of the professional registration laws of the Commonwealth of Virginia and CLARB certification.

Cleanable means the ability for a surface to be restored to near original condition with County approved cleaning products.

Concrete means a hard, strong construction material made by mixing a binder (as portland cement or asphalt) and a mineral aggregate (as sand and gravel) so that the entire mass is bound together and hardened.

Contractor

Construction permit means a written warrant or license issued by Arlington County approving construction-related work within the County limits including: building; demolition; grading; and mechanical.

Conveying Systems means a mechanical system for moving people or goods from one location to another.

County

Curb cut means a depression in the curb for the purpose of accommodating a driveway, which provides vehicular access between private property and the street or easement. Where there is no curb, the point at which the driveway meets the roadway pavement shall be considered the curb cut.

Curb line means the edge of a roadway whether marked by a curb or not. When there is not a curb, the curb line shall be established by the Director of Transportation.

Curb means a physical curb constructed from concrete

D

Design considerations are not requirements, but do present information that is important to consider in the design, construction and maintenance of improvements.

Design criteria means, a set of requirements for the design, construction and maintenance of improvements.

Design standard means a document, or an object for physical comparison, for defining product characteristics, products, or processes, prepared by a consensus of a properly constituted group of those substantially affected by, and having the qualifications to prepare the document for use.

Deviation means variation from something intended or planned.

Dwelling Unit means a room or group of rooms within a dwelling, forming a single habitable unit.

E

Elements are Building elements are major components that are common to most Buildings and that perform a given function regardless of the design specification, construction method, or materials. Building foundations, exterior walls, and lighting are examples of elements.

Excavation means any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

F

False Alarm means activation of alarm systems unnecessarily

Faulty Alarms means activation of alarm systems without human intervention.

Fire Lanes means an area designated by clearly visible signs in which parking shall be prohibited, whether on public or private property, to ensure ready access for and to fire fighting and rescue apparatus, equipment, and facilities.

Foundation means a base where structures such as Buildings, bridges, and light poles are set on.

G

Geotechnical engineer means an engineer with specialized training and knowledge of soils and rocks, employed to do soil investigations, design of structure foundations, and provide field observation.

Grade means the degree of inclination of a road or slope.

Grading means the process of changing the lay of the ground, usually to direct the flow of surface water.

Green Roof is a roof of a building that is partially or completely covered with vegetation and a growing medium, planted over a waterproofing membrane.

Gutter means a trough or dip used for drainage purposes that run along the edge of the street and curb, curb ramp or roof.

H

Reserved

I

Impervious surface means a hard surface area in which the spacing of the particles is such as to permit only extremely slow passage of water. Common impervious surfaces include, but are not limited to, rooftops, walkways, patios, driveways, parking lots, storage areas, concrete or asphalt paving, and gravel roads.

Invitation to Bid

J/K

Reserved

L

Landscape Architect means a person licensed by the Commonwealth of Virginia to practice landscape architecture.

Landscape Industry Certified Technician – Exterior (CLT-E)

LEED (Leadership in Energy and Environmental Design) is a green Building rating system developed by the US Green Building Council. The system helps guide the project team to design and construct environmentally responsible projects. More information at www.usgbc.org

M

MEP Mechanical, Electrical, Plumbing

N

Reserved

O

Obstacle/s means concentration of materials or objects placed in such a manner or circumstance that they obstruct or hinder fire and emergency personnel

Occupancy means the purpose for which a building or portion thereof is utilized or occupied.

Occupant means a person who occupies or is physically located in or on a place, structure or a position; an owner or tenant of a property.

Operations Procedure Manual means a manual that describes the various components and procedures for operating all fire protection equipment and/or systems in a Building, structure, or premises.

Owner's Project Requirements (**OPR**) means the County's written documentation of the functional requirements of the facility and the expectations of how it will be used and operated.

P

Portland cement means hydraulic cement produced by pulverizing clinker consisting essentially of hydraulic calcium silicates, usually containing one or more of the forms of calcium sulfate as an inter-ground addition.

Portland cement concrete means a mixture of water, portland cement, fine aggregate, and coarse aggregate combined into a solid mass as a result of chemical reaction between cement and water.

Professional engineer means a person licensed by the Commonwealth of Virginia to practice engineering.

Q

Reserved

R

Registered Design Professional: An architect or engineer, registered or licensed to practice professional architecture or engineering, as defined by the statutory requirements of the professional registration laws of the Commonwealth of Virginia.

Right of way means a strip of land platted, dedicated, condemned, established by prescription or otherwise legally established for the use of pedestrians, vehicles or utilities.

Roadway means that portion of a street improved, designed, or ordinarily used for vehicular travel and parking, exclusive of the sidewalk or shoulder. Where there are curbs, the roadway is the curb to curb width of the street.

S

Sewer means a pipe or conduit for carrying sewage and other waste liquids excluding hazardous materials. This includes sanitary sewer, side sewer, and combined sewer.

Shoring means support system that provides support to an adjacent structure, underground installation, or the sides of an excavation.

Specification mean written technical descriptions of materials, equipment, construction systems, and workmanship that, in conjunction with the drawings, detail the requirements for acceptable completion of the work.

Stacked Unit means any type of R-3 or R-5 structure (one and two family dwelling units) containing two (2) or more dwelling units where each dwelling unit has an independent means of egress and the dwelling units are arranged one above the other, either partially or totally.

Standard means a document that shows frequently recurring components of work that have been standardized for use by various departments within the County.

Structure means anything constructed or erected on the ground or any improvement built up or composed of parts joined together in some definite manner and affixed to the ground, including fences, walls and signs, but not including poles, flowerbed frames and such minor incidental improvements.

Subsurface Structure means structures such as underground parking garages, subway stations, railroad tunnels including rapid rail transit tunnels, and highway tunnels.

Supplier

T

Townhouse/s means one (1) of a series of three (3) or more attached similar dwelling units or structures, generally having two (2) or more floors, separated by common party walls without openings extending from basement to roof.

Transportation Division means the Arlington County Division of Transportation.

U/V

Reserved

W

Water Main means a water supply pipe for public or community use.

XYZ

Reserved

Appendix F - PUBLICATION IMPROVEMENT REQUEST

Submit to: County Standards Engineer Department of Environmental Services 1400 N Uhle St, Suite 403 Arlington, VA 22201	DEPARTMENT OF ENVIRONMENTAL SERVICES COUNTY STANDARDS PUBLICATION IMPROVEMENT REQUEST FORM	OFFICIAL USE: Request No. _____ Standards Team Action. _____ Standards Committee Action. _____	
Title of Manual Affected		Manual Version & Revision Date	
Chapter Number	Section Number	Heading Title	Page Number(s)
This change is a(n) <input type="checkbox"/> Addition <input type="checkbox"/> Deletion <input type="checkbox"/> Revision			
Proposed Changes (attach an example or additional sheets if needed)			
Explain why the change is needed.			
Does this change affect other portions of the manual? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Please list chapter number, section number, heading title and page number of affected portions.			
Chapter Number	Section Number	Heading Title	Page Number
This change affects a picture, figure or standard drawing in the manual. <input type="checkbox"/> Yes <input type="checkbox"/> No			
Please list chapter number, section number, heading title and page number of affected picture, figure or standard drawing			
Chapter Number	Section Number	Heading Title	Page Number
Submitted By:	Title:	Department/Division/Bureau:	Date:
Address:			Phone No:
OFFICIAL USE: To Be Completed by County Standards Engineer			
<input type="checkbox"/> Approved <input type="checkbox"/> Disapproved	Standard Engineer's Signature:		Date:

Appendix G - BRAND NAME JUSTIFICATIONS (Warren)

Determination to Solicit From a Single Source(s)

The Arlington County Purchasing Officer the has determined that only sources to be reasonably available for the procurement of the following Building Components based on the justifications described in **Table G** acceptable and complies with brand name criteria.

Richard D. Warren. Jr. CPPB  2/27/15
 Purchasing Agent Date

Table G Brand Name Justifications		
Building Element	Brand Name(s)	Justification
Automatic Transfer Switch	Asco, Caterpillar, Cutler HammerOnan/Cummins & Russell Electric	These brands installed in 70% of County Buildings with standby power including, but not limited to, all Mission Critical Facilities. The selection of automatic transfer switches has to be specific to ensure the transfer of electrical power from normal to Generator (open, delayed or closed transition) is completed as seamlessly as possible to ensure clean, uninterruptible and reliable power is delivered. Standardization has led to: 1) Readily available replacements parts for seamless and reliable operation during outages, 2) Uniform inventory of parts that are quickly available without delay, 3) County staff trained on systems and 4) Proven reliability.
Chillers	Carrier, Climacool, McQuay, MultiStack, Trane and York	These brands installed in 50% of Arlington County’s Buildings with chilled water piping. The brand names in the remaining Buildings are being phased out due to past issues with poor performance and it is the County’s intent to consider newer and better models from other manufacturers from York, MultiStack and McQuay. These systems are compatible with our Building Automation System providers including the BACnet system (open source) protocols. Standardization has led to: 1) Readily available replacement parts for seamless and reliable operation during outages, 2) Uniform inventory of

<p align="center">Table G Brand Name Justifications</p>		
Building Element	Brand Name(s)	Justification
		parts that are quickly available without delay, 3) County staff trained on systems and 4) Proven reliability.
Condensing Boilers (Hydronic Heating Water)	Aerco, Triangle Tube Viessmann and Weil-McLain	The acceptable brands are installed in eleven (11) of the County’s thirty-two (32) Buildings with hydronic heating and that are maintained by the Facilities Management Bureau (FMB). Standardizing our heating water boilers has led to: 1) better pricing for replacement parts and maintenance contracts through economy of scale, 2) limiting the on-hand inventory needed, and 3) reduction in training requirements for maintenance staff. The acceptable brands have generally been installed in the County’s facilities through one-for-one replacements as a part of the County’s capital improvement program.
Cooling Towers	Baltimore Aircoil, Evapco and Marley	These brands are installed in 100% of Arlington County’s Buildings with condenser water piping. These systems are compatible with our Building Automation System providers including the BACnet system (open source) protocols. Standardization has led to: 1) Readily available replacements parts for seamless and reliable operation during outages, 2) Uniform inventory of parts, 3) County staff trained on systems and 4) Proven reliability.
Electronic Access Control	The Andover Continuum	This brand is installed and maintained in thirty-five (35) of the County’s facilities (all having such systems). Standardizing this equipment has led to: 1) better pricing for parts and maintenance contracts through economy of scale, 2) limiting the on-hand inventory need, and 3) reduction in training requirements for staff. The brand has been installed in County facilities through one-for-one replacements and new construction/renovations.
Faucets	American Standard, Kohler and Moen	These brands are installed in 75% of Arlington County’s 2 million square feet of Building inventory and meet the requirements of EPA Water Sense Standards. Standardization has led to: 1) Readily available replacements parts 2) Uniform inventory of parts 3) County staff trained on

<p align="center">Table G Brand Name Justifications</p>		
Building Element	Brand Name(s)	Justification
		systems and 4) Proven reliability
Fire Alarm Systems	Edwards, Firelite, Notifier and Silent Knight	These brands are installed and maintained in sixty-six (66) of the County’s facilities (all having such systems). Standardizing this equipment has led to: 1) better pricing for parts and maintenance contracts through economy of scale, 2) limiting the on-hand inventory need, and 3) reduction in training requirements for staff. The brand has been installed in County facilities through one-for-one replacements and new construction/renovations.
Fire System Diesel Exhaust	Plymovent	This brand is installed and maintained in all of the County’s firehouses (all having such systems). Standardizing this equipment has led to: 1) better pricing for parts and maintenance contracts through economy of scale, 2) limiting the on-hand inventory need, and 3) reduction in training requirements for staff. The brand has been installed in County facilities through one-for-one replacements and new construction/renovations.
Flush Valves	Sloan and Zurn	These brands are installed in most of Arlington County’s 2 million square foot of Building inventory and meet the water efficiency requirements for urinals and water closets. Automatic Flush Valves shall be Sloan only. Standardization has led to: 1) Readily available replacements parts for seamless and reliable operation during outages, 2) Uniform inventory of parts, 3) County staff trained on systems, 4) Proven reliability and 5) User friendliness.
Intrusion Detection Systems	Bosch Radionics	This brand is installed and maintained in fifty-five (55) of the County’s facilities (all facilities having such systems). Standardizing this equipment has led to: 1) better pricing for parts and maintenance contracts through economy of scale, 2) limiting the on-hand inventory needed, and 3) reduction in training requirements for staff. The brand has been installed in County facilities through one-for-one replacements and new construction/renovations.
Locksets	Corbin <i>CL3300 Series</i> <i>Keyway 4L</i>	Standardizing our locksets has led to: 1) better pricing for replacement parts and maintenance contracts through economy of scale, 2) limiting the

<p align="center">Table G Brand Name Justifications</p>		
Building Element	Brand Name(s)	Justification
	Schlage <i>D Series C</i> <i>Keyway</i>	on-hand inventory needed with readily available replacements parts, 3) reduction in training requirements for maintenance staff, 4) known past performance and proven reliability and 5) Uniform inventory of parts and keys. The acceptable brands have generally been installed in the County’s facilities through one-for-one replacements as a part of the County’s capital improvement program.
Main Distribution Panels, sub-panels and disconnects	Cutler Hammer, Siemens, and Square D	Cutler Hammer, Siemens, and Square D installed across the County’s inventory of Buildings due to long lasting quality, reliability, maintenance free quality, and readily available replacement parts. Added to this that our maintenance staff is familiar and knowledgeable with these products.
Motor Control Centers	General Electric, Siemens and Square D	General Electric, Siemens and Square D installed across the County due to long lasting quality, reliability, maintenance free quality, and readily available replacement parts. Added to this that our maintenance staff is familiar and knowledgeable in these products.
Network/Digital Video Recorders	Pelco	This brand installed and maintained in twenty-two (22) of the County’s facilities (all facilities having such systems outside of the Justice Center). Standardizing this equipment has led to: 1) better pricing for parts and maintenance contracts through economy of scale, 2) limiting the on-hand inventory needed, and 3) reduction in training requirements for staff. The brand installed in County facilities through one-for-one replacements and new construction/renovations.
Rooftop Units	AAON, Carrier, McQuay and Trane	AAON, Carrier, McQuay and Trane installed in over 80% of the County Facilities due to long lasting quality, reliability, readily available replacement parts and on-call PM contractors who provide post-installation maintenance and repair services. These systems are compatible with our Building Automation System providers including the BACnet system (open source) protocols. Added to this, our maintenance staff are familiar and knowledgeable in these products.

Table G Brand Name Justifications		
Building Element	Brand Name(s)	Justification
Variable Refrigerant Volume (VRV)/Variable Refrigerant Flow (VRF) Systems	Daikin, LG, and Mitsubishi	These brands installed in two County Buildings, Homeless Services Center and the Equipment Bureau and there is a growing demand for this product. Arlington County is evaluating this new technology for its changing space needs. VRF/VRV systems are easy to maintain, modular and lightweight that facilitates faster installation and ease of maintenance. As this is a relatively new technology, there is a small pool of manufacturers who provide reliable products and good after-market service. Standardization will lead to; 1) Readily available replacements parts, 2) Uniform inventory of parts, 3) County staff trained on systems and 4) Proven reliability.
Waterless Urinals	Waterless Co. Inc. (porcelain type)	This brand installed in various County office Buildings. In the future, our intent is to install this product in new Buildings and major renovations in Buildings built after 1980 only. In our opinion, there is no competing product in the market for a similar product. Standardization has led to: 1) Readily available replacements parts, 2) Uniform inventory of parts, 3) County staff and fire station personnel trained on proper maintenance, and 4) Proven reliability.

Appendix H - BRAND NAME JUSTIFICATIONS (Turner)

Determination to Solicit From a Single Source(s)

The Arlington County Purchasing Officer has determined that only sources to be reasonably available for the procurement of the following Building Components based on the justifications described in **Table H** acceptable and complies with brand name criteria.

Bradley J. Turner



April 2, 2015

Acting Purchasing Agent

Date



<p align="center">Table H - BRAND NAME JUSTIFICATIONS (Turner)</p>		
Building Element	Brand Name	Justification
Building Automation Systems (BAS)	Siemens	Siemens installed in 50% of the County’s two million square foot inventory that are maintained by the Facilities Management Bureau (FMB). County Buildings supported by Siemens not only represent the largest square footage percentage but are also the most prominent Buildings in the County’s portfolio. Standardizing our Building Automation System (BAS) has led to: 1) better pricing for replacement parts and maintenance contracts through economy of scale, 2) limiting the on-hand inventory needed, and 3) reduction in training requirements for maintenance staff. The acceptable brands installed in the County’s facilities through competitive bidding generally in new construction or renovation in accordance with A & E specifications. The County has moved FMB’s BAS servers to the County’s Network Operations Center (NOC) and Department of Technology Services (DTS) The BAS vendor is responsible for the maintenance. There are new requirements that DTS has in place regarding security patches that Microsoft issues every month and that DTS implements on the third Sunday of every month. This requires the BAS vendor to review the patches for any possible conflict with their application. Since the implementation is on a Sunday, DTS creates a snapshot prior to applying the patches to the production environment. This requires FMB staff to check the systems

<p align="center">Table H - BRAND NAME JUSTIFICATIONS (Turner)</p>		
Building Element	Brand Name	Justification
		<p>for possible operating conflicts between 12 noon and 3 pm and report to DTS any problems or if the security patch is acceptable. If there is an issue FMB requires the involvement of the BAS vendor to help identify the problem and possible correction.</p> <p>Siemens is the only acceptable BAS vendor that provides 24/7 technical support.</p>
Emergency Standby Generator	Caterpillar, Kohler, MTU & Onan/Cummins	<p>These brands installed in 37% of Arlington County’s Buildings. The brand names in the remaining Buildings are being phased out due to past issues with poor performance and it is the County’s intent to consider newer and better models from other manufacturers, which include Caterpillar, Kohler, MTU & Onan/Cummins. Standardization has led to: 1) Readily available replacement parts for seamless and reliable operation during outages, 2) Uniform inventory of parts that are quickly available immediately, 3) County staff trained on system and 4) Proven reliability. All the above has minimized maintenance costs.</p>
Water Coolers	Elkay, Halsey & Taylor®	<p>These brands are installed in most of Arlington County’s 2 million square foot of Building inventory. Standardization has led to: 1) Readily available replacements parts for seamless and reliable operation during outages, 2) Uniform inventory of parts, 3) County staff trained on systems, 4) Proven reliability and 5) User friendliness.</p>

Appendix I - BRAND NAME JUSTIFICATIONS (Bevis)

Determination to Solicit From a Single Source(s)

The Arlington County Purchasing Officer the has determined that only sources to be reasonably available for the procurement of the following Building Element based on the justifications described in Table I acceptable and complies with Brand Name(s) criteria.

 Michael E. Bevis, JD Date
 CPPD, CPSM, C.P.M., PMP
 Purchasing Agent

Table I - BRAND NAME JUSTIFICATIONS (Bevis)		
Building Element	Brand Name	Justification
Fire Station Alerting System	First-In Systems by Westnet®, Inc.	The First-In Systems by Westnet®, Inc. Alerting System is unique in that the system is the only system on the market with a Dorm Remote. The Dorm Remote provides programmable, company-specific bedside alerting that include energy efficient LED lighting that has proven to minimize emergency response time and enhanced the firefighters' safe response within the fire station by means of a low level lighting system, which reduces eyestrain and night blindness while permitting safe journey to the response vehicle. The Dorm Remote also provides firefighters with the ability to program his or her specific assignment information from the front panel of the Dorm Remote, so that only firefighters needed on the call alerted. The County's First-In Alerting Systems current contract for warranty and maintenance is with First-In Systems by Westnet®, Inc.. This Contract started in 2005. This brand installed and maintained in all of the County's firehouses (all having such systems). Standardizing this equipment has led to: 1) better pricing for parts and maintenance contracts through economy of scale, 2) limiting the on-hand inventory need, and 3) reduction in training requirements for staff. The brand installed in County facilities through one-for-one replacements and new construction/renovations.
Flush Valves – Automatic	Sloan	This brand installed in most of Arlington County's 2 million square foot of building inventory. Standardization has led to: 1) Readily available replacements parts for seamless and reliable operation during outages, 2) Uniform

<p align="center">Table I - BRAND NAME JUSTIFICATIONS (Bevis)</p>		
<i>Building Element</i>	Brand Name	Justification
		inventory of parts, 3) County staff trained on systems, 4) Proven reliability and 5) User friendliness.
Key Box	KNOX-BOX®	In accordance with Chapter 8 of the Code of the County of Arlington, Section 506.1, a Key Box is required in an accessible location when access to or within a facility is difficult due to security. The Fire Department Key Box allows keys unique to each facility to be stored within Key Box allowing responding Fire Department personnel rapid entry into the building during emergency dispatches without forced entry or damage to the facility. The KNOX-BOX® is the recognized Key Box by the Arlington County Fire Department. The Arlington County Fire Department started using the Knox system in 2005. In the past 10 years numerous Key Box’s installed throughout the county. These devices have allowed our Fire Department Crews rapid entry into various Buildings, gated communities, and other locked facilities. A mix of Brand Name Key Box’s not recommended due to the necessity to issue keys to the Fire Department for each Brand Name's Key Box system. The use of non-KNOX-BOX®’s Key Boxes will delay fire protection capabilities upon response and therefore endanger life and property. The requirement for a KNOX-BOX® Key Box ensures rapid response without forced entry into the Building. To use a different Brand Name Key Box will necessitate a change of thousands of key switches, locks and keys and could result in the delay of emergency aid to an incident.
Water Closets	American Standard, Kohler, Moen & Toto	These brands are installed in most of Arlington County’s 2 million square foot of Building inventory and meet the water efficiency requirements water closets. Standardization has led to: 1) Readily available replacements parts for seamless and reliable operation during outages, 2) Uniform inventory of parts, 3) County staff trained on systems, 4) Proven reliability and 5) User friendliness. A Supplier may provide any one of the Brand Name(s) listed.

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DEPARTMENT OF ENVIRONMENTAL SERVICES
FACILITIES AND ENGINEERING
FACILITIES DESIGN AND CONSTRUCTION
1400 N. Uhle Street, Suite 403 Arlington, VA 22201



CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

11/4/2019

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Insurance Associates, a Marsh & McLennan Agency LLC company One Church Street, Suite 500 Rockville MD 20850	CONTACT NAME: Shannon L. Batson PHONE (A/C. No. Ext): 301-838-9400 E-MAIL ADDRESS: sbatson@insassoc.com		FAX (A/C. No): 301-838-9095													
	<table border="1"> <thead> <tr> <th>INSURER(S) AFFORDING COVERAGE</th> <th>NAIC #</th> </tr> </thead> <tbody> <tr> <td>INSURER A : Phoenix Insurance Company</td> <td>25623</td> </tr> <tr> <td>INSURER B : Travelers Prop Cas of America</td> <td>25674</td> </tr> <tr> <td>INSURER C : Charter Oak Fire Insurance Co.</td> <td>25615</td> </tr> <tr> <td>INSURER D : Continental Casualty Company</td> <td>20443</td> </tr> <tr> <td>INSURER E : Pacific Insurance Company, Ltd</td> <td>37338</td> </tr> <tr> <td>INSURER F : Travelers Indemnity Co.</td> <td>25658</td> </tr> </tbody> </table>			INSURER(S) AFFORDING COVERAGE	NAIC #	INSURER A : Phoenix Insurance Company	25623	INSURER B : Travelers Prop Cas of America	25674	INSURER C : Charter Oak Fire Insurance Co.	25615	INSURER D : Continental Casualty Company	20443	INSURER E : Pacific Insurance Company, Ltd	37338	INSURER F : Travelers Indemnity Co.
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INSURED MCN Build, Inc. 1214 28th St NW Washington DC 20007	MCNBUIL-01															

COVERAGES

CERTIFICATE NUMBER: 592003771

REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
A	<input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR <input checked="" type="checkbox"/> Contractual Liab GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input checked="" type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC <input type="checkbox"/> OTHER:	Y	Y	CO4N042844	6/8/2019	6/8/2020	EACH OCCURRENCE \$ 1,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 300,000 MED EXP (Any one person) \$ 5,000 PERSONAL & ADV INJURY \$ 1,000,000 GENERAL AGGREGATE \$ 2,000,000 PRODUCTS - COMP/OP AGG \$ 2,000,000 \$
F	<input checked="" type="checkbox"/> AUTOMOBILE LIABILITY <input type="checkbox"/> ANY AUTO <input type="checkbox"/> ALL OWNED AUTOS <input type="checkbox"/> HIRED AUTOS <input type="checkbox"/> SCHEDULED AUTOS <input type="checkbox"/> NON-OWNED AUTOS	Y	Y	BA6N380251	6/8/2019	6/8/2020	COMBINED SINGLE LIMIT (Ea accident) \$ 1,000,000 BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$ \$
B	<input checked="" type="checkbox"/> UMBRELLA LIAB <input checked="" type="checkbox"/> OCCUR <input type="checkbox"/> EXCESS LIAB <input type="checkbox"/> CLAIMS-MADE <input type="checkbox"/> DED <input checked="" type="checkbox"/> RETENTION \$ 10,000	Y	Y	CUP6N25363	6/8/2019	6/8/2020	EACH OCCURRENCE \$ 25,000,000 AGGREGATE \$ 25,000,000 (Excess of GL/AL/EL) \$
C	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y/N N	N/A	UB006N50832A	6/8/2019	6/8/2020	<input checked="" type="checkbox"/> PER STATUTE <input type="checkbox"/> OTHER E.L. EACH ACCIDENT \$ 1,000,000 E.L. DISEASE - EA EMPLOYEE \$ 1,000,000 E.L. DISEASE - POLICY LIMIT \$ 1,000,000
D E E	Excess Liability (XS of 25M) Professional Liability Pollution Liability			FFX6078651961 42CPINL9193 42CPINL9193	6/8/2019 6/8/2019 6/8/2019	6/8/2020 6/8/2020 6/8/2020	Occurrence/Aggregate \$23,000,000 Ea Professional Claim \$10,000,000 Ea Pollution Incident \$10,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

RE: Contract No. 19-219-RFP: Construction Manager At Risk Services - Fire Station No. 8 - Rebuild

Arlington County, Virginia; County Board of Arlington County, Virginia and its officers, elected and appointed officials, employees, and agents are included as Additional Insureds on a primary and non-contributory basis, if required by written contract and in accordance with the terms and conditions of the policies (endorsement forms attached). Waiver of subrogation applies in favor of the Additional Insureds, if required by written contract and in accordance with the terms and conditions of the policies. Attached forms: CGD604, CAT474, CAT353, EU0001, WC000313, ILT405.

CERTIFICATE HOLDER**CANCELLATION**

Arlington County, Virginia
 Office of the Purchasing Agent
 2100 Clarendon Blvd, Suite 500
 Arlington VA 22201

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

**BLANKET ADDITIONAL INSURED – AUTOMATIC STATUS
IF REQUIRED BY WRITTEN CONTRACT
(CONTRACTORS)**

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

1. The following is added to SECTION II – WHO IS AN INSURED:

Any person or organization that:

- a. You agree in a "written contract requiring insurance" to include as an additional insured on this Coverage Part; and
- b. Has not been added as an additional insured for the same project by attachment of an endorsement under this Coverage Part which includes such person or organization in the endorsement's schedule;

is an insured, but:

- a. Only with respect to liability for "bodily injury", "property damage" or "personal injury"; and
- b. Only as described in Paragraph (1), (2) or (3) below, whichever applies:

(1) If the "written contract requiring insurance" specifically requires you to provide additional insured coverage to that person or organization by the use of:

- (a) The Additional Insured – Owners, Lessees or Contractors – (Form B) endorsement CG 20 10 11 85; or
- (b) Either or both of the following: the Additional Insured – Owners, Lessees or Contractors – Scheduled Person Or Organization endorsement CG 20 10 10 01, or the Additional Insured – Owners, Lessees or Contractors – Completed Operations endorsement CG 20 37 10 01;

the person or organization is an additional insured only if the injury or damage arises out of "your work" to which the "written contract requiring insurance" applies;

(2) If the "written contract requiring insurance" specifically requires you to provide additional insured coverage to that person or organization by the use of:

(a) The Additional Insured – Owners, Lessees or Contractors – Scheduled Person or Organization endorsement CG 20 10 07 04 or CG 20 10 04 13, the Additional Insured – Owners, Lessees or Contractors – Completed Operations endorsement CG 20 37 07 04 or CG 20 37 04 13, or both of such endorsements with either of those edition dates; or

(b) Either or both of the following: the Additional Insured – Owners, Lessees or Contractors – Scheduled Person Or Organization endorsement CG 20 10, or the Additional Insured – Owners, Lessees or Contractors – Completed Operations endorsement CG 20 37, without an edition date of such endorsement specified;

the person or organization is an additional insured only if the injury or damage is caused, in whole or in part, by acts or omissions of you or your subcontractor in the performance of "your work" to which the "written contract requiring insurance" applies; or

(3) If neither Paragraph (1) nor (2) above applies:

(a) The person or organization is an additional insured only if, and to the extent that, the injury or damage is caused by acts or omissions of you or your subcontractor in the performance of "your work" to which the "written contract requiring insurance" applies; and

(b) The person or organization does not qualify as an additional insured with respect to the independent acts or omissions of such person or organization.

COMMERCIAL GENERAL LIABILITY

2. The insurance provided to the additional insured by this endorsement is limited as follows:
 - a. If the Limits of Insurance of this Coverage Part shown in the Declarations exceed the minimum limits of liability required by the "written contract requiring insurance", the insurance provided to the additional insured will be limited to such minimum required limits of liability. For the purposes of determining whether this limitation applies, the minimum limits of liability required by the "written contract requiring insurance" will be considered to include the minimum limits of liability of any Umbrella or Excess liability coverage required for the additional insured by that "written contract requiring insurance". This endorsement will not increase the limits of insurance described in Section III – Limits Of Insurance.
 - b. The insurance provided to the additional insured does not apply to "bodily injury", "property damage" or "personal injury" arising out of the rendering of, or failure to render, any professional architectural, engineering or surveying services, including:
 - (1) The preparing, approving, or failing to prepare or approve, maps, shop drawings, opinions, reports, surveys, field orders or change orders, or the preparing, approving, or failing to prepare or approve, drawings and specifications; and
 - (2) Supervisory, inspection, architectural or engineering activities.
 - c. The insurance provided to the additional insured does not apply to "bodily injury" or "property damage" caused by "your work" and included in the "products-completed operations hazard" unless the "written contract requiring insurance" specifically requires you to provide such coverage for that additional insured during the policy period.
3. The insurance provided to the additional insured by this endorsement is excess over any valid and collectible other insurance, whether primary, excess, contingent or on any other basis, that is available to the additional insured. However, if the "written contract requiring insurance" specifically requires that this insurance apply on a primary basis or a primary and non-contributory basis, this insurance is primary to other insurance available to the additional insured under which that person or organization qualifies as a named insured, and we will not share with that other insurance. But the insurance provided to the additional insured by this endorsement still is excess over any valid and collectible other insurance, whether primary, excess, contingent or on any other basis, that is available to the additional insured when that person or organization is an additional insured, or is any other insured that does not qualify as a named insured, under such other insurance.
4. As a condition of coverage provided to the additional insured by this endorsement:
 - a. The additional insured must give us written notice as soon as practicable of an "occurrence" or an offense which may result in a claim. To the extent possible, such notice should include:
 - (1) How, when and where the "occurrence" or offense took place;
 - (2) The names and addresses of any injured persons and witnesses; and
 - (3) The nature and location of any injury or damage arising out of the "occurrence" or offense.
 - b. If a claim is made or "suit" is brought against the additional insured, the additional insured must:
 - (1) Immediately record the specifics of the claim or "suit" and the date received; and
 - (2) Notify us as soon as practicable.The additional insured must see to it that we receive written notice of the claim or "suit" as soon as practicable.
 - c. The additional insured must immediately send us copies of all legal papers received in connection with the claim or "suit", cooperate with us in the investigation or settlement of the claim or defense against the "suit", and otherwise comply with all policy conditions.
 - d. The additional insured must tender the defense and indemnity of any claim or "suit" to any provider of other insurance which would cover the additional insured for a loss we cover under this endorsement. However, this condition does not affect whether the insurance provided to the additional insured by this endorsement is primary to other insurance available to the additional insured which covers that person or organization as a named insured as described in Paragraph 3. above.
5. The following is added to the **DEFINITIONS** Section:

"Written contract requiring insurance" means that part of any written contract or agreement under which you are required to include a person or or-

COMMERCIAL GENERAL LIABILITY

ganization as an additional insured on this Coverage Part, provided that the "bodily injury" and "property damage" occurs, and the "personal injury" is caused by an offense committed, during the policy period and:

- a. After the signing and execution of the contract or agreement by you; and
- b. While that part of the contract or agreement is in effect.

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

BUSINESS AUTO EXTENSION ENDORSEMENT

This endorsement modifies insurance provided under the following:

BUSINESS AUTO COVERAGE FORM

GENERAL DESCRIPTION OF COVERAGE – This endorsement broadens coverage. However, coverage for any injury, damage or medical expenses described in any of the provisions of this endorsement may be excluded or limited by another endorsement to the Coverage Part, and these coverage broadening provisions do not apply to the extent that coverage is excluded or limited by such an endorsement. The following listing is a general coverage description only. Limitations and exclusions may apply to these coverages. Read all the provisions of this endorsement and the rest of your policy carefully to determine rights, duties, and what is and is not covered.

- | | |
|---|---|
| <ul style="list-style-type: none"> A. BROAD FORM NAMED INSURED B. BLANKET ADDITIONAL INSURED C. EMPLOYEE HIRED AUTO D. EMPLOYEES AS INSURED E. SUPPLEMENTARY PAYMENTS – INCREASED LIMITS F. HIRED AUTO – LIMITED WORLDWIDE COVERAGE – INDEMNITY BASIS G. WAIVER OF DEDUCTIBLE – GLASS | <ul style="list-style-type: none"> H. HIRED AUTO PHYSICAL DAMAGE – LOSS OF USE – INCREASED LIMIT I. PHYSICAL DAMAGE – TRANSPORTATION EXPENSES – INCREASED LIMIT J. PERSONAL PROPERTY K. AIRBAGS L. NOTICE AND KNOWLEDGE OF ACCIDENT OR LOSS M. BLANKET WAIVER OF SUBROGATION N. UNINTENTIONAL ERRORS OR OMISSIONS |
|---|---|

PROVISIONS

A. BROAD FORM NAMED INSURED

The following is added to Paragraph A.1., **Who Is An Insured**, of **SECTION II – COVERED AUTOS LIABILITY COVERAGE**:

Any organization you newly acquire or form during the policy period over which you maintain 50% or more ownership interest and that is not separately insured for Business Auto Coverage. Coverage under this provision is afforded only until the 180th day after you acquire or form the organization or the end of the policy period, whichever is earlier.

B. BLANKET ADDITIONAL INSURED

The following is added to Paragraph c. in A.1., **Who Is An Insured**, of **SECTION II – COVERED AUTOS LIABILITY COVERAGE**:

Any person or organization who is required under a written contract or agreement between you and that person or organization, that is signed and executed by you before the "bodily injury" or "property damage" occurs and that is in effect during the policy period, to be named as an additional insured is an "insured" for Covered Autos Liability Coverage, but only for damages to which

this insurance applies and only to the extent that person or organization qualifies as an "insured" under the **Who Is An Insured** provision contained in Section II.

C. EMPLOYEE HIRED AUTO

1. The following is added to Paragraph A.1., **Who Is An Insured**, of **SECTION II – COVERED AUTOS LIABILITY COVERAGE**:

An "employee" of yours is an "insured" while operating an "auto" hired or rented under a contract or agreement in an "employee's" name, with your permission, while performing duties related to the conduct of your business.

2. The following replaces Paragraph b. in B.5., **Other Insurance**, of **SECTION IV – BUSINESS AUTO CONDITIONS**:

b. For Hired Auto Physical Damage Coverage, the following are deemed to be covered "autos" you own:

- (1) Any covered "auto" you lease, hire, rent or borrow; and
- (2) Any covered "auto" hired or rented by your "employee" under a contract in an "employee's" name, with your

permission, while performing duties related to the conduct of your business.

However, any "auto" that is leased, hired, rented or borrowed with a driver is not a covered "auto".

D. EMPLOYEES AS INSURED

The following is added to Paragraph A.1., **Who Is An Insured**, of **SECTION II – COVERED AUTOS LIABILITY COVERAGE**:

Any "employee" of yours is an "insured" while using a covered "auto" you don't own, hire or borrow in your business or your personal affairs.

E. SUPPLEMENTARY PAYMENTS – INCREASED LIMITS

1. The following replaces Paragraph A.2.a.(2), of **SECTION II – COVERED AUTOS LIABILITY COVERAGE**:

(2) Up to \$3,000 for cost of bail bonds (including bonds for related traffic law violations) required because of an "accident" we cover. We do not have to furnish these bonds.

2. The following replaces Paragraph A.2.a.(4), of **SECTION II – COVERED AUTOS LIABILITY COVERAGE**:

(4) All reasonable expenses incurred by the "insured" at our request, including actual loss of earnings up to \$500 a day because of time off from work.

F. HIRED AUTO – LIMITED WORLDWIDE COVERAGE – INDEMNITY BASIS

The following replaces Subparagraph (5) in Paragraph B.7., **Policy Period, Coverage Territory**, of **SECTION IV – BUSINESS AUTO CONDITIONS**:

(5) Anywhere in the world, except any country or jurisdiction while any trade sanction, embargo, or similar regulation imposed by the United States of America applies to and prohibits the transaction of business with or within such country or jurisdiction, for Covered Autos Liability Coverage for any covered "auto" that you lease, hire, rent or borrow without a driver for a period of 30 days or less and that is not an "auto" you lease, hire, rent or borrow from any of your "employees", partners (if you are a partnership), members (if you are a limited liability company) or members of their households.

(a) With respect to any claim made or "suit" brought outside the United States of America, the territories and possessions of the United States of America, Puerto Rico and Canada:

(i) You must arrange to defend the "insured" against, and investigate or settle any such claim or "suit" and keep us advised of all proceedings and actions.

(ii) Neither you nor any other involved "insured" will make any settlement without our consent.

(iii) We may, at our discretion, participate in defending the "insured" against, or in the settlement of, any claim or "suit".

(iv) We will reimburse the "insured" for sums that the "insured" legally must pay as damages because of "bodily injury" or "property damage" to which this insurance applies, that the "insured" pays with our consent, but only up to the limit described in Paragraph C., **Limits Of Insurance**, of **SECTION II – COVERED AUTOS LIABILITY COVERAGE**.

(v) We will reimburse the "insured" for the reasonable expenses incurred with our consent for your investigation of such claims and your defense of the "insured" against any such "suit", but only up to and included within the limit described in Paragraph C., **Limits Of Insurance**, of **SECTION II – COVERED AUTOS LIABILITY COVERAGE**, and not in addition to such limit. Our duty to make such payments ends when we have used up the applicable limit of insurance in payments for damages, settlements or defense expenses.

(b) This insurance is excess over any valid and collectible other insurance available to the "insured" whether primary, excess, contingent or on any other basis.

(c) This insurance is not a substitute for required or compulsory insurance in any country outside the United States, its territories and possessions, Puerto Rico and Canada.

You agree to maintain all required or compulsory insurance in any such country up to the minimum limits required by local law. Your failure to comply with compulsory insurance requirements will not invalidate the coverage afforded by this policy, but we will only be liable to the same extent we would have been liable had you complied with the compulsory insurance requirements.

- (d) It is understood that we are not an admitted or authorized insurer outside the United States of America, its territories and possessions, Puerto Rico and Canada. We assume no responsibility for the furnishing of certificates of insurance, or for compliance in any way with the laws of other countries relating to insurance.

G. WAIVER OF DEDUCTIBLE – GLASS

The following is added to Paragraph D., **Deductible**, of **SECTION III – PHYSICAL DAMAGE COVERAGE**:

No deductible for a covered "auto" will apply to glass damage if the glass is repaired rather than replaced.

H. HIRED AUTO PHYSICAL DAMAGE – LOSS OF USE – INCREASED LIMIT

The following replaces the last sentence of Paragraph A.4.b., **Loss Of Use Expenses**, of **SECTION III – PHYSICAL DAMAGE COVERAGE**:

However, the most we will pay for any expenses for loss of use is \$65 per day, to a maximum of \$750 for any one "accident".

I. PHYSICAL DAMAGE – TRANSPORTATION EXPENSES – INCREASED LIMIT

The following replaces the first sentence in Paragraph A.4.a., **Transportation Expenses**, of **SECTION III – PHYSICAL DAMAGE COVERAGE**:

We will pay up to \$50 per day to a maximum of \$1,500 for temporary transportation expense incurred by you because of the total theft of a covered "auto" of the private passenger type.

J. PERSONAL PROPERTY

The following is added to Paragraph A.4., **Coverage Extensions**, of **SECTION III – PHYSICAL DAMAGE COVERAGE**:

Personal Property

We will pay up to \$400 for "loss" to wearing apparel and other personal property which is:

- (1) Owned by an "insured"; and

- (2) In or on your covered "auto".

This coverage applies only in the event of a total theft of your covered "auto".

No deductibles apply to this Personal Property coverage.

K. AIRBAGS

The following is added to Paragraph B.3., **Exclusions**, of **SECTION III – PHYSICAL DAMAGE COVERAGE**:

Exclusion 3.a. does not apply to "loss" to one or more airbags in a covered "auto" you own that inflate due to a cause other than a cause of "loss" set forth in Paragraphs A.1.b. and A.1.c., but only:

- If that "auto" is a covered "auto" for Comprehensive Coverage under this policy;
- The airbags are not covered under any warranty; and
- The airbags were not intentionally inflated.

We will pay up to a maximum of \$1,000 for any one "loss".

L. NOTICE AND KNOWLEDGE OF ACCIDENT OR LOSS

The following is added to Paragraph A.2.a., of **SECTION IV – BUSINESS AUTO CONDITIONS**:

Your duty to give us or our authorized representative prompt notice of the "accident" or "loss" applies only when the "accident" or "loss" is known to:

- You (if you are an individual);
- A partner (if you are a partnership);
- A member (if you are a limited liability company);
- An executive officer, director or insurance manager (if you are a corporation or other organization); or
- Any "employee" authorized by you to give notice of the "accident" or "loss".

M. BLANKET WAIVER OF SUBROGATION

The following replaces Paragraph A.5., **Transfer Of Rights Of Recovery Against Others To Us**, of **SECTION IV – BUSINESS AUTO CONDITIONS**:

5. Transfer Of Rights Of Recovery Against Others To Us

We waive any right of recovery we may have against any person or organization to the extent required of you by a written contract signed and executed prior to any "accident" or "loss", provided that the "accident" or "loss" arises out of operations contemplated by

such contract. The waiver applies only to the person or organization designated in such contract.

N. UNINTENTIONAL ERRORS OR OMISSIONS

The following is added to Paragraph B.2., **Concealment, Misrepresentation, Or Fraud**, of SECTION IV – BUSINESS AUTO CONDITIONS:

The unintentional omission of, or unintentional error in, any information given by you shall not prejudice your rights under this insurance. However this provision does not affect our right to collect additional premium or exercise our right of cancellation or non-renewal.

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

BLANKET ADDITIONAL INSURED – PRIMARY AND NON-CONTRIBUTORY WITH OTHER INSURANCE

This endorsement modifies insurance provided under the following:
BUSINESS AUTO COVERAGE FORM

PROVISIONS

- 1. The following is added to Paragraph A.1.c., **Who Is An Insured**, of **SECTION II – COVERED AUTOS LIABILITY COVERAGE**:

This includes any person or organization who you are required under a written contract or agreement between you and that person or organization, that is signed by you before the "bodily injury" or "property damage" occurs and that is in effect during the policy period, to name as an additional insured for Covered Autos Liability Coverage, but only for damages to which this insurance applies and only to the extent of that person's or organization's liability for the conduct of another "insured".

- 2. The following is added to Paragraph B.5., **Other Insurance** of **SECTION IV – BUSINESS AUTO CONDITIONS**:

Regardless of the provisions of paragraph a. and paragraph d. of this part **5. Other Insurance**, this insurance is primary to and non-contributory with applicable other insurance under which an additional insured person or organization is the first named insured when the written contract or agreement between you and that person or organization, that is signed by you before the "bodily injury" or "property damage" occurs and that is in effect during the policy period, requires this insurance to be primary and non-contributory.



THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

XTEND ENDORSEMENT FOR CONTRACTORS

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

GENERAL DESCRIPTION OF COVERAGE – This endorsement broadens coverage. However, coverage for any injury, damage or medical expenses described in any of the provisions of this endorsement may be excluded or limited by another endorsement to this Coverage Part, and these coverage broadening provisions do not apply to the extent that coverage is excluded or limited by such an endorsement. The following listing is a general coverage description only. Read all the provisions of this endorsement and the rest of your policy carefully to determine rights, duties, and what is and is not covered.

- | | |
|---|---|
| <ul style="list-style-type: none"> A. Who Is An Insured – Unnamed Subsidiaries B. Blanket Additional Insured – Governmental Entities – Permits Or Authorizations Relating To Operations | <ul style="list-style-type: none"> C. Incidental Medical Malpractice D. Blanket Waiver Of Subrogation E. Contractual Liability – Railroads F. Damage To Premises Rented To You |
|---|---|

PROVISIONS

A. WHO IS AN INSURED – UNNAMED SUBSIDIARIES

The following is added to **SECTION II – WHO IS AN INSURED**:

Any of your subsidiaries, other than a partnership, joint venture or limited liability company, that is not shown as a Named Insured in the Declarations is a Named Insured if:

- a.** You are the sole owner of, or maintain an ownership interest of more than 50% in, such subsidiary on the first day of the policy period; and
- b.** Such subsidiary is not an insured under similar other insurance.

No such subsidiary is an insured for "bodily injury" or "property damage" that occurred, or "personal and advertising injury" caused by an offense committed:

- a.** Before you maintained an ownership interest of more than 50% in such subsidiary; or
- b.** After the date, if any, during the policy period that you no longer maintain an ownership interest of more than 50% in such subsidiary.

For purposes of Paragraph 1. of Section II – Who Is An Insured, each such subsidiary will be deemed to be designated in the Declarations as:

- a.** An organization other than a partnership, joint venture or limited liability company; or
- b.** A trust;

as indicated in its name or the documents that govern its structure.

B. BLANKET ADDITIONAL INSURED – GOVERNMENTAL ENTITIES – PERMITS OR AUTHORIZATIONS RELATING TO OPERATIONS

The following is added to **SECTION II – WHO IS AN INSURED**:

Any governmental entity that has issued a permit or authorization with respect to operations performed by you or on your behalf and that you are required by any ordinance, law, building code or written contract or agreement to include as an additional insured on this Coverage Part is an insured, but only with respect to liability for "bodily injury", "property damage" or "personal and advertising injury" arising out of such operations.

The insurance provided to such governmental entity does not apply to:

- a.** Any "bodily injury", "property damage" or "personal and advertising injury" arising out of operations performed for the governmental entity; or
- b.** Any "bodily injury" or "property damage" included in the "products-completed operations hazard".

C. INCIDENTAL MEDICAL MALPRACTICE

1. The following replaces Paragraph **b.** of the definition of "occurrence" in the **DEFINITIONS** Section:

b. An act or omission committed in providing or failing to provide "incidental medical services", first aid or "Good Samaritan services" to a person, unless you are in the business or occupation of providing professional health care services.

2. The following replaces the last paragraph of Paragraph **2.a.(1)** of **SECTION II – WHO IS AN INSURED**:

Unless you are in the business or occupation of providing professional health care services, Paragraphs **(1)(a), (b), (c)** and **(d)** above do not apply to "bodily injury" arising out of providing or failing to provide:

(a) "Incidental medical services" by any of your "employees" who is a nurse, nurse assistant, emergency medical technician or paramedic; or

(b) First aid or "Good Samaritan services" by any of your "employees" or "volunteer workers", other than an employed or volunteer doctor. Any such "employees" or "volunteer workers" providing or failing to provide first aid or "Good Samaritan services" during their work hours for you will be deemed to be acting within the scope of their employment by you or performing duties related to the conduct of your business.

3. The following replaces the last sentence of Paragraph **5.** of **SECTION III – LIMITS OF INSURANCE**:

For the purposes of determining the applicable Each Occurrence Limit, all related acts or omissions committed in providing or failing to provide "incidental medical services", first aid or "Good Samaritan services" to any one person will be deemed to be one "occurrence".

4. The following exclusion is added to Paragraph **2.**, **Exclusions**, of **SECTION I – COVERAGES – COVERAGE A – BODILY INJURY AND PROPERTY DAMAGE LIABILITY**:

Sale Of Pharmaceuticals

"Bodily injury" or "property damage" arising out of the violation of a penal statute or ordinance relating to the sale of

pharmaceuticals committed by, or with the knowledge or consent of, the insured.

5. The following is added to the **DEFINITIONS** Section:

"Incidental medical services" means:

a. Medical, surgical, dental, laboratory, x-ray or nursing service or treatment, advice or instruction, or the related furnishing of food or beverages; or

b. The furnishing or dispensing of drugs or medical, dental, or surgical supplies or appliances.

6. The following is added to Paragraph **4.b.**, **Excess Insurance**, of **SECTION IV – COMMERCIAL GENERAL LIABILITY CONDITIONS**:

This insurance is excess over any valid and collectible other insurance, whether primary, excess, contingent or on any other basis, that is available to any of your "employees" for "bodily injury" that arises out of providing or failing to provide "incidental medical services" to any person to the extent not subject to Paragraph **2.a.(1)** of Section II – Who Is An Insured.

D. BLANKET WAIVER OF SUBROGATION

The following is added to Paragraph **8.**, **Transfer Of Rights Of Recovery Against Others To Us**, of **SECTION IV – COMMERCIAL GENERAL LIABILITY CONDITIONS**:

If the insured has agreed in a contract or agreement to waive that insured's right of recovery against any person or organization, we waive our right of recovery against such person or organization, but only for payments we make because of:

a. "Bodily injury" or "property damage" that occurs; or

b. "Personal and advertising injury" caused by an offense that is committed;

subsequent to the execution of the contract or agreement.

E. CONTRACTUAL LIABILITY – RAILROADS

1. The following replaces Paragraph **c.** of the definition of "insured contract" in the **DEFINITIONS** Section:

c. Any easement or license agreement;

2. Paragraph **f.(1)** of the definition of "insured contract" in the **DEFINITIONS** Section is deleted.

F. DAMAGE TO PREMISES RENTED TO YOU

The following replaces the definition of "premises damage" in the **DEFINITIONS** Section:

"Premises damage" means "property damage" to:

- a. Any premises while rented to you or temporarily occupied by you with permission of the owner; or
- b. The contents of any premises while such premises is rented to you, if you rent such premises for a period of seven or fewer consecutive days.

T. WAIVER OR TRANSFER OF RIGHTS OF RECOVERY AGAINST OTHERS TO US

1. If the insured has rights to recover all or part of any payment we have made under this insurance, those rights are transferred to us and the insured must do nothing after loss to impair them. At our request, the insured will bring suit or transfer those rights to us and help us, and with respect to Coverage A, the "underlying insurer", enforce them.

If the insured has agreed in a contract or agreement to waive that insured's right of recovery against any person or organization, we waive our right of recovery against that person or organization, but only for payments we make because of an "event" that takes place or is committed subsequent to the execution of that contract or agreement by such insured.

2. Reimbursement of any amount recovered will be made in the following order:
 - a. First, to any person or organization (including us or the insured) who has paid any amount in excess of the applicable limit of insurance;
 - b. Next, to us; and
 - c. Then, to any person or organization (including the insured and with respect to Coverage A, the "underlying insurer") that is entitled to claim the remainder, if any.
3. Expenses incurred in the process of recovery will be divided among all persons or organizations receiving amounts recovered according to the ratio of their respective recoveries.

U. TRANSFER OF YOUR RIGHTS AND DUTIES UNDER THIS INSURANCE

1. Your rights and duties under this insurance may not be transferred without our written consent except in the case of death of an individual Named Insured.
2. If you die, your rights and duties will be transferred to your legal representative but only while acting within the scope of duties as your legal representative. Until your legal representative is appointed, anyone having proper temporary custody of your property will have your rights and duties but only with respect to that property.

V. UNINTENTIONAL OMISSION OR ERROR

The unintentional omission of, or unintentional error in, any information provided by you which we relied upon in issuing this policy will not prejudice your rights under this insurance. However, this

provision does not affect our right to collect additional premium or to exercise our rights of cancellation or nonrenewal in accordance with applicable insurance laws or regulations.

W. WHEN LOSS IS PAYABLE

If we are liable under this insurance, we will pay for injury, damage or loss after:

1. The insured's liability is established by:
 - a. A court decision; or
 - b. A written agreement between the claimant, the insured, any "underlying insurer" and us; and
2. The amount of the "applicable underlying limit" or "self-insured retention" is paid by or on behalf of the insured.

SECTION VI – DEFINITIONS**A. With respect to all coverages of this insurance:**

1. "Applicable underlying limit" means the sum of:
 - a. The applicable limit of insurance stated for the policies of "underlying insurance" in the Schedule Of Underlying Insurance subject to the provisions in Paragraphs 4.a.(1), (2) and (3) of **COVERAGE A – EXCESS FOLLOW-FORM LIABILITY of SECTION I – COVERAGES**; and
 - b. The applicable limit of insurance of any "other insurance" that applies.

The limits of insurance in any policy of "underlying insurance" will apply even if:

 - a. The "underlying insurer" claims the insured failed to comply with any term or condition of the policy; or
 - b. The "underlying insurer" becomes bankrupt or insolvent.
2. "Auto hazard" means all "bodily injury" and "property damage" to which liability insurance afforded under an auto policy of "underlying insurance" would apply but for the exhaustion of its applicable limits of insurance.
3. "Electronic data" means information, facts or programs stored as or on, created or used on, or transmitted to or from computer software (including systems and applications software), hard or floppy disks, CD-ROMs, tapes, drives, cells, data processing devices or any other media which are used with electronically controlled equipment.
4. "Event" means an "occurrence", offense, accident, act, error, omission, wrongful act or loss.

POLICY NUMBER: CO4N042844

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

DESIGNATED ENTITY – NOTICE OF CANCELLATION PROVIDED BY US

This endorsement modifies insurance provided under the following:

ALL COVERAGE PARTS INCLUDED IN THIS POLICY

SCHEDULE

CANCELLATION:

Number of Days Notice of Cancellation: 30

PERSON OR ORGANIZATION:

ANY PERSON OR ORGANIZATION
(AS PER IL T8 03)

ADDRESS:

PROVISIONS:

If we cancel this policy for any statutorily permitted reason other than nonpayment of premium, and a number of days is shown for cancellation in the schedule above, we will mail notice of cancellation to the person or organization shown in the schedule

above. We will mail such notice to the address shown in the schedule above at least the number of days shown for cancellation in the schedule above before the effective date of cancellation.

GENERAL PURPOSE ENDORSEMENT

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

IL T4 05 03 11 DESIGNATED ENTITY NOTICE OF CANCELLATION PROVIDED BY US

This endorsement modifies insurance provided under the following:

ALL COVERAGE PARTS INCLUDED IN THIS POLICY

SCHEDULE

CANCELLATION: Number of Days Notice of Cancellation: 30

PERSON OR ORGANIZATION:

ANY PERSON OR ORGANIZATION TO WHOM YOU HAVE AGREED IN A WRITTEN CONTRACT THAT NOTICE OF CANCELLATION OF THIS POLICY WILL BE GIVEN, BUT ONLY IF:

1. YOU SEND US A WRITTEN REQUEST TO PROVIDE SUCH NOTICE, INCLUDING THE NAME AND ADDRESS OF SUCH PERSON OR ORGANIZATION, AFTER THE FIRST NAMED INSURED RECEIVES NOTICE FROM US OF THE CANCELLATION OF THIS POLICY; AND
2. WE RECEIVE SUCH WRITTEN REQUEST AT LEAST 14 DAYS BEFORE THE BEGINNING OF THE APPLICABLE NUMBER OF DAYS SHOWN IN THIS ENDORSEMENT.
TYPE UNDER "ADDRESS":

ADDRESS:

THE ADDRESS FOR THAT PERSON OR ORGANIZATION INCLUDED IN SUCH WRITTEN REQUEST FROM YOU



- b. You have paid all premiums due for this policy at the time you make such request;
 - c. You promptly pay the additional premium we charge for the Extended Reporting Period endorsement for this insurance when due. We will determine that additional premium after we have received your request for the Extended Reporting Period endorsement for this insurance. That additional premium is not subject to any limitation stated in the "underlying insurance" on the amount or percentage of additional premium that may be charged for the "extended reporting period" in such "underlying insurance"; and
 - d. That Extended Reporting Period endorsement is issued by us and made a part of this policy.
3. Any Extended Reporting Period endorsement for this insurance will not reinstate or increase the Limits of Insurance or extend the policy period.
 4. Except with respect to any provisions to the contrary contained in Paragraphs 1., 2. or 3. above, all provisions of any option to purchase an "extended reporting period" granted to you in the "underlying insurance" apply to this insurance.

J. INSPECTIONS AND SURVEYS

1. We have the right but are not obligated to:
 - a. Make inspections and surveys at any time;
 - b. Give you reports on the conditions we find; and
 - c. Recommend changes.
2. Any inspections, surveys, reports or recommendations relate only to insurability and the premiums to be charged. We do not make safety inspections. We do not undertake to perform the duty of any person or organization to provide for the health or safety of workers or the public. We do not warrant that conditions:
 - a. Are safe or healthful; or
 - b. Comply with laws, regulations, codes or standards.

K. LEGAL ACTION AGAINST US

1. No person or organization has a right under this insurance:
 - a. To join us as a party or otherwise bring us into a "suit" asking for damages from an insured; or

- b. To sue us on this insurance unless all of its terms have been fully complied with.
2. A person or organization may sue us to recover on an agreed settlement or on a final judgment against an insured. We will not be liable for damages that:
 - a. Are not payable under the terms of this insurance; or
 - b. Are in excess of the applicable limit of insurance.

An agreed settlement means a settlement and release of liability signed by us, the insured and the claimant or the claimant's legal representative.

L. MAINTENANCE OF UNDERLYING INSURANCE

1. The insurance afforded by each policy of "underlying insurance" will be maintained for the full policy period of this Excess Follow-Form And Umbrella Liability Insurance. This provision does not apply to the reduction or exhaustion of the aggregate limit or limits of such "underlying insurance" solely by payments as permitted in Paragraphs 4.a.(1), (2) and (3) of **COVERAGE A – EXCESS FOLLOW-FORM LIABILITY** of **SECTION I – COVERAGES**. As such policies expire, you will renew them at limits and with coverage at least equal to the expiring limits of insurance. If you fail to comply with the above requirements, Coverage A is not invalidated. However, in the event of a loss, we will pay only to the extent that we would have paid had you complied with the above requirements.
2. The first Named Insured shown in the Declarations must give us written notice of any change in the "underlying insurance" as respects:
 - a. Coverage;
 - b. Limits of insurance;
 - c. Termination of any coverage; or
 - d. Exhaustion of aggregate limits.
3. If you are unable to recover from any "underlying insurer" because you fail to comply with any term or condition of the "underlying insurance", Coverage A is not invalidated. However, we will pay for any loss only to the extent that we would have paid had you complied with that term or condition in that "underlying insurance".

M. **OTHER INSURANCE**

This insurance is excess over any valid and collectible "other insurance" whether such "other insurance" is stated to be primary, contributing,

excess, contingent or otherwise. This provision does not apply to a policy bought specifically to apply as excess of this insurance.

However, if you specifically agree in a written contract or agreement that the insurance provided to any person or organization that qualifies as an insured under this insurance must apply on a primary basis, or a primary and non-contributory basis, then insurance provided under Coverage A is subject to the following provisions:

1. This insurance will apply before any "other insurance" that is available to such additional insured which covers that person or organization as a named insured, and we will not share with that "other insurance", provided that the injury or damage for which coverage is sought is caused by an "event" that takes place or is committed subsequent to the signing of that contract or agreement by you.
2. This insurance is still excess over any valid and collectible "other insurance", whether primary, excess, contingent or otherwise, which covers that person or organization as an additional insured or as any other insured that does not qualify as a named insured.

N. PREMIUM

1. The first Named Insured shown in the Declarations is responsible for the payment of all premiums and will be the payee for any return premiums.
2. If the premium is a flat charge, it is not subject to adjustment except as provided in Paragraph 4. below.
3. If the premium is other than a flat charge, it is an advance premium only. The earned premium will be computed at the end of the policy period, or at the end of each year of the policy period if the policy period is two years or longer, at the rate shown in the Declarations, subject to the Minimum Premium.
4. Additional premium may become payable when coverage is provided for additional insureds under the provisions of **SECTION II – WHO IS AN INSURED.**

O. PREMIUM AUDIT

The premium for this policy is the amount stated in Item 5. of the Declarations. The premium is a flat charge unless it is specified in the Declarations as adjustable.

P. PROHIBITED COVERAGE – UNLICENSED INSURANCE

1. With respect to loss sustained by any insured in a country or jurisdiction in which we are not licensed to provide this insurance, this insurance does not apply to the extent that insuring such loss would violate the laws or regulations of such country or jurisdiction.
2. We do not assume responsibility for:
 - a. The payment of any fine, fee, penalty or other charge that may be imposed on any person or organization in any country or jurisdiction because we are not licensed to provide insurance in such country or jurisdiction; or
 - b. The furnishing of certificates or other evidence of insurance in any country or jurisdiction in which we are not licensed to provide insurance.

Q. PROHIBITED COVERAGE – TRADE OR ECONOMIC SANCTIONS

We will provide coverage for any loss, or otherwise will provide any benefit, only to the extent that providing such coverage or benefit does not expose us or any of our affiliated or parent companies to:

1. Any trade or economic sanction under any law or regulation of the United States of America; or
2. Any other applicable trade or economic sanction, prohibition or restriction.

R. REPRESENTATIONS

By accepting this insurance, you agree:

1. The statements in the Declarations and any subsequent notice relating to "underlying insurance" are accurate and complete;
2. Those statements are based upon representations you made to us; and
3. We have issued this insurance in reliance upon your representations.

S. SEPARATION OF INSURED

Except with respect to the Limits of Insurance, and any rights or duties specifically assigned in this policy to the first Named Insured shown in the Declarations, this insurance applies:

1. As if each Named Insured were the only Named Insured; and
2. Separately to each insured against whom claim is made or "suit" is brought.



**WORKERS COMPENSATION
AND
EMPLOYERS LIABILITY POLICY**

ENDORSEMENT WC 00 03 13 (00) - 001

POLICY NUMBER: UB006K431293

WAIVER OF OUR RIGHT TO RECOVER FROM OTHERS ENDORSEMENT

We have the right to recover our payments from anyone liable for an injury covered by this policy. We will not enforce our right against the person or organization named in the Schedule. (This agreement applies only to the extent that you perform work under a written contract that requires you to obtain this agreement from us.)

This agreement shall not operate directly or indirectly to benefit any one not named in the Schedule.

SCHEDULE

DESIGNATED PERSON:

DESIGNATED ORGANIZATION:

**ANY PERSON OR ORGANIZATION FOR WHICH THE INSURED HAS AGREED
BY WRITTEN CONTRACT EXECUTED PRIOR TO LOSS TO FURNISH THIS
WAIVER.**