ARLINGTON
VIRGINIA

Office of the Purchasing Agent
2100 Clarendon Blvd., Suite 500
Arlington, VA 22201

Invitation to Bid Number 21-DPR-ITB-467
Technical Specifications

Department of Parks and Recreation

Towers Park
Playground Renovations
801 South Scott Street
Arlington, Virginia 22204

Project includes, but is not limited to, demolition, site work, utilities (storm drain), playground, stormwater management, walkways, fencing, signage, site furnishings, reforestation area and landscaping.

TABLE OF CONTENTS

SECTION 011000 – GENERAL CONDITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Use of premises.
3. General requirements.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Towers Park Playground Renovations

B. Project Location: 801 South Scott Street, Arlington, Virginia 22204

C. Owner: Arlington County, Virginia
Department of Parks and Recreation
2100 Clarendon Boulevard, Suite 414
Arlington, VA 22201

D. The Work consists of, but is not limited to, the following:

1. Demolition, site work, signage, and landscaping; the construction of site improvements as shown on the Plans and specified hereinafter, including:

a. Site preparation including construction fences, tree protection fencing, temporary erosion and sediment control measures, test pits and construction stake-out.

b. Protection and maintaining and all other existing park property, Arlington County right-of-way, and other existing improvements as required.

c. Site restoration of all facilities damaged by construction operations, or as directed by Department of Parks and Recreation (DPR), to the original condition and/or the satisfaction of DPR. Site restoration includes, but is not limited to, pavement restoration, site grading, top soil, seeding and sodding.

d. Site Improvements:

1. Construction of playground as shown on the Plans and Specifications.
2. Construction of bioretention as shown on the Plans and Specifications.
3. Demolition of existing playground inside RPA (Resource Protection Area) as shown on the Plans and Specifications.
4. Construction of reforestation area as shown on the Plans and Specifications.

5. Additional Site Improvements:

   (a) Construction of concrete walks, concrete curbs, and aggregate base as shown on the Plans and Specifications.
   (b) Supply and install site furnishings and structures such as benches and signage as shown on the Plans and Specifications.
   (c) Plantings as shown on the Plans and Specifications.
   (d) Root pruning and other tree protection measures as shown on the Plans and Specifications.

E. Project will be constructed under a single prime contract.

1.3 USE OF PREMISES

A. General: Contractor shall have limited use of premises for construction operations as indicated in the Specifications and on the Drawings by the Contract limits.

B. Any existing water fountain or other site water sources shall not be used as supply for construction water, unless approved by the Project Officer.

C. Use of Site: Do not disturb portions of Project site beyond areas in which the Limit of Disturbance (LOD) is shown. Specific limitations on use of the site include the following:

1. Construction activity shall not take place inside designated tree protection areas, except when necessary and as approved by Project Officer. Contractor shall provide Project Officer with 72 hours' notice when work within a tree protection area is necessary, so that the County's urban forester can be notified.
2. Maintain public access to areas outside the limits of work whenever possible. Contractor shall request approval from Project Officer 72 hours in advance when closures outside the limits of work are necessary.

1.4 GENERAL REQUIREMENTS

A. Coordination: The Contractor shall be responsible for coordinating all construction operations included in the various Sections of the Specifications to ensure efficient and orderly installation of each part of the work.

B. Contact Person: The Contractor shall establish a single contact person that will be responsible for all communication between the Contractor (including all subcontractors) and the Project Officer, Landscape Architect, and/or Engineer.

C. Submittals: Upon Contract award, the Contractor shall immediately prepare a list of required submittals, based on the specifications, and begin to gather the required submittals for submission to the Project Officer as soon as possible. Submittals for long lead items shall be submitted within 30 days from NTP.

D. Site Access: Contractor shall ONLY access site per plans. Contractor shall be responsible for any damage to park property from access point to construction entrance at the project's limits of disturbance.

E. Tree Protection: See plans.

F. Quantities: Contractor shall verify all quantities per drawings and specifications.

G. Permits:

1.1 The County shall provide the Virginia Stormwater Management Permit (VSMP), the building permit to the Contractor and Land Disturbance Activity (LDA) Permit.

1.2 The Contractor is responsible for obtaining all other required permits (including but not limited to ROW, trade permits, electrical and/or any other work necessary for the completion of the project) from the Arlington County Department of Environmental Services (DES) and/or Inspection Services Division (ISD).

1.3 The Contractor is required to submit designs, shop drawings, structural calculations, engineer certifications, or other items required for permit approval. In that case, the Contractor shall build in the required time for obtaining, submitting, and gaining approval of these items into the construction schedule.

1.4 Contractor shall be required to obtain any necessary permits except the items covered by G. 1.1.

H. Subcontractors:

1. A list of proposed subcontractors shall be submitted to the Project Officer. Proposed subcontractors shall be subject to the review and approval of the Project Officer, who will respond to the proposed list of subcontractors within ten (10) working days of receipt. Reasons for rejection of a proposed subcontractor may include, but are not limited to, the following:

   A. Unsatisfactory work on previous County contracts.

   B. Lack of experience in the type of work to be subcontracted.

2. The Contractor is fully responsible for the work of its subcontractors, and any unsatisfactory work on the part of a subcontractor shall be remedied at the Contractor's expense if necessary.

3. A competent person from the Prime Contractor shall be present on the site during the work of all subcontractors. If such a person is not present while a subcontractor is working on the site, the Project Officer reserves the right to stop work. No Claims for Delay will be allowed as a result of such stoppages.

4. All subcontractors must be furnished with a full set of the contract drawings and specifications at the Contractor's expense, and subcontractors shall be required to have these documents on site while the work is being performed. If the

subcontractor does not have access to a full set of plans and specifications while working on the site, the Project Officer reserves the right to stop work. No Claims for Delay will be allowed as a result of such stoppages.

I. Construction Schedule:

1. The construction schedule, to be provided by the Contractor at the preconstruction meeting, shall indicate the dates and date ranges where major components of the Work will be performed.

2. The schedule shall indicate the dates that required submittals will be provided and shall also indicate time allotted for the review and approval of submittals.

3. The Contractor shall maintain and update the schedule monthly and when conditions change and shall resubmit the updated schedule to the Project Officer.

4. The Contract completion date cannot be changed by submission of a construction schedule indicating a different completion date. The Contract completion date can only be changed if specifically authorized by Change Order.

J. Preconstruction Meeting:

1. The Contractor shall attend a preconstruction meeting on-site with the Project Officer, Landscape Architect, their Consultants, major subcontractors, and other concerned parties.

2. At the meeting, the Contractor shall provide the following:

   i. Construction schedule

   ii. List of required submittals

   iii. List of proposed subcontractors

3. Items of significance that could affect the progress of the work shall be discussed at the meeting.

4. Requirements for tree protection and erosion control shall be reviewed.

5. The Project Officer shall record and distribute meeting minutes.

K. Notice to Proceed:

1. After the preconstruction meeting, the Project Officer will issue a written Notice to Proceed (NTP) to the Contractor.

2. Work shall commence 14 days from the date of NTP, which will be the first day of the timeframe in which the work is to be completed.

L. Progress Meetings:

1. The Contractor shall attend construction progress meetings on a bi-weekly basis, and at the request of the Project Officer.

2. An updated construction schedule shall be submitted at each progress meeting.

3. At the meeting, the following issues shall be discussed:

   i. Work completed to date.

   ii. Work remaining to be completed and anticipated timeframes.

   iii. Issues affecting the progress of the work.

   iv. Items that require correction.

4. The Contractor shall record and distribute meeting minutes.

M. Requests for Information (RFI):

1. The Contractor shall submit a written RFI in any of the following instances (not all-inclusive):

   i. If the intent of any item in the drawings and specifications is unclear.

   ii. If existing conditions differ from those indicated on the drawings.

   iii. To document any verbal agreements or instructions.

2. In instances (a) and (b), the Contractor shall stop work in the affected area, notify the Project Officer, and await instructions.

3. The Contractor shall be responsible for any expenses incurred due to unexpected conditions if he fails to notify the Project Officer and wait for direction prior to continuing work in the affected area.

4. The Contractor's failure to properly document any verbal agreements or instructions will result in the rejection of any claim for changes to the Contract amount or additional time for completion.

5. The Contractor is responsible for making the necessary inquiries to determine the design intent of the drawings and specifications if anything is unclear, prior to submitting a bid. Claims for changes to the contract amount submitted after Contract award due to an RFI response may be approved or rejected at the sole discretion of the Project Officer.

N. Documentation of Events: The Contractor shall document and immediately report any of the following events to the Project Officer:

1. Accidents.

2. Stoppages, delays, shortages, and losses.

3. Orders and requests of authorities having jurisdiction.

4. Services connected and disconnected.

5. Existing conditions that significantly differ from those indicated on the drawings.

O. Documentation of Work Activity: The Contractor shall document and submit on a daily basis a daily report. The daily report shall contain the following information:

1. Contractor name.

2. Date and time.

3. Temperature and weather condition.

4. Project number.

5. Contract number.

6. List of sub-contractors on site by trade.

7. List of number of man-hours for contractor and subcontractor.

8. Description of each activity performed by the contractor and sub-contractor(s).

9. List of materials stored on site and delivered.

10. List of equipment materials stored on site and delivered.

11. Submit all tickets for verification for the following, but not limited to: materials and equipment delivered, concrete pours and soils removal.

P. If the Project Site will not be worked on a particular work day or days, the Contractor shall notify the Project Officer that the site will not be worked on and shall state the reason for such.

Q. If planting installation is not feasible because it is not the proper season for planting, the Contractor shall notify the Project Officer.

R. Liquidated Damages (Damages for Delay): The Project Officer does NOT have the authority to waive Liquidated Damages unless the supporting documentation described above has been provided by the Contractor (within the aforementioned time limit) and approved by the Project Officer.

S. Existing Conditions: Dimensions and/or locations of existing facilities and/or underground utilities shown on the plans are approximate. Verify exact locations before commencing work.

T. Code Compliance: Comply with all applicable codes and regulations of authorities having jurisdiction.

U. Safety: Take all precautions necessary to protect the public during the construction period.

V. Security: The Contractor shall take all precautions necessary to secure materials, equipment, work in progress, and completed work at the site. The Contractor is fully responsible for providing security at the Project Site and shall rectify any damage due to breach of security at no additional cost to Arlington County.

W. Protection of Existing Conditions: Take all precautions necessary to protect existing facilities to remain during the construction period. Repair any and all damage to existing facilities to remain caused by construction operations. Maintain existing utilities and protect them against damage during construction. Contact Miss Utility at (800) 552-7001 for utility locations prior to any excavation.

X. County Rights-of-Way: Work taking place within the right-of-way of County streets shall conform to the Arlington County DES "Construction Standards and Specifications". The Contractor shall obtain a right-of-way permit from the County for work to take place within street rights-of-way.

Y. Differing or Conflicting Requirements: If a Specification section requires compliance with two or more standards, or if requirements conflict, the more stringent standard or requirement shall apply.

Z. Quality Control Testing and Laboratory Services: The Contractor shall provide necessary labor and supervision required to support field testing and inspection by the Project Officer. Defects disclosed by tests shall be rectified at no additional cost to Arlington County.

AA. Record "As-Built" Drawings: The Contractor shall submit three (3) sets of marked-up plans at the end of the construction period indicating any and all conditions that differ from the original Contract drawings. As-builts need to be in CAD format and pdf's. As-builts hall be signed by a licensed engineer / surveyor. As-builts shall meet County DES standards.

BB. Operation and Maintenance Manuals: Contractor shall provide operations and maintenance manuals for all applicable products and systems used in the Work prior to final completion inspection.

CC. Claims for Delay:

1. If the Contractor believes that the proposed time for completion in the Contract is unreasonable, the Contractor shall notify the Project Officer at least ten (10) working days prior to the bid opening date and suggest a more reasonable contract time frame. If the proposed new time frame is accepted, an amendment to the bid will be issued.

2. The Contractor shall submit a written Claim for Delay within ten (10) working days of any event where the Contractor believes that an extension to the Contract time for completion is necessary or justified.

3. The written Claim for Delay must include the following information:

i. Amount of days claimed

ii. Justification for the delay

iii. Supporting documentation

4. Justifications for Claims for Delay include the following:

i. Inclement weather that prevents work on the site

ii. Events beyond the control of the Contractor that result in a delay to the project, with the following exceptions:

a. Delays in the delivery of materials.

b. Failure of suppliers to provide required submittals in a timely manner.

c. Any delays that result from the actions of a subcontractor.

d. Disputes between the Contractor and subcontractors or suppliers.

e. Rejection of submittals.

f. Re-work resulting from unsatisfactory work.

g. Re-work resulting from failure to provide required submittals.

h. Re-work resulting from failure to submit a Request for Information (RFI) if the design intent is unclear.

i. Failure to obtain required permits in a timely fashion, as stated in Section 1.4. D. Permits.

j. Failure to request required inspections from the Inspection Services Division (ISD) in a timely fashion, or rejection of work by an inspector.

k. Stop work orders issued by authorities having jurisdiction that are due to items that are the Contractor's responsibility.

l. A Claim for Delay may be denied if the Contractor fails to continue work on other aspects of the project that are not affected by the particular delayed item, or if, in the Project Officer's determination, the Contractor has failed to continuously work on the project or effectively manage the project.

m. If planting installation is not feasible because it is not the proper season for planting, the Contractor shall notify the Project Officer. The Project Officer, at his/her sole discretion, may decide to treat planting as a Punch List item, thereby exempting it as a requirement for a Determination of Substantial Completion

END OF SECTION 011000

SECTION 012000 - MOBILIZATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Mobilization shall include the following items:

1. Furnish and set up Contractor's necessary general plant and equipment required for operations on to the site, including storage areas, office, and such sanitary and other facilities as are required by County, State, or Federal law or regulation. The determination of adequacy of the Contractor's facilities, except as noted above, shall be made by the Contractor.
2. Providing on-site all OSHA required notices and establishment of safety programs.
3. Obtaining all required permits for completion of the project.
4. Having the Contractor's superintendent at the jobsite full time.
5. The cost of required insurance and bonds and/or any other similar significant initial expense required for the initiation of the contract work shall be included in this item.
6. Submitting initial submittals and log.
7. The cost for mobilization shall not exceed 3% of the total contract bid price (all items listed on the Pricing Sheet) excluding the bid for mobilization.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 Such work as is done in providing the facilities and services under this item shall be done in safe and workmanlike manner and shall conform to any pertinent County, State or Federal law, regulation, or code. Good housekeeping consistent with safety shall be maintained.

PART 4 – MEASUREMENT

The Contractor's attention is directed to the condition that no payment for Mobilization, or any part thereof, will be approved for payment under the Contract Documents until all Mobilization items listed above have been completed as specified to the satisfaction of the Project Officer.

For MOBILIZATION in accordance with the specifications the Contractor shall receive the Schedule-of-Values amount, which is not to exceed three percent (3%) of the total contract bid price excluding the bid for mobilization.

END OF SECTION 012000

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Landscape Architect or Project Officer's responsive action.

B. Informational Submittals: Written information that does not require Landscape Architect or Project Officer's responsive action. Submittals may be rejected for not complying with requirements.

1.3 GENERAL REQUIREMENTS

A. Upon Contract Award, the Contractor shall prepare a list of required submittals, and shall immediately begin working to compile all required submittals.

B. The Contractor shall not begin work which requires the submission of other data, until said submittals are returned with the Project Officer’s stamp indicating approval or “approved as noted.”

C. Deviations from Contract Documents: Approval of submittals does not relieve Contractor from responsibility for full compliance with the Contract Documents. Approval of a submittal does not indicate acceptance of any deviations from the Contract Documents included in the submittal. Such deviations must be approved specifically in writing by the Project Officer.

1.4 SUBMITTAL PROCEDURES

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

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

B. Project Officer: All submittals shall be submitted to the Project Officer, who will then distribute submittals to the Landscape Architect, as applicable. Landscape Architect shall return submittals with action taken to the Project Officer who will then notify the Contractor.

C. Submittals Schedule: Include a list of submittals for review in the construction schedule.

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

1. Initial Review: Allow ten (10) business days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Project Officer will advise Contractor when a submittal being processed must be delayed for coordination.
2. Resubmittal Review: Allow ten (10) business days for review of each resubmittal.

E. Identification: Each submittal shall indicate the following:

1. Name of firm or entity that prepared each submittal.
2. Project name.
3. Date.
4. Name and address of Contractor.
5. Name and address of subcontractor.
6. Name and address of supplier.
7. Name and address of manufacturer.
8. Applicable specification section.
9. A unique identifier, such as the Transmittal Number and Item Number. See Instructions, included at the end of this Specification Section 013300, for a description of how the standard Transmittal form shall be completed, including submittal formatting, numbering and nomenclature. Submittal number used in the Transmittal form, and any electronic file if applicable, should include the corresponding Technical Specifications section number. For example, 033000-001 shall be used for the first initial submittal about Cast in Place Concrete; 033000-001-R1 for a following re-submittal.

F. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using the transmittal form attached at the end of this section. Project Officer will discard submittals received from sources other than Contractor.

H. Resubmittals: Make resubmittals in same form as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision and clearly indicate extent of revision.
3. Resubmit submittals until they are marked "approved" or "approved as noted."

I. Use for Construction: Use only final submittals with mark indicating "approved" or "approved as noted" by Project Officer.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

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

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.

3. Include the following information, as applicable:

a. Manufacturer's written recommendations.
b. Manufacturer's product specifications.
c. Manufacturer's installation instructions.
d. Manufacturer's catalog cuts.
e. Compliance with specified referenced standards.
f. Testing by recognized testing agency.

4. Number of Copies: Submit three (3) copies and one (1) electronic copy of Product Data, unless otherwise indicated. Project Officer will return one copy.

C. Shop Drawings: Where required in the Specifications, prepare project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

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

a. Dimensions.
b. Identification of products.
c. Fabrication and installation drawings.
d. Schedules.
e. Notation of coordination requirements.
f. Notation of dimensions established by field measurement.
g. Relationship to adjoining construction clearly indicated.
h. Seal and signature of professional engineer if required.
i. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 24 by 36 inches.

3. Number of Copies: Submit three (3) copies and one (1) electronic copy of each submittal. Project Officer will return one copy.

D. Samples: When required by other specification sections, submit samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit samples that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Attach label on unexposed side of samples that includes the following:

a. Generic description of sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of appropriate specification section.

3. Samples for Initial Selection: If colors, textures, and/or patterns are not clearly indicated in the drawings and/or specifications, submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Project Officer will return submittal with options selected.

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

a. Number of Samples: Submit one set of samples. Project Officer will retain the sample set and indicate acceptance or rejection in writing to the Contractor.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Project Officer will not return copies.
2. Certificates and Certifications: Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Prior to submittal to Project Officer, review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions.

3.2 LANDSCAPE ARCHITECT'S ACTION

A. Action Submittals: Landscape Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Landscape Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1. No Exceptions Taken or Approved: A marking of “approved or “No Exceptions Taken” indicates approval of a submittal for general conformance with the design concept of the Project and with the drawings and specifications.

    a. The Contractor is still responsible for confirming and correlating dimensions at job site, for information which pertains to fabrication processes or construction techniques and for coordination of work of all trades.
    b. Approval of submittals does not relieve Contractor from responsibility for full compliance with the Contract Documents.

2. Make Corrections, Approved as Noted or Approved as Noted: A marking of “Make Corrections, Approved as Noted” or “Approved as Noted” indicates conditional approval of a submittal.

    a. The Contractor is expected to comply with the revisions or notes indicated by the Landscape Architect in the document. These notes become an integral part of the approved submittal and their acceptance by the Contractor indicates an agreement to comply with the noted requirements.
    b. The Contractor is still responsible for confirming and correlating dimensions at job site, for information which pertains to fabrication processes or construction techniques and for coordination of work of all trades.
    c. Approval of submittals does not relieve Contractor from responsibility for full compliance with the Contract Documents.

3. Revise and Resubmit: Based on the notations provided by the Landscape Architect, make revisions required to comply with the requirements in the Contract Documents, and resubmit for approval.

4. Rejected: The product indicated does not comply with the requirements in the Contract Documents and shall not be used in the Project. Provide submittals for the correct product as indicated in the drawings and specifications.

B. Informational Submittals: Landscape Architect will review each submittal and will not return it or will return it if it does not comply with requirements.

C. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

D. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE	DATE	TRANSMITTAL NO.

SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS (*This section will be initiated by the contractor*)

TO:	FROM:	CONTRACT NO.	CHECK ONE: ☐ THIS IS A NEW TRANSMITTAL ☐ THIS IS A RESUBMITTAL OF TRANSMITTAL

SPECIFICATION SEC. NO. (*Cover only one section with each transmittal*)	PROJECT TITLE AND LOCATION	THIS TRANSMITTAL IS FOR: (*Check one*) ☐ FIO ☐ GA ☐ DA ☐ CR DA/CR DA/GA

ITEM NO. (*See Note 3*)	DESCRIPTION OF SUBMITTAL ITEM (*Type size, model number/etc.*)	SUBMITTAL TYPE CODE (*See Note 7*)	NO. OF COPIES	CONTRACT DOCUMENT REFERENCE		CONTRACTOR REVIEW CODE	VARIATION Enter "Y" if requesting a variation (*See Note 6*)	COUNTY ACTION CODE (*Note 8*)
				SPEC. PARA. NO.	DRAWING SHEET NO.			
a.	b.	c.	d.	e.	f.	g.	h.	i.

REMARKS	I certify that the above submitted items had been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as otherwise stated.	
	NAME OF CONTRACTOR	SIGNATURE OF CONTRACTOR

SECTION II - APPROVAL ACTION

ENCLOSURES RETURNED (*List by item No.*)	NAME AND TITLE OF APPROVING AUTHORITY	SIGNATURE OF APPROVING AUTHORITY	DATE

INSTRUCTIONS

1. Section l will be initiated by the Contractor in the required number of copies.

2. Each Transmittal shall be numbered consecutively. The Transmittal Number typically includes two parts separated by a dash (-). The first part is the specification section number. The second part is a sequential number for the submittals under that spec section. If the Transmittal is a resubmittal, then add a decimal point to the end of the original Transmittal Number and begin numbering the resubmittal packages sequentially after the decimal.

3. The "Item No." for each entry on this form will be the same "Item No." as indicated in the Submittal Register

4. Submittals requiring expeditious handling will be submitted on a separate Form.

5. Items transmitted on each transmittal form will be from the same specification section. Do not combine submittal information from different specification sections in a single transmittal.

6. If the data submitted are intentionally in variance with the contract requirements, indicate a variation in column h, and enter a statement in the Remarks block describing he detailed reason for the variation.

7. When submittal items are transmitted, indicate the "Submittal Type" (*SD-01 through SD-11*) in column c of Section I.
   Submittal types are the following:

SD-01 - Preconstruction	SD-02 - Shop Drawings	SD-03 - Product Data	SD-04 - Samples	SD-05 - Design Data	SD-06 - Test Reports
SD-07 - Certificates	SD-08 - Manufacturer's Instructions	SD-09 - Manufacturer's Field Reports		SD-10 - O&M Data	SD-11 - Closeout

8. For each submittal item, the Contractor will assign Submittal Action Codes in column g of Section I. The County approving authority will assign Submittal Action Codes in column i of Section I. The Submittal Action Codes are:

   A -- Approved as submitted.
   B -- Approved, except as noted on drawings. Resubmission not required.
   C -- Approved, except as noted on drawings. Refer to attached comments. Resubmission required.
   D -- Will be returned by separate correspondence.
   E -- Disapproved. Refer to attached comments.
   F -- Receipt acknowledged.
   X -- Receipt acknowledged, does not comply with contract requirements, as noted.
   G -- Other action required *(Specify)*
   K -- Government concurs with intermediate design. (*For D-B contracts*)
   R -- Design submittal is acceptable for release for construction. (*For D-B contracts*)

9. Approval of items does not relieve the contractor from complying with all the requirements of the contract.

Page 2 of 2

END OF SECTION 013300

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. See Division 1 Section "Closeout Procedures" for submitting warranties for Contract closeout.

C. See Divisions 2 through 33 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.2 SUBMITTALS

A. Proposed Equivalent Item Requests during bidding process:

Refer to Section I. – Instructions to Bidders, Paragraph 16. – Use of Brand Names/Substitutes of the solicitation document for request procedures.

B. Substitution Requests after Contract award:

1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

    a. Reasons why the specified product cannot be provided.
    b. Coordination information, including a list of changes or modifications needed to other parts of the Work that will be necessary to accommodate proposed substitution.
    c. Detailed comparison of significant qualities of proposed substitution with those of the product specified.
    d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    e. Samples, where applicable or requested.
    f. List of similar installations for completed projects with project names and addresses and names and addresses of Architects and owners, if requested.
    g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
    h. Statement of impact on the construction schedule. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
    i. Cost information, including a proposal of change, if any, in the Contract Sum.

j. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
k. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

2. Project Officer's Action: If necessary, Project Officer will request additional information or documentation for evaluation within five (5) business days of receipt of a request for substitution. Project Officer will notify Contractor of acceptance or rejection of proposed substitution within ten (10) business days of receipt of request, or five (5) business days of receipt of additional information or documentation, whichever is later.

a. Use product specified if Project Officer cannot make a decision on use of a proposed substitution within time allocated.

1.3 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

1.5 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Project Officer.
2. Special Warranty (if required by other specification sections): Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide additional rights for the County.

B. Special Warranties (if required by other specification sections): Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to Divisions 2 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and that are new at time of installation.

1. Standard Products: Unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects by the manufacturer.

B. Product Selection Procedures:

1. Sole-Source: Where Specifications name a single product and manufacturer without the words “or approved equal,” provide the named product that complies with requirements. No substitutions will be accepted.

2. Approved Equal: Where Specifications name a single product and manufacturer accompanied by the words “or approved equal,” the specification establishes a minimum standard for design and quality. This should not be construed as eliminating from competition other products of equal or better quality that also satisfy the design intent of the project (as determined by the Project Officer). In this case, either provide the named product that complies with requirements, or submit proposed equivalent items for consideration by the Project Officer in accordance with process described in the solicitation documents.
    a. Protocols for Approved Equal Request(s):
        a) When the project is in construction and the specified product(s) cannot be procured due to the following;
        b) Product is no longer available
        c) The County and the Contractor agree that the lead time is too long
        d) If there is a “better” product.
        e) Contractor shall submit Approved Equal request to Construction Manager for approval.

3. Product List: Where Specifications include a list of manufacturers and products, provide the specified quantity of one of the named products that complies with requirements or an equivalent. Product selected shall be compatible with products previously selected, even if previously selected products were also options. Alternatives not listed will be considered by the Project Officer based on the compliance with specification requirements. To request consideration of an alternative not listed, submit proposed equivalent items for consideration by the County in accordance with process described in the solicitation documents.

END OF SECTION 016000

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Warranties.
3. As-Built Drawings
4. O/M Manuals
5. Final cleaning.

B. See all other Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.2 FINAL COMPLETION

A. Preliminary Procedures: See 'Final Completion' in ITB Terms and Conditions.

B. Inspection: Submit a written request for inspection for Final Completion. On receipt of request, Project Officer will either proceed with inspection or notify Contractor of unfulfilled requirements. Project Officer will prepare the Certificate of Final Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by the Project Officer, that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Acceptance.

1.3 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment.
2. Submit copy of Project Officer's Final Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Project Officer. The copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit As-built drawings and Operation and Maintenance Manuals.

5. Instruct Project Officer's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Project Officer will either proceed with inspection or notify Contractor of unfulfilled requirements. Project Officer will process final payment after inspection or will notify Contractor of construction that must be completed or corrected before payment will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three (3) copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1.5 WARRANTIES

A. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

B. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Clean each surface or unit to condition expected in an average cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Remove tools, construction equipment, machinery, and surplus material from Project site.
d. Remove snow and ice to provide safe access to site.
e. Remove labels that are not permanent.
f. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

g. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
h. Replace parts subject to unusual operating conditions.
i. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
j. Leave Project clean and ready for use.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

SECTION 033000 – CAST IN PLACE CONCRETE

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes, but is not limited to, the following:

1. Foundation for Site Furnishings and Fieldstone Boulders
2. Foundation for Playground Equipment and Structures
3. Cast-in-Place Walls and Steps

1.2 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

C. Comply with ACI 301, "Specification for Structural Concrete."

D. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For concrete pavement mixture.

C. Delivery Tickets: For concrete including the date, time, truck identification, concrete plant, plant inspector, ticket and load number concrete class and design mix, moisture content of aggregates, quantity and location of placement.

PART 2 – PRODUCTS

2.1 STEEL REINFORCEMENT

D. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

E. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

F. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed, sizes as shown on the drawings.

G. Plain Steel Wire: ASTM A 82, as drawn.

H. Deformed-Steel Wire: ASTM A 496.

I. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice."

2.2 CONCRETE MATERIALS

A. The design of the concrete mix, equipment, workmanship, and materials shall conform to the applicable requirements of Division 3 sections, except as hereinafter specified. Minimum compressive strength after 28 days shall be 3500 psi. Maximum size of aggregate shall be 1-01/2 inches, but not less than 3/4 inch. Air content by volume shall be 4-1/2 per-cent, plus or minus 1-1/2 percent. The same brand of cement, source of sand, and water/cement ratio shall be maintained for each load of concrete.

1. Provide Class A3 General Use (3,500 psi) concrete for curbs (all) and site furnishing foundations.
2. Provide 4,500 psi concrete for all walls, concrete pavement and steps.
3. Provide concrete for specialty items (playground equipment, fence, shade structures etc.) as per the manufacturer’s recommendation.

B. Portland Cement air-entrained, ASTM C 150, Class A3 General Use (3,500 psi) per VDOT 217.

2.3 CURING MATERIALS (non colored concrete)

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.

2.4 EXPANSION JOINT FILLER

A. Joint filler shall be ½ inch preformed asphalt expansion joint material conforming to ASTM D994 or ASTM D1751.

B. If bituminous fiber material is used, a bond breaker such as one-half (1/2”) wide polyethylene tape or five eighths inch (5/8”) diameter expanded polyethylene foam backer rod shall be installed as recommended by the manufacturer.

2.5 EXPANSION JOINT SEALANT

A. Expansion Joint Sealant: Sealant shall be one-component polyurethane-base elastomeric sealant. Asphalt cement will not be approved as a substitution. Sealant color shall match color of adjacent pavement. Where joints fall between pavement sections of different colors, color shall be approved by Project Officer and Landscape Architect to match one of the pavement colors.

1. Products: Subject to compliance with requirements, provide one of the following or an approved equal:

a. SikaFlex-1a by Sika Corporation.
b. Sonolastic NP-1 by Sonneborn and Chem Rex Inc.

PART 3 – EXECUTION

3.1 SAMPLING, TESTING AND ENFORCEMENT

A. Sampling and testing shall be performed in accordance with Section 03100- Concrete Formwork Reinforcement and Materials, Arlington County Department of Environmental Services Construction Standards and Specifications.

3.2 PREPARATION FOR PLACING CONCRETE

A. Formwork:

1. General: Construct forms of sound material, and of the correct shape and dimensions shown on the Drawings, constructed tightly and of sufficient strength. Brace and tie the forms together so that the movement of workers, 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. 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.

2. Chamfered Corners: Unless otherwise indicated, provide chamfered corners on all exposed corners. Provide 3/4 inch moldings in forms for all chamfering required.

3. 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.

4. 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.

5. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.

B. Preparing the Subgrade: Thoroughly prepare and compact the subgrade as specified in Section 312000 – Earthwork. Subgrade shall be excavated to the required elevation below the finished surface of the pavement in accordance with grades and lines shown on the Drawings.

C. Layout: Cast in place concrete shall have true curves to the radii indicated on the Drawings. No straight segments or tangents shall be approved. A digital CADD file containing the project layout is available from the Project Officer to aid in the installation of cast in place concrete elements.

D. Dewatering: 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. 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.

E. Inspection: After placement of reinforcing steel in the forms, and prior to placing concrete, notify the Project Officer so that proper inspection may be made. Such notification shall be made at least 48 hours in advance of placing concrete to permit proper arrangements for inspection.

3.3 DELIVERY

A. Submit a delivery ticket indicating the mix and design strength of the concrete, design slump, and time of leaving the truck mixer with each batch at the time of delivery. Record on the back of the delivery ticket: (a) the time of arrival of the truck mixer on the site; (b) the time of deposit of the concrete from the truck; and (c) the place of deposit of the concrete. The completed delivery ticket shall be delivered to the Project Officer. Failure to deliver such completed ticket to the Project Officer will be cause for the Project Officer to reject the deposited concrete at any time and cause it to be removed and replaced at no additional expense to the County.

B. All batching of concrete shall be in accordance with the manufacturer’s instructions.

C. 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.

3.4 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. Depositing of concrete shall be in accordance with the manufacturer’s instructions.

D. Mix concrete in such quantities as required for immediate use and place prior to loss of slump. Do not re-temper concrete.

E. 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.

3.5 REMOVAL OF FORMS

A. After concrete has been placed, all forms, bracing and supports shall remain undisturbed long enough to allow the concrete to reach the strength necessary to support with safety its own weight plus any live load and earth pressure that might be placed upon it without causing excessive settlement or deflective or any temporary or permanent damage to the structure. Prevent the breaking of edges and corners of concrete in the stripping of forms. Upon removal of formwork, immediately patch honeycombed areas and other voids to the satisfaction of the Project Officer.

B. Thoroughly clean forms and recoat with specified form coating before each reuse. Do not reuse any form for exposed work which cannot be reconditioned to "like new" condition. Discard forms considered unsatisfactory by the Project Officer. Apply form coating to all forms in accordance with the manufacturer's specifications. Apply form coatings before placing reinforcing steel.

3.6 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 sleeves, projecting inserts, anchor bolts and other embedded items from disturbances until the concrete has sufficiently set to hold such items.

3.7 CONTROL JOINTS

A. Provide sawn or tooled joints or removable insert strips; depth equal to 1/4 slab thickness. Spacing as required and approved by the Project Officer.

3.8 EXPANSION JOINTS

A. Furnish and install preformed expansion joint material at locations shown on the drawings or every 20 feet on center, minimum, full depth of concrete at approved locations by Project Officer and Landscape Architect. 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. Provide smooth dowels across joint which permit 1 inch horizontal movement and no vertical shear movement.

B. Tool the concrete edges at expansion or contraction joints to a one-eighth (1/8)-inch radius.

3.9 FINISHING

A. Finishing and caulking of concrete shall be in accordance with the manufacturer’s instructions.

B. Concrete Walls: All areas of exposed concrete walls from the top of the wall to 1 foot below the finished grade of the structure shall be finished 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.
4. All walls shall receive a light sandblast finish. Prepare mock-up for approval prior to commencing work.

C Concrete Flush Curbs Troweled with Fine-Broom Finish:

1. General: Do not add water to concrete surfaces during finishing operations.
2. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
3. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.

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 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 the Specifications.

B. Remove all defective concrete and replace in a manner meeting with the Project Officer's approval. Should only surface imperfections occur, patch at the discretion of, and in a manner satisfactory to, the Project Officer. Permission to patch the work shall not be considered as a waiver of the County's right to require complete removal and replacement of such defective work should the patching fail to satisfactorily restore the required quality and appearance of the work.

PART 4 – MEASUREMENT

4.1 The measurement of CAST IN PLACE CONCRETE shall be the number of CUBIC YARDS constructed, including, but not limited to, all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 033000

SECTION 034819 – PRECAST CONCRETE TREADS AND RISERS

PART 1 – GENERAL

1.1 SUMMARY

A. Provide and install precast concrete stair treads and risers as shown on the construction bid drawings.

1.2 RELATED SECTIONS

A. Section 321313 Concrete Pavement

B. Section 033000 Cast in Place Concrete

B. Arlington County DES Construction Standards and Specifications

C. Construction Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM C 33 Concrete Aggregates
2. ASTM C139 Concrete Compressive Strength
3. ASTM C 144 Aggregate for Masonry Mortar
4. ASTM C 150 Portland cement
5. ASTM C 642 Water Absorption, Density, Voids in Hardened Conc.
6. ASTM C 666 Rapid Freeze/Thaw Resistance of Conc.
7. ASTM C 979 Pigments for Integrally Colored Concrete
8. ASTM C 1028 Coefficient of Friction

1.4 SUBMITTALS

A. Shop Drawings: Provide detailed setting drawings and templates showing recommended installation and jointing.

B. Samples:

1. Submit two 3” x 3” wide by full depth sample of stair tread/riser unit of the color specified for approval.

C. Manufacturer's Installation Details: Submit complete plan for installation of each stair, include tread and riser sizes.

D. Warranty: Provide certified copies of manufacturer's product warranties.

1.5 QUALITY ASSURANCE

A. Compliance with Regulations: Comply with requirements of state and local building

codes and with rules and regulations relating to building accessibility.

B. Qualifications of Manufacturer: Company specializing in manufacture of precast concrete stair treads with a minimum of 10 continuous years of documented experience.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials to the installation site in the manufacturer's original packaging. Packaging shall contain manufacturer's name, customer name, order, identification number and other related information.

B. Handle and store stair treads and risers in accordance with manufacturer's recommendations.

1.7 WARRANTY

A. Provide warranty covering precast concrete stair treads and risers against defects in material and workmanship for a period of 5 years. Unusual abuse and neglect are excepted.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Hanover Architectural Products, Prest® Pavers On-Grade, or approved equal.
Hanover, PA 17331
(800) 426-4242
www.hanoverpavers.com

2.2 MATERIALS

A. Product:
1. Treads/ Risers: Precast Paver

B. Stair treads/ risers shall be high density, hydraulically pressed precast concrete pavers, consisting of the following:
1. Coplay Cement, Type I, Buff.
2. Aggregate: A blend from 200 mesh to 5/8” with a light gray color. Should have a PA S.L. Test of H and a specific gravity of 2.79 and absorption of 2.60
3. Compressive strength: Minimum 8,000 psi.
4. Water absorption: not more than 5% average.

2.3 COLOR AND FINISH

A. Color: To be Limestone Gray. Color shall be integral.

B. Finish: Top surface shall be Tudor.

C. Unit size:

1. Tread: 2” thick x 35 3/8” long x 17 5/8” wide (to form a 5’ wide stair)

2. Riser: 2 1/2" thick x 32 ½" long x 5 7/8" wide
3. Alternate Joints from treads to risers

D. Factory infused Application of Sealer: Factory apply one coat of penetrating sealer to all surfaces of paving units.

E. Nosing edge only: Tread nosing edge shall be Hanover Profile "C". All other edges shall be straight.

2.4 PAVER PHYSICAL PROPERTIES

A. Density: 155 lbs/cu ft.

B. Water absorption: Not more than 5%.

2.5 SEALANT

A. Sealer shall be:
Hanover Natural Sealer as manufactured by Hanover Architectural Products or approved equal.

B. Sealer shall be a liquid sealer to protect pavers from water, alkalis, acids, air borne pollutants, dirt, oil and UV light while allowing paver surface to breathe. Sealer shall be non-staining, penetrating material, suitable for exterior use, type which does not discolor the surface. Sealant shall maintain the natural appearance of the paver.

2.6 MORTAR

A. Setting Bed and Joints: Mortar shall be composed of one (1) part Portland cement and a maximum of two (2) parts sand with not more than five (5) percent of the cement content of hydrated lime. Contractor shall add LATICRETE admixture to mortar as per manufacturer's specifications.

1. Setting bed shall be 1" thick.
2. Joints shall be 3/8" wide at stairs
3. Color: To match Precast Paver.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that structural components of stairs are in place, aligned and level, within tolerances for proper installation of stair treads and risers and required structural inspections have been completed.

3.2 INSTALLATION – GENERAL

A. Installation shall comply with requirements of applicable building codes and state and local jurisdictions.

B. Install stair treads aligned, level and with uniform treads and risers throughout the extent of the stair. Where cutting is necessary, use powered masonry saw.

C. Do not install stair treads having excessively stained, defaced, or damaged faces, edges, or corners where to remain exposed. Remove dust and dirt from stair tread units using oil-free compressed air.

D. Stair construction shall conform to all current ADA standards.

3.3 CLEANING AND SEALING PAVERS

A. Clean exposed surfaces of stair treads and risers. Use cleaners appropriate for precast concrete finishes and colors. No acid-based cleaners may be used.

B. Apply sealer after newly installed pavers as per manufacturer's instructions. Pavers shall be completely dry, clean and free of oil, grease, dust, dirt, sand, efflorescence and frost.

C. Sealer shall not be applied when temperatures are 50 degrees and below.

3.4 COMPLETION

A. Protect precast concrete paving units from damage due to subsequent building operations.

B. After installation and before completion, inspect precast concrete paving units for construction damage and obtain new precast concrete paving units if required.

C. Immediately prior to final acceptance of project, clean precast concrete paving units.

PART 4 – MEASUREMENT

4.1 The measurement of PRECAST TREADS AND RISERS shall be the number of LINEAR FEET constructed, including, but not limited to, all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 034819

SECTION 055200 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide and install all aluminum handrail and post and steel metal fence as shown on the construction bid drawings.

1.2 RELATED SECTIONS

A. Section 033000 – Cast in place concrete

B. Construction Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 QUALITY ASSURANCE

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

B. Conform to requirements of the following Reference Standards or as modified and supplemented hereinafter.

1. Uniform Building Code (latest edition)
2. Applicable Arlington County building codes and regulations
3. American Institute of Steel Construction (AISC)
4. American Iron and Steel Institute (AISI)
5. Aluminum Association
6. Aluminum Standards and Data
7. Standards for Aluminum Sand and Permanent Mold Castings
8. American Welding Society (AWS)
9. AAMA 2603 – Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels, latest edition.
10. NAAMM – Metal Finishes Manual.
11. NAAMM – Pipe Railing Manual.
12. NFPA – 101 Life Safety Code.
13. NOMMA – Metal Rail Manual.

C. American Society for Testing and Materials (ASTM) Publications:

1. ASTM A36 - Structural Steel.
2. ASTM A121 - Zinc-Coated (Galvanized) Steel Barbed Wire.
3. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
5. ASTM A1264 - Safety Requirements for Workplace Floor and Wall Openings,

Stairs, and Railing Systems.

1. ASTM B26 – Specification for Aluminum Alloy Sand Castings.
2. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
3. ASTM B221 – Standard Specification for Aluminum and Aluminum-Ally Extruded Bars, Rods, Wire, Profiles, and Tubes, latest edition.
4. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; latest edition.
5. ASTM B429/B429M – Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube, latest edition.
6. ASTM D822 - Tests on Paint and Related Coatings Using Filtered Open-Flame Carbon-Arc Exposure Apparatus.
7. ASTM B483/B483M – Standard Specification for Aluminum-Alloy Drawn Tubes and Pipe for General Purpose Applications, latest edition.
8. ASTM D1794 - Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
9. ASTM D3363 - Test Method for Film Hardness by Pencil Test.
10. ASTM E894 – Standard Test Methods for Anchorage of Permanent Metal Railing Systems and Rails for Buildings.
11. ASTM E935 – Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings, latest edition.

D. Aluminum and steel fabricators shall be experienced in aluminum and steel fabrication including: cutting, bending, fastening, and finishing.

E. Source Limitations: Obtain each type of railing through one source from a single manufacturer.

F. Welding: Qualify procedures and personnel according to the following:

a. AWS D1.2, "Structural Welding Code--Aluminum."

1.4 DESIGN REQUIREMENTS

A. Railing assemblies and attachments shall be designed, fabricated, and installed in accordance with ASTM A1264, ASTM E894, ASTM E935 to support:

1. 200 pounds concentrated loading applied at any point in any direction.

2. 50 pounds per linear foot uniform load applied horizontally to top of rail.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's published literature for specified products and accessories as applicable including manufacturer's specifications, performance calculations, and physical characteristics specified material.

Product must be equal in durability to the one specified herein. The products specified are for heavy duty park usage.

B. Shop Drawings: Before any fabrication has begun, submit detailed shop drawings of all metal items showing layout (plan), sizes of metal components, method of assembly, hardware, and anchorage or connection to other work.

C. Samples: Submit 4-inch long metal pipe product samples for each type of product used.

1.6 QUALITY ASSURANCE

Standard structural steel shapes and plates shall be in conformance with ASTM A-36.

Steel Pipe shall be in conformance with ASTM A 269 Type 304 or Type 316.

1.7 DELIVERY, STORAGE AND HANDLING

A. Ship, store, and handle all items so as to protect metal components from damage on site. Store in a safe location, out of pedestrian and vehicular traffic and protected from weather. Repair or replace any damaged components before installation.

1.8 WARRANTY

A. Provide not less than 5-year warranty for factory finish against cracking, peeling, and blistering under normal use.

PART 2 - PRODUCTS

2.1 HANDRAIL AND POSTS

A. Standard material for handrails, posts, fittings, connections, cover flange and hardware shall be aluminum. Handrails and post shall be schedule 40 in alloy 6063.

B. Refer to construction details for post spacing and height.

2.2 FACTORY FINISHES

a. Finish: Clear anodized-AA-M10-C22-A31 (204R1). Pipe shall be extruded with a clean smooth surface finish.

2.3 FABRICATORS

A. Qualifications:

A firm with a minimum of 5 years of experience in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance.

B. Handrail and Post Basis of Design: Handrail and Posts shall be a pipe railing system without welding such as Connectorail by Julius Blum & Co., Inc., Carlstadt, NJ, 800-526-6293.

C. Steel Metal Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Action Fabricators & Erectors, Inc., Hyattsville, MD, 301-322-7600
2. Hallmark Fabricators, Inc., Richmond, VA, 804-230-0880

D. Steel Manufacturers NOT listed above must meet the following requirements:

1. Hold not less than five (5) years of producing high quality, easily maintained, and cost-conscious metal fabrications.

2. Demonstrate a long-term relationship with municipalities and public entities in the region, such as Arlington County.

3. Be prepared to fabricate metal work on time and within acceptable budget provisions while providing the expected quality of craftsmanship.

2.4 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.

B. Aluminum:

1. Extruded Aluminum Bars and Tubing: ASTM B 221 (ASTM B 221M), Alloy 6063-T5/T52.

2. Extruded Structural Aluminum Pipe and Round Tubing: ASTM B 429, Alloy 6063-T6.

a. Provide Standard Weight (Schedule 40) pipe, unless otherwise indicated.

3. Drawn Seamless Aluminum Tubing: ASTM B 210 (ASTM B 210M), Alloy 6063-T832.

4. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.

5. Aluminum Die and Hand Forgings: ASTM B 247 (ASTM B 247M), Alloy 6061-T6.

6. Aluminum Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

C. Ferrous Metals:

1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Tubing: ASTM A 500, cold-formed steel tubing.
3. ASTM A 653/A 653M, structural steel, Grade 33 (Grade 230), with G90 (Z275) coating; 0.079-inch (2-mm) nominal thickness.

2.5 FASTENERS

A. General: Provide the following:

1. Steel Metal: Type 304 stainless-steel fasteners.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated.

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.

D. Anchors: Provide chemical or torque-controlled expansion anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

E. Epoxy Bolts in Concrete: Use QUIKRETE High Strength, PC-Concrete, or approved equal. Install per manufacturer's recommended directions. Provide bolts, washers, nuts, and shims as needed.

2.6 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI #79.

B. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107.

C. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless otherwise indicated.

D. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.7 FABRICATION

A. General: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.

1. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
2. Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. Finish exposed welds smooth and blended.
3. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
4. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

5. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded metal strap anchors, not less than 24 inches (600 mm) o.c.

B. Miscellaneous Framing and Supports: Provide framing and supports not specified in other Sections as needed to complete the Work. Fabricate units from shapes, plates, and bars of welded construction. Cut, drill, and tap units to receive hardware, hangers, and similar items.

C. Miscellaneous Steel Trim: Fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Exterior Miscellaneous Steel Trim: Prime with zinc-rich primer.

2.8 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finish metal fabrications after assembly.

B. Steel Finishes:

1. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below for environmental exposure conditions of installed metal fabrications:

a. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

2. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting," for shop painting.

3. Powder Coating: The coating shall be TGIC-Polyester Powder applied to the Zinc coated steel via the powder coating process. The manufacturer shall perform all processes required to achieve a smooth material bond. The surface coat shall be an electrostatically sprayed, lead-free, TGIC-Polyester powder coating applied to a minimum of 5 mil thickness which shall be oven cured at temperatures between 400 and 450 degrees Fahrenheit for a period of 20 minutes. Manufacturer’s directions for storage and use shall be adhered to. Material surfaces shall be protected during shipment so as to arrive mar and scratch free in the field.

a. The powder-coating shall conform to the following ASTM Designations:

Adhesion D 3359-B
Pencil Hardness (H-2H) D 3363
Flexibility D 522 (Mod)
Impact Resistance D 2794 (Mod)
Abrasion Resistance D 4060 (Mod)
Salt Spray Resistance B117

Humidity Resistance D2247

b. Colors: refer to Drawings

PART 3 - EXECUTION

3.1 FIELD PREPARATION

A. Prior to fabrication, field verify required dimensions.

B. Provide sleeve setting holes for embedment of posts. Sleeves shall not be visible after installation of non-metallic grout. For core drilling, concrete shall have cured for a minimum of 28 days. Hole shall be 2 inches in diameter greater than post width.

3.2 FABRICATION

A. Material 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.

B. Concrete pads shall be constructed as shown on the construction drawings before submittal shop drawings and fabrication of metal handrail. Verify all measurements at site before fabrication. This will ensure proper fabrication of handrail to the built slope of the walk.

C. Construct to sizes indicated using rolled shapes and/ or plates as detailed.

3.3 INSTALLATION

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.

B. Connect handrail pipe to concrete footing as shown on the Drawings. Handrails to be set straight, true, and plumb without curves and bends from vertical.

C. Protect all dissimilar metals from galvanized corrosion by pressure tapes, coatings or isolators.

3.4 PROTECTION

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.

3.5 TOUCH UP PROCEDURES

A. Repair all areas that may have been damaged during installation, construction or at discretion of the Project Officer. Materials damaged during delivery shall not be accepted prior to installation.

B. Remove all oil, grease, and loosely adhering deposits from area to be touched up.

PART 4 - MEASUREMENT

4.1 The measurement of METAL HANDRAIL shall be the number of LINEAR FEET constructed, including, but not limited to, all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 055200

PART 1 - SECTION 101400 – SIGNAGE

1.1 SUMMARY

A. This Section includes, but not limited to, the following:

1. Playground Age Appropriate Playground Signs
2. Bioretention Sign
3. Reforestation Sign

B. Related sections:

1. Section 033000 – Cast in Place Concrete

1.2 REFERENCES

A. Department of Justice 2010 ADA Standards for Accessible Design (‘2010 ADA’)

B. Aluminum shall conform to ASTM designation B209, of either 5052-H38, or 6061-T6 alloy.

1.3 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings for all signs: Include plans, elevations, sections of components, and installation details.

1.4 WARRANTY

A. Warranty Period: Minimum of one year from date of Final Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Available Manufacturers: Subject to compliance with requirements, provide the signs by the following or approved equal:

1. Engraphix Architectural Signage, Inc., 132 Hanley Industrial Court, St. Louis, MO 63144 (314) 781-7878.

2. Gelberg Signs, 6511 Chillum Place, NW, Washington, D.C., 20012; (202) 882-7733

3. Sign graphics, text layout and color shall be as shown on the shop drawings.

B. Manufacturers NOT listed above must meet the following requirements:

1. The vendor(s) shall have a long and established history (no less than five (5) years) of producing high quality, easily maintained, and cost-conscious sign fabrications.

2. The vendor shall a long-term relationship with municipalities and public entities in the region, such as Arlington County.

3. Vendor shall be prepared to fabricate sign(s) on time and within acceptable budget provisions while providing the expected quality of craftsmanship.

2.2 MATERIALS

A. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of alloy 5005-H15.

B. Vinyl Film: Opaque, nonreflective vinyl film, 0.0035-inch minimum thickness, with pressure-sensitive adhesive backing, suitable for exterior applications.

C. Colored Coatings for Plastic Sheet: Nonfading coatings, including inks and paints for copy and background colors. Use coatings that are recommended by manufacturers for optimum adherence to type of plastic used.

D. Steel Plate: ASTM A36.

E. Steel Tubing: ASTM A500, Grade B.

F. Concrete for Postholes: Comply with requirements in Division 3 Section "Cast-in-Place Concrete."

G. Hardware: Hot-dipped galvanized or stainless steel.

2.3 POSTS

A. General: Fabricate posts to lengths required for mounting method indicated.

1. Direct-Burial Method: Provide posts 36 inches longer than height of sign to permit direct embedment in concrete foundations.

2. Size: As indicated on the drawings.

3. Color: As shown on the drawings.

2.4 SIGN PANELS

A. Signs:
   1. Unframed Single-Sheet Panels: Provide unframed single-sheet sign panels with edges mechanically and smoothly finished.
      a. Panel Material: 0.125-inch- thick aluminum sheet.
      b. Panel Finish: Per plans

2.5 TEXT

A. All sign text shall read as shown on the drawings.

2.6 GRAPHICS

A. Graphic Content and Style: Provide sign copy that complies with requirements indicated in Drawings for size, style, spacing, content, mounting height and location, material, finishes, and colors of signage.

2.7 ALUMINUM FINISHES

A. Baked-Enamel Finish: Cleaned with inhibited chemicals; acid-chromate-fluoride-phosphate conversion coating; thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603, medium gloss.

   1. Color: As selected by Architect from manufacturer's full range.

2.8 ACCESSORIES

A. Mounting Methods: Use fasteners fabricated from materials that are not corrosive to sign material and mounting surface.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Excavation: In firm, undisturbed or compacted soil, drill or (using a post-hole digger) hand-excavate holes for posts to diameters and spacing indicated.
   1. Excavate hole depths as indicated on the drawings.

B. Setting Posts: Center and align posts in holes 3 inches above bottom of excavation, unless otherwise indicated. Place concrete and vibrate or tamp for consolidation. Check for alignment and hold in position until concrete has achieved its initial set.

C. Install signs level, plumb, and at height indicated, with surfaces free from distortion.

PART 4 – MEASUREMENT

4.1 The measurement of PLAYGROUND AGE-APPROPRIATE SIGNAGE – DOUBLE SIDED shall be the number of EACH constructed, including, but not limited to, all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

4.2 The measurement of BIORETENTION SIGN – DOUBLE SIDED shall be the number of EACH constructed, including, but not limited to, all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

4.3 The measurement of REFORESTATION SIGNAGE – SIGNLE SIDED shall be the number of EACH constructed, including, but not limited to, all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 101400

SECTION 116800 - PLAYGROUND EQUIPMENT AND STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Play equipment and structures.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show equipment layout, use zones, fabrication and installation details for playground equipment and structures. Shop drawings shall be submitted to and approved by the Project Officer prior to ordering equipment.

C. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Extent of safety surface systems and use zones for equipment.
2. Critical heights for playground surface or fall heights for equipment.
3. Color: As selected by Landscape Architect from manufacturer's full range of colors.

D. Product certificates.

E. Product test reports.

F. One Installation and Maintenance Manual, complete, as provided by manufacturer.

G. Warranty certificates as described in 1.4 “Warranty” below.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Playground equipment shall be installed by a manufacturer certified installer.

B. Manufacturer Qualifications: A firm whose playground equipment components have been certified by IPEMA's third-party product certification service.

C. Safety Standards: Contractor shall be responsible that all play equipment and layout is complying with or exceeding requirements specified below; any discrepancies or conflicts shall be brought to the attention of the Project Officer prior to installation:

1. ASTM F 1487.
2. CPSC No. 325.

D. Preinstallation Conference: Contractor shall notify Project Officer 72 hours prior to installation of playground equipment.

E. After installation and before its first use, playground equipment shall be thoroughly inspected by a third-party person that is qualified to inspect playgrounds for safety.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of playground equipment that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: Five years from date of Final Completion, or manufacturer’s standard warranty period, whichever is greater.

B. Provide Manufacturer’s product liability insurance certificate of at least one million dollars with the County named as certificate holder, prior to delivery.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

1. Play equipment, play elements and swings shall be as shown on the drawings. All products shall be as manufactured by the following:

a. Kompan, Kensington, MD 20895, (301) 213-6433
b. Playground Specialists Inc., Thurmont, MD, (800) 385-0075
c. Gametime, Thurmont, MD, (800) 385-0075
d. Landscape Structures, Delano, MN, (888)438-6574

2. NO SUBSTITUTIONS.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Extruded Bars, Profiles, and Tubes: ASTM B 221.
2. Cast Aluminum: ASTM B 179.
3. Flat Sheet: ASTM B 209.

B. Steel: Comply with the following:

1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Pipe: ASTM A 53/A 53M or ASTM A 135, standard-weight.
3. Steel Tubing: ASTM A 500 or ASTM A 513, cold formed.
4. Steel Sheet: ASTM A 1011/A 1011M.
5. Perforated Metal: Steel sheet not less than 0.0747-inch uncoated thickness; manufacturer's standard perforation pattern.
6. Expanded Metal: ASTM F 1267, Type II (expanded and flattened), manufacturer's standard carbon-steel sheets, deburred after expansion.
7. Woven Wire Mesh: Manufacturer's standard, with wire complying with ASTM A 510.

C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666; Type 304.

D. Castings and Hangers: Malleable iron, ASTM A 47/A 47M, Grade 32510, hot-dip galvanized.

E. Post Caps: Cast aluminum or color-impregnated, UV-stabilized, mold-resistant polyethylene or polypropylene; color to match posts.

F. Platform Clamps and Hangers: Cast aluminum or zinc-plated steel, not less than 0.105-inch-nominal thickness.

G. Hardware: Manufacturer's standard; commercial-quality; corrosion-resistant; hot-dip galvanized steel and iron, stainless steel, or aluminum; of a secure and vandal-resistant design.

H. Fasteners: Manufacturer's standard; corrosion-resistant; hot-dip galvanized or plated steel and iron, or stainless steel; permanently capped, and theft resistant.

I. Opaque Plastic: Color impregnated, UV stabilized, and mold resistant.

J. Glass Fiber Reinforced Concrete (GFRC): Air Entrainment: 6% - 8% (per ASTM C260)

2.3 Cast-In-Place-Concrete

A. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete".

2.4 Glass fiber reinforced concrete (GFRC)

A. Sculpted structures shall have GFRC manually applied utilizing a multi-layered technique. Layers shall be applied with minimal interruption between layers and be no less than 3/4" thick at any location (except designed features).

B. All manually applied GFRC shall be completely supported by a steel mesh 100% MIG welded sub-structure which is welded to a steel base. GFRC shall be mechanically ‘locked’ to the sub-structure as part of the design and application process. Wire shall not be used to connect any component.

C. The outermost face layer of concrete shall NOT include glass fiber.

D. Concrete components shall have a 10-year limited warranty against structural failure due to natural deterioration or manufacturing defects. Minor chips, hairline cracks and efflorescence are inherent in concrete products and are not covered by warranty.

2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.6 ALUMINUM FINISHES

A. Baked-Enamel Finish: Prepare, treat, and coat metal to comply with paint manufacturer's written instructions.

B. PVC Finish: Manufacturer's standard, UV-stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish.

C. Color: As selected by Landscape Architect from manufacturer's full range of colors.

2.7 IRON AND STEEL FINISHES

A. Powder-Coat Finish: Prepare, treat, and coat ferrous metal to comply with resin manufacturer's written instructions.

B. Baked-Enamel Finish: Apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat.

C. PVC Finish: Manufacturer's standard, UV-stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with minimum dry film thickness of 80 mils.

D. Color: As selected by Landscape Architect from manufacturer's full range of colors.

2.8 STAINLESS-STEEL FINISHES

A. Bright, Cold-Rolled, Unpolished Finish: No. 2B finish on exposed faces.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written installation instructions, unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated.

1. Maximum Equipment Height: Coordinate installed heights of equipment and components with finished elevations of playground safety surfacing. Set equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. Verify that playground equipment elevations comply with requirements for each type and component of equipment.

B. Post and Footing Excavation: Excavate holes for posts and footings as indicated in firm, undisturbed or compacted subgrade soil.

C. Post Set with Concrete Footing: Comply with ACI 301 for measuring, batching, mixing, transporting, forming, and placing concrete.

1. Set equipment posts in concrete footing, as indicated in manufacturer's instructions.
2. Embedded Items: Use setting drawings and manufacturer's written instructions to ensure correct installation of anchorages for equipment.

D. The Contractor shall wrap each piece of play equipment with plastic safety fence at the end of the workday. The Contractor shall be responsible for the maintenance of the fence throughout the installation period and shall remove the fence immediately after the final completion of the project by the County.

E. The Contractor shall install the specified safety surfacing as soon as possible after the play equipment installation is complete.

3.2 INSPECTION

A. Project Officer may make periodic inspections of the work during construction.

B. The Project Officer and County Staff will inspect the play equipment and all related work upon completion for compliance with plans, approved shop drawings and applicable change orders. The Playground Equipment manufacturer's representative shall be present at the final inspection.

C. The contractor shall engage the services of a third party CPSI inspector for certifying the play equipment after installation and reports shall be provided.

3.3 PROTECTION

A. Protect finishes from damage during construction with temporary protective coverings. Remove protective coverings at the time of completion.

B. Restore finishes damaged during installation and construction so no evidence remains of correction work.

PART 4 – MEASUREMENT

4.1 The measurement of PLAYGROUND EQUIPMENT AND STRUCTURES (BRAND NAMES – NO SUBSTITUTIONS ALLOWED) shall be the number of EACH constructed, including, but not limited to, all labor, materials, equipment, footings and incidental expenses necessary to com-

plete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 116800

SECTION 129300 - SITE FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Benches

1.2 RELATED SECTIONS:

A. Section 312000 - Earthwork

B. Section 033000 - Cast in Place Concrete

1.3 SUBMITTALS

A. Shop Drawings: Provide fabricator's shop drawings for each type of product indicated for approval prior to any fabrication.

B. Product Data: For each type of product indicated.

C. Fastener Data: For each type of fastener used.

D. Material Certificates: For site furnishings, signed by manufacturers.

E. Maintenance Data.

PART 2 - PRODUCTS

2.1 BENCH

A. Manufacturers: Subject to compliance with requirements, provide products by the following or approved equal: Kenneth Lynch & Sons, 114 Willenbrock Road, Oxford, Connecticut 06478. Phone: (203) 264-2831.

B. Style: 1939 New York World's Fair Bench, 8' length, Model No. 6737.

C. Frame: Cast ductile iron, powder coated Black or approved equal.

D. Slats: Shall be Ipe of the sizes and dimensions shown on the drawings.

1. Manufacturers: Subject to compliant with requirements, provide products by the following or approved equal: Ipe Woods USA, 869 E 4500 S #212, Salt Lake City, UT 84107. Phone: 1 844-674-4455.

2. Slats shall be milled perfectly smooth to the finished length. Each slat shall be of one continuous piece; no joints will be allowed. Lumber shall be parallel cut without heart center or sap-wood and shall be straight grained, maximum slope of grain to be 1:10. All milled surfaces shall be sanded smooth on all four sides and both ends after being worked to the required dimensions. All edges shall be eased to a radius of one-eighth inch (1/8"). All wood shall be thoroughly seasoned and shall contain no more than fifteen percent (15%) to twenty percent (20%) of moisture by weight.

3. Lumber shall be in sound condition, free from worm holes, knots, longitudinal heart cracks, firm or soft sap wood, fungus, and deformation (twisting or cupping) which cannot be removed during installation using normal installation methods and tools. Natural drying checks, to a maximum of one-eighth inch (1/8") in width, will be acceptable. Dimensional tolerance (measured at 20% moisture content) shall be plus or minus .08" in both width and thickness.

4. The County reserves the right to independently identify species of samples of wood taken from the job site. Random samples must be supplied to PRCR for identification, at the request of the Project Officer. Should the wood provided on the job site not be as previously approved, the Contractor shall replace all the incorrect wood at no extra cost to the County.

E. Hardware: Bolts, nuts, and washers used to secure slats to standards shall be stainless steel. Anchor bolts used to secure the benches to pavements may be either stainless steel or hot-dipped galvanized steel. Type and dimensions of all bolts, nuts, and washers shall be as indicated on the plans. Threads of all bolts shall have the ends upset after installation of nuts so as to render the connection vandal resistant.

F. Finish: Surfaces of the cast iron bench standards, bars and brace rods shall be powder coated with a polyester thermosetting Powder Coating as manufactured by Tiger Drylac, Sherwin Williams, PPG or Spraylat, or an approved equivalent. Powder coating shall be applied at a film thickness of 3 to 4 mils (.08 mm to .10 mm) by electrostatic spray process and bake finished per the manufacturer's directions. It shall be applied without voids, tears or cuts that reveal the substrate and shall thoroughly adhere to the metal without peeling when scratched with a pick device or knife blade point.

1. PPG Powder primer PCM70140
2. All surfaces shall first receive hot-iron phosphating treatment.
3. Finish shall pass the Cross Hatch test per ASTM standard, method B.
4. Color: To be specified by Landscape Architect from manufacturer's full range of colors including optional colors.

PART 3 - EXECUTION

3.1 GENERAL

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

C. Field locate and mark all site furnishings at the location indicated on the drawings for approval by the Landscape Architect before installing footers or drilling for surface mounted site furnishing in hardscape.

D. Install site furnishings level, plumb, true, and anchored.

E. Post Setting: Set cast-in support posts in concrete footing with smooth top. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.

3.2 CLEANING AND PROTECTION

A. After installation, clean soiled surfaces according to manufacturer’s written instructions. Protect site furnishings from damage until acceptance by Project Officer.

PART 4 – MEASUREMENT

4.1 The measurement of BENCHES shall be the number of EACH installed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 129300

SECTION 311000 - SITE CLEARING, DEMOLITION & REMOVALS

PART 1 - GENERAL

1.1 SUMMARY

A This Section includes the following:

1. Removal and repurposing of existing play equipment
2. Tree removal
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above-grade site items.
6. Disconnecting and capping or sealing site utilities.

B Footings, bases and foundations for the above-mentioned removals shall be removed under Section 312000, “Earthwork.”

C See Section 312500, “Temporary Erosion and Sediment Control” for temporary erosion and sedimentation control measures.

D See Section 311300, “Tree Protection and Root Pruning” for requirements related to tree protection.

1.2 MATERIAL OWNERSHIP

A Except for stripped topsoil, items identified by the Project officer as salvage, or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.3 PROJECT CONDITIONS

A Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Project Officer and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B Salvable Items: Carefully remove items indicated by the Project officer to be salvaged and store on Owner's premises where indicated in the Demolition Plans.

C Utility Locator Service: Notify Miss Utility at (800) 552-7001 for utility location services 72 hours prior to site clearing.

D Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Section 312000, "Earthwork."

1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A Protect and maintain benchmarks and survey control points from disturbance during construction.

B Erect temporary tree protection fencing around existing trees to remain as indicated on the drawings and as specified in Section 311300, “Tree Protection and Root Pruning”

C Protect existing site items to remain from damage during construction.

1. Restore damaged existing site items to their original condition, as acceptable to the Project Officer.

3.2 TREE REMOVAL

A General

1. Remove all trees marked for removal on the Demolition Plans in a manner that will protect the adjacent trees to be preserved, vegetation and other site elements to include but not limited to the existing site fence, adjacent properties, power lines, playground, and basketball court that are outside of the Limits of Disturbance (LOD)

B Tree removal

1. Remove all other trees using techniques as required.

3.3 EXISTING UTILITIES

A Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.

B Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Project Officer not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Project Officer's written permission.

3.4 CLEARING AND GRUBBING

A Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain.
2. Grind down stumps and remove roots larger than 2 inches, obstructions, and debris to a depth of 18 inches below exposed subgrade.
3. Chip removed tree branches, and trunks and legally dispose of off-site.

B Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of **6 inches** and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

A Remove sod and grass before stripping topsoil.

B Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

C Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

3.6 EXISTING SITE ITEMS

A Remove existing above-grade items as indicated and as necessary to facilitate new construction.

3.7 DISPOSAL

A Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

PART 4 – MEASUREMENT

4.1 The measurement of SITE CLEARING, PREPARATION, DEMOLITION AND REMOVALS shall be the LUMP SUM, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 311000

SECTION 311300 – TREE PROTECTION AND ROOT PRUNING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Protection and stress reduction of existing trees that interfere with, or are affected by, execution of the Contract, whether temporary or permanent.
2. Contractor coordination with Construction Manager, Arlington County Arborist, Third Party Arborist, County Landscape Architect, Consultant Landscape Architect
3. Pruning of existing trees roots that are affected by execution of the Work, whether temporary or permanent construction.
4. Tree Protection Measures of existing trees to remain, including but not limited to Root Aeration Matting, Root Protection Matting, Fencing, Signage, Mulch and Topsoil, Trunk Protection and Super Sonic Air Tool Excavation. Installation, sequencing and removal of the above.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated in Section 2.1

B. Certification: From Arlington County arborist or contract arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

C. Maintenance Requirements: From Arlington County arborist or contract arborist, for care and protection of trees affected by construction during and after completing the Work.

D. Contract arborist Qualifications: Copy of firm's ISA certification and individuals' ISA certification.
1. Two resumes and detailed qualifications from staff or team individuals assigned to this project.
2. Provide references for above from a minimum of three commercial, nongovernmental or governmental projects for whom similar tree preservation programs have been successfully implemented. Include the following: project name, size and scope; number and principal tree species of trees involved; relevant photos or aerials; tree preservation budget; scope of services provided; name and contact for client, designer or general contractor.

E. Shop Drawings: From General Contractor and their arborist, for specific protection work within tree critical root zones, including but not limited to:
1. Pavement demolition methods and hand removal methods within critical root zones.
2. Root Protection Mat materials, types and construction uses
3. Root Prune methods
4. Root Aeration Mat materials and installation
5. Tree Protection Fence and Signs
6. Mulch sample and source

7. Super Sonic Air Tool excavation methods

F. Contractor Arborist Seasonal/Monthly Report: Submit seasonal/monthly reports (at direction of Construction Manager), including but not limited to the following:
   1. Existing Conditions: Upon installation of designated protection measures the Contract Arborist submit documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
   2. Site Documentation: Submit documentation of all tree protection work for each tree. These activities are including but not limited to: root pruning, tree protection fencing, excavation within critical root zones, temporary root protection or root aeration matting. Documentation shall include tree numbers, date or dates of installation / applications and plan markup. Representative photos of each activity are also required.
   3. Recommendations for maintenance and stress reduction measures as a result of demolition/construction.

1.3 PROJECT CONDITIONS

A. The following practices are prohibited within all tree protection areas except as specifically indicated herein:
   1. Storage or stockpiling of construction materials, chemicals, debris, or excavated materials
   2. Parking vehicles, trailers or equipment
   3. Erection of sheds or structures
   4. Impoundment or discharge of water
   5. Excavation or other digging unless otherwise indicated
   6. Attachment of signs or other materials to, or wrapping materials around trees or plants unless otherwise indicated

B. Do not direct vehicle or equipment exhaust toward protection zones or tree crowns.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

1.4 QUALITY ASSURANCE

A. Contract Arborist Qualifications: An arborist certified by ISA or licensed in the jurisdiction where Project is located.
   1. Individual: An arborist certified by the International Society of Arboriculture (ISA). All work performed by Contract Arborist including any oversight and documentation work, shall be performed or directly supervised by at least one on-site arborist with these minimum qualifications.
   2. Firm: Established business with documented experience of at least five years. Experience working on a minimum of three commercial, nongovernmental or governmental projects where similar tree preservation programs have been successfully implemented. Properly licensed and insured to perform arboricultural work in the region where the project is located.
   3. Provide individual(s) names, certifications and each anticipated role in this project. “Role(s)” shall be defined as one or more of the following:
      a. Project Manager
      b. Technical Oversight

c. Field Arborist/Technician

B. Tree Pruning Standard: Comply with ANSI A300 (Part 1), "Tree, Shrub, and Other Woody Plant Maintenance--Standard Practices (Pruning)."

C. Pre-Construction Meeting: Conduct meeting at the project site prior to commencement of any project-related site activities. Arlington County Arborist, Arlington County Landscape Architect, consultant Landscape Architect, County Third-Party Arborist, and Arlington County Construction manager shall attend. Coordinate this meeting with Erosion & Sediment Control Pre-construction meetings/inspections. Walk the site limits to review methods and procedures related to tree protection and preservation including, but not limited to, the following:
1. Construction schedule: verify availability of materials, personnel, and equipment needed to make progress and avoid delays.
2. Enforcement of requirements for tree protection areas
3. Responsibilities of all parties, including coordination, access and timing requirements
4. Field Quality Control
5. Review and mark locations of root pruning, root protection matting, and special demolition within tree protection areas.
6. Review sequencing and methods of demolition and excavation work near trees.
7. Review location and sequencing of shoring for excavation near trees.

D. Urban Forester Notification: The Contractor shall notify the Project Officer 72 hours prior to the following events, so that the County's Urban Forester can be present to supervise work:

1. Tree protection fencing installation, to discuss locations and trees to be saved on-site.
2. Tree or root-pruning operations.
3. Work within tree protection zones.
4. Tree planting.

PART 2 - PRODUCTS

2.1 MATERIALS

A. 6' Height Tree Protection Fence/Construction Fence (Chain Link): This fence is used around the perimeter of the entire protect site and demarcates the Limits of Work (LOW)/Limits of Disturbance (LOD). Galvanized tension wires, line posts, end posts, and tension bars. 2" chain link fabric (12 or 13 gauge). See plans for locations.

B. 4' Height Tree Protection Fence: This fence is used for tree protection *within* the LOW/LOD. This fence changes locations during the transition from Phase 1 (demolition) to Phase 2 (construction). Galvanized tension wires, line posts, end posts, and tension bars. 2" chain link fabric (12 or 13 gauge). See plans for locations.

C. Tree Protection Signs: Shall be of heavy-duty sheet aluminum or weatherproof plastic material measuring 12 inches by 18 inches. Signs shall state "NO ENTRY, TREE PRESERVATION AREA, CALL 703-228-6557 TO REPORT VIOLATIONS" in both English and Spanish. Signs shall be mounted on fence every 30 feet.

D. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 1 inch in diameter; and free of weeds, roots, and toxic and other non-soil materials.

1. Obtain topsoil only from well-drained sites where topsoil is 4 inches deep or more; do not obtain from bogs or marshes.

E. Wood Chip Mulch. Refer to Section 329300 – Exterior Plants. Application of a wood mulch product to areas surrounding designated trees. Mulch increases moisture-holding capacity, helps mitigate soil compaction, and increases needed soil organic composition

F. Temporary Root Protection Matting: Double-side geocomposite, geonet core with non-woven covering (Tenax Tendrain 770/2 or approved equal). See plans for locations. The purpose of the RPM is to reduce compaction, rutting, and contamination of soils and root systems of trees to be retained should staging, temporary stockpile, or equipment access be required within the CRZ areas due to extreme site constraints. Various materials or combinations are specified depending up the anticipated construction work equipment, stockpile, or storage. Location of all RPM may or may not be shown on drawings but shall be coordinated between the Contractor, Third-Party Arborist, Arlington County Arborist and Construction Manager.
1. May be required for access during hardscape demolition operations where sharp turns are difficult.
2. Shall be used for all access within critical root zones of trees to remain.
3. Not required over existing pavement or concrete that will remain undisturbed.

G. Trunk Trunk & Limb Protection Wrap: Wrap trunks and root flare in doubled-sided geocomposite geonet core with non-woven covering (such as Tenax Tendrain 770/2), ¼” or greater closed-cell foam pads with 2x4 planks and strap binding planks, or approved equal.Secure wrap with wire or rope. Install tree protection sign on each tree that receives wrap protection. See plans for locations.

H. Permanent Root Aeration Matting (Stage One & Stage Two): Triax TX130S Geogrid or approved equal. The purpose of this RAM geocomposite matting is to distributes compressive loads, resists compaction of soil CBR, provide atmospheric air / gas exchange to top soil and roots, to maximize airflow throughout the core for buried Critical Root Zones of protected trees. This prevents suffocation of roots under grade fills and pavement sections such as parking lots and driveways. See plans for locations.

I. Root Pruning: Action indicated on Drawings to provide a more suitable cut for protected tree roots prior to excavations or grading with standard construction equipment. Removal of roots is always a cause for concern by arborists, however proper root pruning will minimize ripped or torn roots during excavations and grading with standard construction equipment. Various methods may be used as specified. See plans for locations.

J. Super-Sonic Air Tool Excavation: Hand held tool designed to focus highly compressed air (90-125 psi) provided from a large air compressor (185-375 cfm) at speeds close to 1400 mph at the tip of the tool. Widely used by arboricultural firms and consultants for multiple purposes including but not limited to: root collar investigation, CRZ investigation, root pruning for large roots, or where existing underground cables or conduits are located existing underground cables or conduits are located), vertical or radial mulching and restoration of compacted soils, excavation for utilities within protected CRZs to minimize root damage from construction. See plans for locations.

PART 3- EXECUTION

3.1 GENERAL & PREPARATION

A. Schedule: Contractor's Arborist shall be responsible for performing all arboricultural activities included within the scope of this specification. All activities will commence immediately upon notice to proceed. Activities will be completed in a continuous manner and coordinated to prevent delay of other construction processes.

B. Pre-Construction Meeting: Prior to the commencement of any site demolition or site work, as well as the placement of tree protection fencing, the Contractor shall coordinate and arrange an on-site pre-construction meeting with the Arlington County Arborist, Arlington County Landscape Architect, consultant Landscape Architect, County Third-Party Arborist, and Arlington County Construction manager. The contractor shall meet on-site with these parties to review trees to remain and protective measures required.

C. Labor: Contractor's Arborist will dedicate labor and equipment as necessary to complete the work. It shall be the Contractor's Arborist's responsibility to maintain a consistent crew on the job site in order to complete work in a timely manner. It will be the Contractor's Arborist's responsibility to supervise work and scheduling and see that work progresses in an efficient manner.

D. Notifications: Contractor's Arborist shall notify the DES Arborist and DPR Construction Manager of any site condition changes which may affect work progress.

E. Initial Work: No other construction activity may occur on site until tree preservation fencing has been installed and approved by the Construction Manager, Arlington County Arborist and Third-Party Arborist.

F. Subcontractors: The general contractor shall be responsible for ensuring that all subcontractors are aware of tree preservation specifications.

G. Flagging: Prior to installation, Contractor shall flag or paint location of fencing in field for verification by Construction Manager.

H. Tree Protection Fence: Install tree protection fencing and signs around tree protection zones to protect remaining trees and vegetation from construction damage. Maintain temporary fence and remove all tree protection fence when construction is complete. See plans for tree protection fencing locations. Tree protection shall be inspected and approved by Arlington County Arborist or Third-Party Arborist before any site work (demolition or proposed) or other disturbances occur. If either arborist deems the tree protection fencing insufficient, the contractor shall correct the fencing for approval by the Arlington County Arborist or Third-Party Arborist prior to any site work or disturbances occur.

Trunk Protection: Install trunk protection around tree trunks as shown on plans. Maintain trunk protection throughout demolition and construction. Remove trunk protection when construction is complete and as instructed by Third-Party Arborist or County Arborist.

K. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

L. No personnel, vehicles, equipment, construction materials, or construction debris shall be allowed inside the tree protection areas at any time during construction without the written consent of the Project Officer. If a violation is observed, the Contractor will be notified by the Project Officer and shall immediately rectify the situation per the approval of the Project Officer.

3.2 DEMOLITION & REMOVAL OF EXISTING FEATURES

A. Contractor shall remove and legally dispose all items shown for demolition/removal on the Demolition Plan and in accordance with Specification Section 311000. The tree protection plans and demolition plan indicate some areas to be removed by hand due to their proximity to trees that shall not be disturbed. Hand removal shall be completed without moving the tree protection fencing and as directed by the Arlington County or Third-Party Arborist.

B. Appropriate RPM and TPF shall be in place for each area prior to equipment access, staging, stockpile, and backfill. No equipment, staging, or stockpile is allowed upon areas where pavement has been demolished inside CRZs unless Temporary Root Protection Matting is installed and approved. Light duty, rubber tracked equipment less than 4.2 lbs per sq inch PSI can operate on new topsoil back fill for grading purposes as long as topsoil is in 6” lifts minimum. For equipment operation less than six (6) inch lifts Temporary Root Protection Matting is required.

C. Existing pavement will be allowed for equipment access, stockpile, or staging upon approval during pre-construction walk through by Inspector and protection devices are installed.

D. Once demolition is completed in a CRZ area then backfill voids with topsoil to cover exposed roots. Backfill should not exceed the top surface of adjacent existing grades until a review and approval of final grading procedures is accomplished.

E. Once backfill is accomplished Tree Protection Fence is to be reconfigured to protect new topsoil grading from equipment access, staging, and stockpile unless Temporary Root Protection Matting is reviewed and approved.

3.3 TRANSPLANTING

A. Transplant existing trees shown on plans to on-site location as determined by DPR Construction Manager and Landscape Architect and in accordance with Specification Section 329600.

3.4 TREE PROTECTION AND STRESS REDUCTION MEASURES – GENERAL

A. The Contractor’s Arborist coordination responsibilities include, but are not limited to the following: existing underground utilities; survey layout of construction elements; site walk with Arlington County Landscape Architect, Consultant Landscape Architect and Construction Manager to verify location of all tree protection measures prior to execution; notify Construction Manager if construction adjacent to tree protection does not appear to follow specifications or prior agreement or conflicts with tree protection seem eminent; coordinate access of deliveries, crews, equipment, start up, and cleanup of each item of work; provide as-built drawing of any change to location of tree protection; attend progress meetings as required

3.5 4’ AND 6’ TREE PROTECTION FENCING

A. Exact placement of fences will be determined in walk through with General Contractor, Contractor’s arborist, Construction Manager, Arlington County Arborist, Arlington County Landscape Architect and Consultant Landscape Architect.

3.6 REMOVAL OF PHASE 1 INTERIOR TREE PROTECTION FENCE AND INSTALLATION OF PHASE 2 INTERIOR TREE PROTECTION FENCE.

A. When the construction manager approves the completion of the demolition phase, the contractor shall remove the Phase 1 Interior Tree Protection Fencing and immediately replace with the Phase 2 Interior Tree Protection Fencing. The Arlington County Arborist or Third-Party Arborist shall approve the removal of the Phase 1 Fence and the installation of the Phase 2 Fence.

3.7 EXCAVATION

A. Install shoring or other protective support systems to minimize sloping or benching of excavations.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Where utility trenches are required within tree protection zones, root pruning shall take place prior to trenching.

3.8 Where new finish grade is indicated below existing grade around trees, slope grade beyond tree protection zones. Maintain existing grades within tree protection zones. ROOT AERATION MATTING (RAM)

A. The purpose of RAM is to protect existing roots and soils from proposed grade fills and structures.

B. Prior to installing matting on existing, undisturbed grade the arborist shall remove trees, shrubs, vines, stumps, logs, and boulders without rutting or disturbing the soil or roots. Tall grass or weeds can be mowed or trimmed down to 3”. Voids can be filled with topsoil or structural soil or stone depending upon application.

C. No compaction of subgrade is needed. Topsoil shall not be disturbed or removed. No grubbing, grading, excavation or equipment traffic shall be allowed in the area to receive RAM. Equipment may travel on RAM after it is installed and fill material placed but should be minimized.

D. Install and maintain permanent RAM as indicated on drawings and maintain a minimum of 6” mulch whenever construction activity is occurring within the area (Stage One). Temporary Fencing (orange plastic or wwf) must be installed to protect areas to receive RAM if fill is not to be placed immediately at the beginning of site work.

E. Replenish mulch as needed to maintain the 6” cover or as instructed by Arlington County Arborist or Third-Party Arborist.

F. RAM may be needed to be cut in order to allow for caisson/footing installation. Coordinate with Third-Party Arborist or County Arborist.

G. Provide root access vents in permanent RAM as indicated on details.

H. When construction activity is complete (as indicated by Construction Manager), remove construction equipment and machinery from atop permanent RAM. Under the supervision of Third-Party Arborist or County Arborist, concurrently pull back mulch from atop Permanent RAM and place topsoil atop permanent RAM in accordance with the construction drawings (Stage Two). The RAM itself is permanent and shall not be removed.

3.9 ROOT PROTECTION MATTING (RPM)

A. The purpose of the RPM is to reduce compaction, rutting, and contamination of soils and root systems of trees to be retained should staging, temporary stockpile, or equipment access be required within the CRZ areas due to extreme site constraints.

B. RPM shall be used for all access within CRZ areas of trees to remain. Matting is not required where existing pavement or concrete will remain undisturbed

C. Install and maintain temporary root protection matting (RPM) as indicated on drawings and wherever construction activity is occurring within critical root zones of trees to remain. Install additional Temporary RPM as instructed by Arlington County Arborist or Third-Party Arborist.

D. If short duration access is needed, such as one week or less, the use of "AlturnaMATS", or approved equal may be needed to avoid rutting and compaction. These materials may be shifted and re-used as work progresses.

E. When construction activity is complete (as indicated by Construction Manager), remove construction equipment and machinery from atop temporary RPM. Remove temporary RPM under the supervision of Third-Party Arborist or County Arborist.

3.10 SUPER SONIC AIR TOOL (SSAT) EXCAVATION

A. SSAT is used to avoid utility trenching through critical root zones of trees to remain. Typical trenching cuts roots and damages the health of the tree. Several irrigation lines run through critical root zones and will require SSAT excavation as shown on the irrigation drawings.

B. When adjacent to pedestrians, vehicles, or structures, SSAT work shall include the use of a barrier system such as temporary screen or tents to protect property and pedestrians from flying debris.

C. Proposed underground utility excavation within critical root zones shall be reviewed by the Third-Party Arborist, Arlington County Arborist, and Landscape Architect in the field to determine potential for damage to priority roots of select trees and layout the limit of work.

D. Pre-watering of the proposed areas of excavation during summer and fall months is recommended to maintain root / soil moisture.

E. The Contract Arborist shall provide a qualified arborist crew experienced with the SSAT and utility excavation (especially irrigation) to protect adjacent structures and pedestrians, install temporary RPM, open the excavation, hand prune minor roots, and identify and protect priority roots to remain. Coordination with the appropriate sub-contractor shall be made to determine appropriate width, depth, and sequencing.

F. Exposed roots shall be covered with burlap or plastic awaiting pipe or conduit installation and backfill. Moisten soil and roots as needed to prevent dry out.

3.11 ROOT PRUNING:

A. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots with sharp pruning instruments; do not break or chop.

B. Sufficient moisture is necessary for reducing the level of dust, increase work efficiency, and provide a hospitable environment for the tree roots and pedestrians.

C. Should night time temperatures create frozen ground during work hours soil warming equipment shall be provided by the General Contractor if the schedule cannot be delayed for favorable weather.

D. During the auguring and installation of curb caissons and playground equipment footings, root prune under direction of Third-Party Arborist or County Arborist.

E. Root prune for CIP stair installation and in certain locations near the playground as shown on drawings and under the supervision of Third-Party Arborist or County Arborist.

3.12 FIELD QUALITY CONTROL AND MONITORING

A. Tree Condition Monitoring:
   1. An ISA Certified Arborist (provided by the Contract Arborist) shall perform monitoring twice per month year-round to monitor insects, disease, soil moisture levels, weather, and health changes on all trees within the project area.
   2. The monitoring will include a report that details problematic areas that have been addressed, treatments provided to reduce the problem, and anticipated treatments forecast for 30 days. This report will be forwarded to the Construction Manager, Third-Party Arborist, Arlington County Arborist and Arlington County Landscape Architect for documentation.

B. Construction Oversight by Third-Party Arborist
   1. Any work within CRZs of retained trees shall be directly supervised by the Contract Arborist.
   2. If roots are encountered during excavations, work shall progress as directed by the Contract Arborist. Contract Arborist, in coordination with the construction and design teams, shall determine appropriate means and methods to address the roots. Options may include, but not be limited to, severing the roots, hand or SSAT excavation. Contractor shall not cut roots.
   3. All work shall be documented thoroughly, including photo documentation. Refer to site documentation submittal requirements.

3.13 TREE REPAIR AND REPLACEMENT

A. Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots according to Arlington County arborist or contract arborist's written instructions.

B. The Contractor shall be responsible for any damage to trees within the Tree Protection Area caused by the Contractor’s personnel, vehicles, or equipment at the site. Any damage to a tree to remain shall result in a payment by the Contractor to the Project office for the amount of damage based on the latest edition of the Council of Tree and Landscape Appraisers Guide for Plant Appraisal

published by the International Society of Arboriculture (ISA). All trees are to be valued as landscape trees.

C. Remedial measures:
   1. Any damage caused to the trees by the work of this contract through negligence by the contractor shall be immediately remedied by the contractor. Contractor shall be responsible for any associated costs.
   2. Remedial work may include pruning, cabling, or any other measures up to and including removal and replacement, as determined by the Third-Party Arborist and Construction Manager.
   3. Remedial work shall be performed by the Contractor's Arborist, as approved by the Third-Party Arborist and Arlington County Arborist.
   4. All required remedial work shall be performed to the satisfaction of the Third-Party Arborist, County Arborist and Construction Manager, at no additional cost to Arlington County Department of Parks and Recreation.

3.14 DISPOSAL OF WASTE MATERIALS

A. Burning is not permitted.

B. Disposal: Remove excess excavated material and displaced trees from Owner's property.

PART 4 – MEASUREMENT

4.1 The measurement of TRUNK/LIMB PROTECTION WRAP shall be the number of EACH constructed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

4.2 The measurement of ROOT PRUNING shall be the number of LINEAR FEET constructed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

4.3 The measurement of ROOT PROTECTION MATTING shall be the number of SQUARE FEET constructed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 311300

SECTION 312000 - EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Preparing subgrades for slabs-on-grades, walks, pavements, lawns and grasses, and exterior plants.
2. Excavating and backfilling for structures.
3. Subbase course for concrete walks and pavements.
4. Subsurface drainage backfill for trenches.
5. Excavating and backfilling for utility trenches.

B. Provide all labor, materials, tools and equipment to clear and grub all areas identified on the approved plans.

C. Related Sections:

1. Section 033000 – Cast-in-Place Concrete
2. Section 101400 – Signs
3. Section 116800 – Playground Equipment & Structures
4. Section 129300 – Site Furnishings
5. Section 311000 – Site Clearing, Demolition and Removals
6. Section 311300 – Tree Protection and Root Pruning
7. Section 312500 – Temporary Erosion & Sediment Control
8. Section 321313 – Concrete Pavement
9. Section 321816 – Engineered Wood Fiber Surfacing
10. Section 321817 – Poured-in-Place Rubber Surface System
11. Section 321819 – Fieldstone Boulders
12. Section 329100 – Planting Preparation
13. Section 329200 – Seeding and Sodding
14. Section 329300 – Exterior Plants
15. Section 334000 – Storm Drainage

1.2 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimized upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Project Officer Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevation or beyond indicated lines and dimensions without direction by Project Officer Unauthorized excavation, as well as remedial work directed by Project Officer shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Equipment for Footing, Trench, and Pit Excavation: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- wide, maximum width, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,090 lbf and stick-crowd force of not less than 18,400 lbf extra-long reach boom.
2. Equipment for bulk excavation: Late-model, track-mounted loader; rated at not less than 230 hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket.

I. Structures: Footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

J. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

K. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

L. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services.

1.3 SUBMITTALS

A. Product Data: for the following:
   1. Geotextile.
   2. Controlled low-strength material, including design mixture.

B. Samples: 12-by-12-inch Sample of subdrainage geotextile.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
   1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
   2. Laboratory compaction curve according to ASTM D 698 for each on-site and borrow soil material proposed for fill and backfill.

D. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

1.4 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: The County shall engage an independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548. The Contractor shall coordinate directly with testing agency.

1.5 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Arlington County or others unless permitted in writing by Project Officer and then only after arranging to provide temporary utility services according to requirements indicated.
   1. Notify Project Officer not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Project Officer’s written permission.
   3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from Project Site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active

C. Protect all exiting pipes, poles, wires, fences, trees, and landscape plant materials, and other structures that are to remain in place. In case of damage, notify the appropriate agency to affect repair in a manner resulting in a condition at least equal to the condition prior to damage.

D. Excavations near existing structures shall not be closer than the distance from finished grade to the bottom of the foundation without sheeting and shoring to protect the existing structure.

E. On paved surfaces, do not use or operate tractors, bulldozers, or other power-operated equipment, the treads or wheels of which are so shaped as to cut or otherwise damage such surfaces. Placing mats or using other methods of protection may be allowed subject to the approval of the Project Officer. Promptly restore all surfaces which have been damaged to a

condition at least equal to that in which they are found immediately prior to the beginning of operations. Suitable materials and methods shall be used for such restoration.

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

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups CL, ML, SC, GC, GW, GP, GM, SW, SP, and SM, or a combination of these groups; free of rock or gravel larger than 4 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or crushed stone, slag, and natural or crushed sand; with or without soil motor.

E. Base Course: designated as Type I or Type II as follows: Type I shall consist of crushed stone, crushed slag, or crushed gravel with or without soil mortar or other admixtures. Crushed gravel shall consist of particles of which at least 90 percent by weight of the material retained on the No. 10 sieve shall have at least one face fractures by artificial crushing. Type II shall consist of gravel, stone or slag screenings; fine aggregate and crushed coarse aggregate; sand-clay-soil mortar or other admixtures.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

G. Bedding Course: Crushed stone Virginia Department of Transportation (VDOT) size 57, 68, or 78 in accordance with VDOT Specification section 203 Table II-5.

H. Drainage Course: Narrowly graded mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.

J. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 157 lbf; ASTM D 4632.
3. Sewn Seam Strength: 142 lbf; ASTM D 4632.
4. Tear Strength: 56 lbf; ASTM D 4533.
5. Puncture Strength: 56 lbf; ASTM D 4833.
6. Apparent Opening Size: Equal to or smaller than 0.300mm.
7. Permittivity: 0.8 second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Minimum 30 mil PVC geomembrane liner, or equivalent.

2.3 ACCESSORIES

A. Warning Tape: Acid-and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:

B. Detectable Warning Tape: Acid-and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Preparations of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface as specified in section

311000 Site Clearing, Preparation, Demolition and Removals and 311300 Tree Protection and Root Pruning.

C. Protect and maintain erosion and sedimentation controls, which are specified in section 312500 Temporary Erosion and Sediment Control Site Preparation and 311300 Tree Protection and Root Pruning, during earthwork operations.

D. Provide protective insulating materials to protect to protect subgrades and foundations soils against freezing temperatures or frost.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project Site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES:

A. Explosives: Use of explosives is prohibited.

3.4 EXCAVATION, GENERAL

A. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by the Geotech. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract time may be authorized for rock excavation.

1. Earth Excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.

a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

2. Rock Excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:

a. 24 inches outside of concrete forms other than at footings.
b. 12 inches outside of concrete forms at footings.

c. 6 inches outside of minimum required dimensions of concrete cast against grade.
d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
e. 6 inches beneath bottom of concrete slabs on grade.
f. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Pile Foundations: Stop excavations 6 to 12 above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Retain, revise, or delete subparagraph below to suit Project.

1. Clearance: As indicated on details.

C. Trench Bottoms: Excavate trenches deeper than bottom of pipe elevation to allow for bedding course.

1. Width and Depth: As indicated on details.

3.8 SUBGRADE INSPECTION

A. Notify Project Officer when excavations have reached required subgrade.

B. If Project Officer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed. Unsatisfactory subgrade soil may be attributed to several factors, including but not limited to: dis-uniformity; presence of

bedrock or foreign materials; presence of highly plastic clays, organic materials, oversaturated materials; inadequate bearing support; excessive moisture content; inadequate dry density.

C. Proof-roll subgrade below slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting and replace with compacted backfill or fill as determined by Engineer.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Project Officer, without additional compensation. Project Officer shall determine when all disturbed subgrades are adequately reconstructed.

3.9 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 3000 psi, may be used when approved by Project Officer.

1. Fill unauthorized excavations under other construction or utility pipe as directed by Project Officer.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover within 24 hours to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within tree protection areas and drip line of remaining trees.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Records Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.

5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 3, Section “Cast-in-Place Concrete.”

D. Backfill voids with satisfactory soil while installing and removing shoring and bracing.

E. Place and compact final backfill of satisfactory soil to final subgrade elevation.

F. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 6 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures, slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 90 percent.
3. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 90 percent.
4. For utility trenches, compact each layer of final backfill soil material at 95 percent.

3.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades as shown on plans to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1/2 inch.
3. Pavements: Plus or minus 1/2 inch.

3.17 SUBBASE AND BASE COURSES

A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase and base course under pavements and walks as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer’s written instructions, overlapping sides and ends.
2. Place base course material over subbase course under hot-mix asphalt pavement.
3. Shape subbase and base course to required crown elevations and cross-slope grades.
4. Place subbase and base course 6 inches or less in compacted thickness in a single layer.

5. Place subbase and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3-inches thick.
6. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.18 DRAINAGE COURSE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place drainage course 6 inches or less in compacted thickness in a single layer.
3. Place drainage course that exceeds 6-inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6-inches thick or less than 3 inches thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95-percent of maximum dry unit weight according to ASTM D 698.

3.19 FIELD QUALITY CONTROL

A. Testing Agency: The County shall engage a qualified independent geotechnical engineering testing agency to perform testing for critical structures, foundations and any additional field quality control. The Contractor shall coordinate directly with testing agency and shall inform Project Officer.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Project Officer.

D. Testing agency with test compaction of soils in place according to ASTM D 698. Tests will be performed at the following locations and frequencies:

1. Retaining Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet or less of wall length, but no fewer than 2 tests.
2. Trench Backfill: At each compacted bedding and final backfill layer, at least 1 test for each 300' or less of trench length, but no fewer than 2 tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.20 PROTECTION

A. Protecting Graded Areas: Protect newly areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to match the proposed grades. Obtain approval by Project Officer after the work has been corrected.

C. Where settling occurs before Final Completion, removed finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Project Site.

PART 4 – MEASUREMENT

4.1 The measurement of CUT TO FILL shall be the number of CUBIC YARDS constructed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

4.2 The measurement of FILL BROUGHT TO SITE shall be the number of CUBIC YARDS constructed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

4.3 The measurement of FINE GRADING shall be the number of SQUARE FEET constructed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 312000

SECTION 312500 - TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes temporary measures to control erosion and siltation.

1. Measures shall include:

a. Stabilized Construction Entrance
b. Silt Fence
c. Gravel Curb Inlet Sediment Filter

2. Temporary erosion and siltation control measures as described herein, shall be applied to erodible material exposed by any activity associated with construction, consistent with state and local erosion and sediment control standards.

B. Provide all labor, materials, tools and equipment necessary to install and maintain temporary erosion and sediment control measures identified on the approved plans as construction has been completed and Project Office has accepted the Project.

C. The Contractor is responsible for providing and maintaining facilities adequate to control erosion and sedimentation. The Project Officer reserves the right to order the performance of other temporary measures not specifically described herein to correct an adverse erosion or siltation condition.

D. Related Sections:

1. 311000 – Site Clearing, Preparation, Demolition and Removals
2. 311300 – Tree Protection and Root Pruning
3. 312000 – Earth Moving
4. 329100 – Planting Preparation
5. 329200 – Seeding and Sodding

E. In addition to the specifications contained herein, work shall be performed in accordance with the following:

1. Virginia Erosion and Sedimentation Control Handbook, Latest Edition
2. Underground Utility Protection Ordinance – Chapter 55 Arlington County Code
3. Arlington County Erosion and Sediment Control Ordinance – Chapter 57 Arlington County Code
4. Arlington County Department of Environmental Services (DES) Construction Standards and Specifications
5. Tree Protection Standards and Fencing Requirements – as contained in Arlington County Landscape Standards http://parks.arlingtonva.us/design-standards/ and in Section 311300.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials shall be at the Contractor's Option, in accordance with the approved erosion and sediment control plans and all applicable standards listed above.

PART 3 - EXECUTION

3.1 TIMING OF INSTALLATION

A. No grading operations will be allowed until temporary erosion and sediment control measures have been installed in accordance with the Erosion and Sediment Control Plan and all applicable standards listed above.

3.2 MINIMIZED EXPOSED SOIL

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

B. Unless specifically authorized by the Project Officer, the grubbing of root mat and stumps shall be confined to the area over which excavation is to be actively executed 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 within 15 days following the stripping operations.

D. 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.

E. No disturbed area, including stockpiles, is to remain denuded longer than 7 days without temporary seeding or otherwise stabilizing the area.

3.3 CLEANING AND MAINTENANCE:

A. 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.

PART 4 – MEASUREMENT

4.1 The measurement of STABILIZED CONSTRUCTION ENTRANCE (PHASE 1 & 2) shall be the LUMP SUM constructed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

4.2 The measurement of TREE/PROTECTION FENCE (PHASE 1 & 2) shall be the number of LINEAR FEET constructed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

4.3 The measurement of INLET PROTECTION (PHASE 1 & 2) shall be the number of EACH constructed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

4.4 The measurement of SILT FENCE (PHASE 1 & 2) shall be the number of LINEAR FEET constructed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 312500

SECTION 321313 – CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes exterior concrete pavement for, but not limited to, the following:

1. Horizontal surfaces, including but not limited to walkways, slabs, and bench pads.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For concrete pavement mixture.

C. Delivery tickets for concrete including 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.

D. Color of expansion joint sealant.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed, sizes as shown on the drawings.

D. Plain Steel Wire: ASTM A 82, as drawn.

E. Deformed-Steel Wire: ASTM A 496.

F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice."

2.2 CONCRETE MATERIALS

A. The design of the concrete mix, equipment, workmanship, and materials shall conform to the applicable requirements of Division 3 sections, except as hereinafter specified. Minimum compressive strength after 28 days shall be 3000 psi. Maximum size of aggregate shall be 1-01/2 inches, but not less than 3/4 inch. Air content by volume shall be 4-1/2 per-cent, plus or minus 1-1/2 percent.

1. Provide Class A3 General Use (3,500 psi) concrete for walkways.

B. Portland Cement air-entrained, ASTM C 150, Class A3 General Use (3,000 psi) per VDOT 217.

2.3 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth.

A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

B. Water: Potable.

C. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

D. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

E. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.

2.4 EXPANSION JOINT FILLER

A. Joint filler shall be ½ inch preformed asphalt expansion joint material conforming to ASTM D994 or ASTM D1751.

B. If bituminous fiber material is used, a bond breaker such as one-half (1/2”) wide polyethylene tape or five eighths inch (5/8”) diameter expanded polyethylene foam backer rod shall be installed as recommended by the manufacturer.

2.5 EXPANSION JOINT SEALANT

A. Expansion Joint Sealant: Sealant shall be one-component polyurethane-base elastomeric sealant. Asphalt cement will not be approved as a substitution.

B. Sealant color shall match color of adjacent pavement. Where joints fall between pavement sections of different colors, color shall be selected by Project Officer and authorized by Landscape Architect to match one of the pavement colors.

1. Products: Subject to compliance with requirements, provide one of the following or an approved equal:

    a. SikaFlex-1a by Sika Corporation.
    b. Sonoclastic NP-1 by Sonneborn and Chem Rex Inc.

C. Approved equal requirements: Premium-grade, high performance, moisture cured, polyurethane based, non-sag elastomeric sealant. Meets Federal specification TT-S-00230C, Type II, Class A. Meets ASTM C-920, Type S, Grade NS, Class 35, use T, NT, O, M, G, I.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive concrete with Project Officer present for compliance with requirements for installation tolerances and other conditions which might affect the performance of the concrete. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Forms shall be set to alignment and grade and to conform smoothly to the shapes and dimensions indicated on the Drawings. All curves, where shown on the drawings or as require, shall be smooth. No tangents or broken segments shall be accepted.

C. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.4 JOINTS

A. Construct expansion and contraction joints at right angles to the lines of the sidewalks and pads.

B. Control joints in sidewalks and pads shall be formed 1/4 depth of the slab with a tool designated for that purpose, and shall be spaced as indicated on Drawings, or if not shown, as directed by Project Officer. Saw-cut joints are not acceptable under any circumstances.

C. Where 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.

D. Form expansion joints using 1/2 inch thick pre-molded expansion joint fillers, full depth of the concrete, conforming to the shape of the sidewalks and curb and gutters. Place expansion joints where walks or exterior concrete slabs abut other vertical surfaces, including but not limited to building perimeter, curbs, columns, retaining or cheek walls, etc. Place expansion joints elsewhere as indicated on Drawings or as directed by Landscape Architect.

E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

3.5 CONCRETE PLACEMENT

A. Moisten subbase to provide a uniform dampened condition at time concrete is placed.

B. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

D. Screed pavement surfaces with a straightedge and strike off.

E. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.6 FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

C. Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.7 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screening, and bull floating or darbying concrete, but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing shall be stated as soon as it is possible to apply the curing medium without damaging the surface. 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˚ F.

F. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these methods.

3.8 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement.

C. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

PART 4 - MEASUREMENT

4.1 The measurement of CONCRETE PAVEMENT shall be the number of SQUARE FEET constructed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 321313

SECTION 321816 – ENGINEERED WOOD FIBER SURFACING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes engineered wood fiber playground safety surfacing.

B. Related sections:

1. Section 310000 – Earthwork
2. Section 321817 – Poured-in-Place Playground Safety Surfacing
3. Section 033000 – Cast in Place Concrete
4. Section 321126 – Aggregate Base Course and Underdrainage
5. Section 321313 – Cement Concrete Pavement
6. Section 334000 – Storm Drainage

1.2 SUBMITTALS

A. Samples: An 8-ounce sample of engineered wood fiber material proposed to be used in the project.

B. Manufacturer's Recommended Installation Instructions: Installation of wood fiber surfacing shall be as per manufacturer's written instructions.

PART 2 – PRODUCTS

2.1 ENGINEERED WOOD FIBER

A. Product shall conform to ASTM F2075. Wood fiber particles shall be ground to a fibrous consistency, randomly sized, approximately ten times longer than wide with a maximum length of two (2) inches and free of hazardous substances. Commercial nursery wood chips, bark mulch or wood fiber derived from pallets, reused or pressure-treated lumber shall NOT be acceptable. Wood fiber shall not contain twigs, bark, leaf debris or other extraneous material.

B. Provide one of the following Engineered wood fiber products, or an approved equal:
1. Fibar Engineered Wood Fiber as manufactured by Fibar Inc., Armonk NY, phone: 1-800-342-2721.
2. Woodcarpet as manufactured by Zeager Bros. Inc. Middletown PA, phone: 1-800-346-8524.

2.2 DRAINAGE

A. Geotextile Fabric:

1. The fabric shall be a material suitable for the application, a porous non-woven polypropylene stabilization fabric, placed over the aggregate subbase/ exposed subgrade overlapping the seams properly (minimum 12")

2. Provide one of the following products, or an approved equal:

   a. Geotex 401 by Propex.
   b. Mirafi 140N by Tencate.

3. Geotextile fabric shall have the following properties

Geotextile Fabric Properties	**Test Method**	**Minimum Average Roll Values**
Grab Tensile Strength (lbs.)	ASTM D4632	120
Grab Tensile Elongation (%)	ASTM D4632	50
Trapezoidal Tear Strength (lbs.)	ASTM D4533	50
CBR Puncture Strength (lbs.)	ASTM D6241	310
Apparent Opening Size (US Std Sieve)	ASTM D4751	70
Permittivity (sec. ^{1})	ASTM D4491	1.7
Flow Rate (gal/min/ft.^{2})	ASTM D4491	140
U.V. Resistance (% strength retained at 500 hrs.)	ASTM D4355	70

PART 3 – EXECUTION

3.1 GENERAL

A. The engineered wood fiber material shall be inspected by the Project Officer on delivery. The Contractor shall notify the Project Officer at least 24 hours prior to delivery. All deliveries of wood fiber which fail to meet the requirements of the specifications will be rejected and the Contractor will be directed to remove the non-conforming material from the site and replace it with the specified material.

B. No deliveries of engineered wood fiber shall be permitted when weather conditions are unsatisfactory or if the area to receive the wood fiber material is insufficiently prepared. No frozen wood fiber will be accepted.

C. Engineered wood fiber shall be installed as soon as possible after the play equipment installation is complete. Play equipment shall be wrapped with safety fencing after installation per Division 11 section - Play Equipment and Structures.

3.2 INSTALLATION

A. The Contractor shall excavate the area designated for installation to a uniform depth of 16 inches (12" EWF+4" Stone Base). All roots, stones, vegetation, and debris must be removed from the excavated area and the entire area graded, filled, and compacted prior to installation.

B. Fabric seams shall overlap a minimum of 12 inches. No equipment, machinery, or materials other than the wood fiber shall be placed on or transported over the exposed fabric surface.

1. Where necessary to fit around the footings of play equipment or other, slit the filter fabric and overlap all slits with more filter fabric.

C. Install the engineered wood fiber surfacing per the manufacturer's written instructions to a minimum depth of 13 inches (1" higher than proposed finish grade) of new material. Spread the engineered wood fiber surfacing over the prepared subsurface using hand labor. Hand rake the material after final placement to achieve a smooth finished surface.

PART 4 – MEASUREMENT

4.1 The measurement of ENGINEERED WOOD FIBER SURFACE SYSTEM shall be the number of SQUARE FEET constructed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 321816

SECTION 321817 – POURED-IN-PLACE PLAYGROUND SAFETY SURFACING

PART I – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes poured-in-place rubber safety surfacing. Surface shall be unitary and seamless.

B. Related Sections

1. Section 116800 – Play Equipment and Structures
2. Section 321313 – Concrete Pavement
3. Section 321816 – Engineered Wood Fiber Surfacing

1.3 DEFINITIONS

A. Critical Height: Standard measure of shock attenuation according to ASTM-F2223, same as “critical fall height: in ASTM-F1292.

B. Unitary Surfacing: A protective surfacing of one or more material components bound together to form a continuous surface, same as “unitary system” in ASTM-F2223.

1.4 SUBMITTALS

A. Samples: The Contractor shall submit one sample (minimum 6 inches x 6 inches) of the safety surface material for each different color and texture specified. Samples shall include certified test data showing the material meets or exceeds ASTM F-1292.

B. Installer Certification and Qualifications: Installer must be trained and certified by the manufacturer. Installer’s certification on manufacturer’s letterhead shall be submitted to the Project Officer. Installer must have completed at least 10 surfacing projects within the last 5 years. Installer shall submit a list of 10 projects. The list shall contain projects which require the same level of difficulty, size, color transition and graphics.

C. Shop Drawings: For each playground surface system, include materials, plans, cross sections, drainage, installation, and edge termination. Include patterns made by varying colors of surfacing. Include details of graphics.

D. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Extent of surface systems and use zones for equipment.

2. Critical heights for playground surfaces and fall heights for equipment specified in Section 116800 “Play Equipment and Structures.”.

E. Manufacturer’s Warranty. Submit, for Owner’s acceptance, manufacturer’s standard warranty document executed by authorized company official. Manufacturer’s warranty is in addition to, and not a limitation of, other rights Owner may have under contract documents. Minimum of Five (5) years from FINAL completion, not pro-rated.

F. Material data safety sheet for all proposed rubber. Certification that no recycled tire rubber content or recycled rubber with known carcinogens will be/ were used in the installation of the proposed surfacing.

G. Lead Content Testing from Independent Third-Party Material Testing Laboratory: All components of the Poured-in-Place (PiP) rubber surface system shall cumulatively contain less than 400 parts per million of lead per the United States Environmental Protection Agency (EPA) regulations for play areas. Project Officer reserves the right to require that the PiP system contains less than 100PPM at no additional expense to the Owner. Any PiP system with more than the allowable limit will be rejected.

H. Product Data: For each type of product.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For playground surface system to include in maintenance manuals.

B. Material Certificates: Material certificates will be filled out and signed by specified manufacturer/supplier that specified materials were shipped and in proper amounts for square footage/thickness/color. Certification that no recycled tire rubber content or recycled rubber with known carcinogens will be/ were used in the installation of the proposed surfacing.

C. Warranty Documents.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer. Compliance with Section 1.03B, above.

B. Source Limitations: Obtain playground surface system materials, including primers and binders, from manufacturer specified

1. Provide secondary materials including adhesives, primers, and repair materials of type and from source recommended by manufacturer of playground surface system materials.

C. Standards and Guidelines: Comply with CPSC No. 325, "Handbook for Public Playground Safety"; ASTM F 1292; and ASTM F 1487.

1.7 PERFORMANCE REQUIREMENTS

A. Shock and Impact Attenuation: ASTM F-1292.

B. Flammability: ASTM D-2859.

C. Accessibility of Surface Systems: ASTM F1951.

D. Coefficient of Friction: ASTM 2047-82.

E. Tensile Strength: ASTM D412-87.

F. Tear Resistance: ASTM D624

G. Accelerated U.V.: Test to not less than 5-year stability.

H. IPEMA certified: Product and crew chiefs must be IPEMA certified.

I. Standard Guide for ASTM Standards on Playground Surfacing: ASTM F2223

J. Playground Equipment: ASTM F1487-11

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of playground surface system that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Reduction in impact attenuation.
b. Deterioration of surface and other materials beyond normal weathering.
c. Excessive UV fade/ loss of color.

2. Warranty Period: Five (5) years from date of FINAL Completion.

1.9 WEATHER CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit playground surface system installation to be performed according to manufacturers' written instructions and warranty requirements. Temperature should be 45 degrees and rising during the installation period. The installer shall have sole discretion based off of their judgement to proceed or to halt the installation based on their judgement.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels still attached.

B. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at a minimum of 45 degrees F and a maximum temperature of 85 degrees F.

PART 2 – PRODUCTS

2.1 POURED-IN-PLACE PLAYGROUND SAFETY SURFACING

A. Dual-density, poured-in-place system with wearing course over cushion course. The surface system shall be manufactured from a base mat consisting of 100% recycled tires mixed with a proprietary binder and a wearing course comprised of EPDM rubber and a UV-resistant proprietary binder. Provide manufacturer's standard thickness for each layer as required for overall thickness indicated, tested for impact attenuation according to ASTM F 1292 and for accessibility according to ASTM F1951. NO RECYCLED TIRE RUBBER CONTENT WILL BE ACCEPTED AS PART OF THE SURACE WEARING COURSE ON THIS INSTALLATION. ANY RECYCLED RUBBER CONTENT WITH KNOWN CARCINOGENS THAT CAN AFFECT HUMAN HEALTH WILL ALSO BE REJECTED. SEE SECTION 1.03-G, ABOVE FOR REQUIREMENTS PERTAINING TO INDEPENDENT THIRD-PARTY LAB TESTING.

1. Subject to compliance with requirements, provide products by one of the following or an approved equal:

    a. GameTime; GT Impax Poured.
    b. Surface America Incorporated.
    c. Xgrass Commercial Playground Surfaces.

B. Thickness: The thickness of the material shall meet or exceed critical fall height requirements for the locations used, as established by the current editions of Publication No. 325, Consumer Product Safety Commission (CPSC) guidelines and the American Society for Testing and Materials (ASTM F-1487) standards.

C. Cushion Course: Manufacturer's standard formulation of 5/8” chunk rubber with correct amount of urethane for impact attenuation and longevity. Chunk rubber may not be recycled SBR rubber from tires. It must be high quality pre consumer recycled rubber containing EPDM.

D. Wearing Course: Minimum ½” thick after troweling using rubber granules 1-3.5mm. Urethane shall be 11.5 lbs per 55 lb bag or 21% of the weight of the rubber used if partial bags are required. All colors must be UV stable for a minimum of 5 years. Polymer content must be 25% minimum. Tiles will not be allowed. Wear mats will not be allowed.

E. Color: The wearing course shall have an integral color as indicated on the Drawings or as selected by the Landscape Architect. All installation procedures and recommendations of the manufacturer shall be followed. Contractor shall provide options from manufacturer’s full range for selection by Landscape Architect.

F. Binder: Weather-resistant, flexible, non-hardening, 100 percent solids polyurethane complying with requirements of authorities having jurisdiction for nontoxic and low VOC content. Binders allowed are Prem Arc urethanes as distributed by American Recycling Center in Owosso, Michigan, or approved equivalent. No TDI urethanes will be permitted. Aliphatic urethane binder shall be used for the top surface regardless of EPDM color.

G. Critical Height: Manufacturer of playground equipment must supply contractor with adequate documentation

2.2 BASE

A. Base for poured-in-place safety surfacing shall be in conformance with the Drawings and with Division 321313 Section Concrete Pavement. New concrete must be cured for a minimum of 7 days. Concrete should be finished with a light broom finish, unsealed.

B. Leveling and Patching Material: Portland cement-based grout or epoxy- or polyurethane-based formulation suitable for exterior use and approved by playground surface system manufacturer.

PART 3 – EXECUTION

3.1 GENERAL

A. Play equipment shall be wrapped with safety fencing after installation per Division 11 Section 116800 “Play Equipment and Structures.”

B. Installation of safety surfacing shall be in accordance with CPSC guidelines and manufacturers installation instructions.

C. The safety surfacing shall be installed over a concrete base as shown on the Drawings and in accordance with Division 32 Section “Concrete Pavement”. All installation procedures and recommendations of the manufacturer shall be followed.

D. All safety surfacing shall either be flush with surrounding finish grade, or have a beveled perimeter transition piece along its entire open perimeter to allow for a smooth, easy transition between the surrounding finish grade and the level of the safety surfacing as shown on the Drawings.

E. Testing is required after installation to ensure that it meets drop height requirements. Contractor shall provide third-party inspection and testing of playground safety surfacing system by an NRPA Certified Playground Safety Inspector (CPSI) within 30 days of installation. Testing shall be performed with the Project Officer. 48 hours’ notice is required. Provide written report of findings, with photographs, to Project Officer.

3.2 WEATHER/JOB CONDITIONS

A. Poured-in-place shall be installed when the weather is at a temperature of 45° F or greater and rising and a maximum temperature of 90˚ F and shall remain at 45˚ F or greater for at least 7 days after application. No installations can be made when the forecast calls for freezing temperatures, snow or rain. The area must be dry during the entire installation process.

B. Contractor shall ensure that material temperature is a minimum of 50 degrees F at the time of installation.

C. Maximum surface temptation shall be a maximum of 80 degrees F.

D. Adjacent materials and the poured-in-place shall be protected during installation while curing and/or unattended from weather and other damage.

3.3 EXAMINATION

A. Hard-Surface Substrates: Verify that substrates are satisfactory for unitary playground surface system installation and that substrate surfaces are dry, cured, and uniformly sloped to drain within recommended tolerances according to playground surface system manufacturer's written requirements for cross-section profile.

1. Verify that substrates are dry, free from surface defects, and free of laitance, glaze, efflorescence, curing compounds, form-release agents, hardeners, dust, dirt, loose particles, grease, oil, and other contaminants incompatible with playground surface system or that may interfere with adhesive bond. Determine adhesion, dryness, and acidity characteristics by performing procedures recommended in writing by playground surface system manufacturer.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.4 INSTALLATION OF SEAMLESS PLAYGROUND SURFACE SYSTEMS

A. Seamless Surface: Mix and apply components of playground surface system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface and impact-attenuating system of total thickness indicated.

1. Poured Cushion Course: Spread evenly over primed substrate to form a uniform layer applied at manufacturer's standard spreading rate in one continuous operation, with a minimum of cold joints. Thickness of cushion course should meet ASTM 1292-04 guidelines and shall be a minimum of 1” thick. Varying thickness is allowed to match fall height.
2. Intercoat Primer: Over cured cushion course, apply primer at manufacturer's standard spreading rate.
3. Wearing Course: Spread over primed base course to form a uniform layer applied at manufacturer's standard spreading rate in one continuous operation and, except where color changes, with no cold joints. Finish surface to produce manufacturer's standard wearing-surface texture. Minimum thickness of wear course shall be ½” after being trowled. A minimum of 5/8 screed rod shall be used when leveling wear course.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall engage a third-party qualified testing agency to perform tests and inspections to ensure that surfacing meets drop height requirements. Testing shall be performed with the Project Officer. 48 hours’ notice is required.

B. Testing Services: Testing and inspecting of completed applications of playground surface system shall take place according to ASTM F 1292-04 or latest version.

C. Remove and replace applications of playground surface system where test results indicate that it does not comply with requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with requirements.

E. Do not allow foot traffic on poured-in-place surfacing until a minimum of 80 percent cure is obtained (up to 48 hours, depending on temperature and humidity).

F. Protect the installed playground surface from damage resulting from subsequent construction activity on site.

PART 4 – MEASUREMENT

4.1 The measurement of POURED-IN-PLACE PLAYGROUND SAFETY SURFACING shall be the number of SQUARE FEET constructed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 321817

SECTION 321819 – FIELDSTONE BOULDERS

PART I – GENERAL

1.1 SUMMARY

A. The Contractor shall furnish and install FIELDSTONE BOULDERS**,** in accordance with the plans and specifications.

B. Related sections:

1. Section 055200 – Metal Fabrications
2. Section 312000 – Earthwork
3. Section 033000 – Cast in Place Concrete

1.2 SUBMITTALS

A. All submittals shall be as per Section 013300.
   a. SUBMITTALS

1.3 QUALITY ASSURANCE

A. Contractor shall coordinate with Construction Manager to arrange a site visit to a local quarry or stone distributor, to be located no more than 50 miles from 2100 Clarendon Blvd. Arlington, VA. DPR Landscape Architect shall approve all boulders.
B. If contractor sources stone material from quarry or stone distributor more than 50 miles away from aforementioned address, DPR Landscape Architect reserves the right to reject any boulder. The contractor is responsible for removing rejected boulders from the Project Site and replacing rejected boulders with acceptable substitute. Removal and replacement shall be paid for by the contractor at no additional expense to Arlington County.
C. Contractor shall mock up selected boulders around the playground on Project Site for review and approval by the DPR Landscape Architect.
D. DPR Landscape Architect shall review and approve placement of all boulders on Project Site.

PART 2 – PRODUCTS

2.1 FIELDSTONE BOULDERS

A. See Plans. Boulders shall be Pennsylvania Mountain Blue or other natural boulders, as approved by DPR Landscape Architect.
B. Approximate boulder size: 2’ x 3’ in all directions.

PART 3 – EXECUTION

3.1 GENERAL

A. Shall be installed per Plans.

PART 4 – MEASUREMENT

4.1 The measurement of BOULDERS shall be the number of TONS constructed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

4.2 The measurement of SMALL 10-12" BOULDERS FOR OUTLET AND SWALE shall be the number of TONS constructed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 321819

SECTION 323113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish all labor, materials, and equipment required to install the chain link fencing as indicated on the drawings and/or specified herein. Said work shall include any incidentals required to provide a finished job.

1.2 RELATED SECTIONS

A. Section 033000 – Cast-In-Place Concrete

B. Construction Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 REFERENCES

A. ASTM:

1. A90/A90M - Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
2. A653/A653M - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
3. A924/A924M - Specification for General Requirements of Steel Sheet, Metallic-Coated by the Hot-Dip Process
4. B6 - Specification for Zinc
5. B117 - Practice for Operating Salt Spray (Fog) Apparatus
6. D1499 - Practice for Operating Light- and Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Plastics
7. D3359 - Test Methods for Tension Testing of Adhesive by Tape Test
8. E8/E8M - Test Methods for Tension Testing of Metallic Materials
9. E8/E8M - Practice for Installation of Chain-Link Fence
10. F626 - Specification for Fence Fittings
11. F668 - Specification for Poly (Vinyl Chloride) (PVC)-Coated Steel Chain-Link Fence Fabric
12. F934 - Specification for Standard Colors for Polymer-Coated Chain- Link Fence Materials
13. F1043 - Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework

B. Chain Link Fence Manufactures Institute (CLFMI):

1.4 DEFINITIONS

A. Definitions of terms used in this Section, such as chain link fabric, selvage, knuckle, twist, and diamond count, shall conform to ASTM F 552

1.5 SYSTEM DESCRIPTIONS

A. Design Requirements: Provide components having dimension for structural capacity required for height and loading. Based structural design on exposure and wind load designated by code for site.

B. The contractor shall supply a total color chain link fencing system of the design, style and strength defined herein. The system shall include all components (i.e., framework, chain link fabric and fittings) required.

1.6 SUBMITTALS

A. Product Data: Submit complete manufacturer's descriptive literature and specifications.

B. Shop Drawings: In accordance with the construction drawings, submit complete Shop Drawings comprehensively describing fabrication and installation of all chain link fences describing and detailing typical line post, terminal post, fabric, materials, hardware assemblies, and all proposed fence alignment sections.

C. In the preparation of Shop Drawings, use terminology conforming to ASTM F552

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Regularly engaged and specializing, for preceding 5 years, in the fabrication and installation of equivalent fencing systems.

B. The installer must be experienced in fence installations. Contractor shall provide three representative fence projects for review.

C. Regulatory Requirements: In additions to complying with applicable codes and regulations, comply with pertinent recommendations contained in the Standard Specifications and the CLFMI Product Manual.

D. Contractor shall provide a warranty stating that the fencing is secure and stable, tight, corrosion-free, in proper alignment, complete in detail and finish, and free of hazardous conditions. Any defects that develop within one year from the date of Physical Completion shall be replaced at the expense of the Contractor.

1.08 PRODUCT HANDLING AND STORAGE

A. All materials are to be new and delivered to the site in an undamaged condition.

B. Upon receipt at the job site, all materials shall be checked to ensure that no damages occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage and to protect against damage, weather, vandalism and theft.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Framework for color chain link fence systems shall conform to Ameristar PermaCoat PC-40 FencePipe (industrial weight), as manufactured by Ameristar Fence Products in Tulsa, Oklahoma or approved equivalent.

B. The zinc used in the galvanizing process shall conform to ASTM B6. Weight of zinc shall be determined using the test method described in ASTM A90 and shall conform to the weight range allowance for ASTM A653, Designation G-210.

C. The framework shall be manufactured in accordance with commercial standards to meet the strength (50,000 psi minimum yield strength) and coating requirements of the following standards:

1. ASTM F1043, Group IC, Electrical Resistance Welded Round Steel Pipe, heavy industrial weight.
2. M181, Type I, Grade 2, Electrical Resistance Welded Steel Pipe
3. RR-F-191/3, Class 1, Grade B, Electrical Resistance Welded Steel Pipe

D. The exterior surface of the electrical resistance weld shall be recoated with the same type of material and thickness as the basic zinc coating.

E. The manufactured framework shall be subjected to the PermaCoat process, a complete thermal stratification coating process (multi-stage, high-temperature, multi-layer) including, as a minimum, a six-stage pretreatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish.

F. The material used for the base coat shall be a zinc-rich (gray color) thermosetting epoxy; the minimum thickness of the base coat shall be two (2) mils. The material used for the finish coat shall be a thermosetting "no-mar" TGIC polyester powder; the minimum thickness of the finish coat shall be two (2) mils. The stratification-coated pipe shall demonstrate the ability to endure a salt-spray resistance test in accordance with ASTM B117 without loss of adhesion for a minimum exposure time of 3,500 hours. Additionally, the coated pipe shall demonstrate the ability to withstand exposure in a weather-ometer apparatus for 1,000 hours without failure in accordance with ASTM D1499 and to show satisfactory adhesion when subjected to the crosshatch test, Method B, in ASTM D3359. The polyester finish coat shall not crack, blister or split under normal use.

G. The color of all framework shall be BLACK in accordance with ASTM F934.

H. The strength of Ameristar PermaCoat PC-40 FencePipe shall conform to the requirements of L.ASTM F1043; the minimum weight shall not be less than 90% of the nominal weight (see Table L. The strength of line, end, corner and pull posts shall be determined by the use of 4’ or 6’ cantilevered beam test. The top rail shall be determined by a 10’ free-supported beam test (see Table 1). An alternative method of determining pipe strength is by the calculation of bending moment (see Table 1). Conformance with this specification can be demonstrated by measuring the yield strength of a randomly selected piece of pipe from each lot and calculating the section modulus. The yield strength shall be determined according to the methods described in ASTM E8. For materials under this specification, the 0.2 offset method shall be used in determining yield strength. Terminal posts, line posts and top/bottom rails shall be precut to specified lengths.

TABLE 1

Fence Industry O.D.	Decimal O.D. Equivalent		Pipe Wall Thickness		Weight		Section Modulus inches	x	Min. Yield Strength psi	=	Max Bend. Moment lb. in.	Calculated Load (lbs.)		
												10' Free Supported	Cantilever	
	inches	(mm)	inches	(mm)	Lb./ft.	(kg/m)							4'	6'
1-5/8"	1.66	42.16	0.111	2.82	1.84	2.74	0.1961	x	50,000	=	9,805	327	204	136
2"	1.9	48.26	0.12	3.05	2.28	3.39	0.281	x	50,000	=	14,050	468	293	195
2-1/2"	2.375	60.33	0.13	3.3	3.12	4.64	0.4881	x	50,000	=	24,405	814	508	339

2.2 FABRIC

A. The material for color chain link fence fabric shall be manufactured from galvanized steel wire.

B. The weight of zinc shall meet the requirements of ASTM F668, Table 4. Galvanized wire shall be PVC or Powder coated to meet the requirements of ASTM F668. The class of the fence fabric shall be (specify Class 1 – Extruded, Class 2A – Extruded and Bonded, or Class 2B – Fused and Bonded).

C. Selvage: Top edge knuckled and bottom edge knuckled.

D. Color: The coating color for the fence fabric shall be BLACK. Reference ASTM F668 and ASTM F934.

E. Wire Size: The size of the steel wire core shall be 9 gauge (See Table 2); the finished size of the coated wire shall be 6 gauge (See Table 2).

F. Height and Mesh Size: The fabric height shall be determined by the contractor per each fence height with a mesh size of 2" inches for all chain link fence.

TABLE 2

Finished Gauge	Finished OD (NOM)	Core Diameter (NOM)	PVC Coating Thickness	Mesh Sizes Available	Fabric Extrusion Type	Minimum Breaking Strength
6	.192 (4.88 mm)	.148 (3.76 mm)	.015 - .025 (0.38-0.64 mm)	2 (50 mm) 1 ¾ (44 mm)	CLASS 2A	1290#
9	.148 (3.76 mm)	.120 (3.05 mm)	.015 - .025 (0.38-0.64 mm)	2 (50 mm) 1 ¾ (44 mm) 1 (25 mm)	CLASS 1, 2A	850#

2.3 FITTINGS AND ACCESSORIES

A. Fittings shall be hot-dipped galvanized pressed steel in accordance with ASTM F 626-89a. All fittings shall be industrial quality.

B. All fittings except nuts and bolts shall have the PVC coating extruded and adhered to the galvanized steel core wire per ASTM F 668-88, Class 2a. or powder coated and BLACK in Color. All other materials shall be 10 to 15 mils PVC coating minimum. No hand painting is allowed, except for minor touching up.

C. After installation, spray all nuts and bolts with two coats of flat alkyd enamel paint (color to match fence) suitable for metal.

D. Post tops shall be pressed steel and designed as a weather tight closure cap for tubular posts, and shall be vinyl or powder coated.

E. Accessory Materials: The material for fence fittings shall be manufactured to meet the requirements of ASTM F626. The coating for all fittings shall be the same Permacoat color coating system required for the framework (see 2.02); the color of all fittings and fasteners shall be black in accordance with ASTM F934. All fasteners shall be stainless steel.

F. Wire Ties: Manufacturer's 11 gauge galvanized steel wire for attachment of fabric to line posts. Double wrap 11 gauge galvanized steel wire for rails and braces. Hog ring ties for attachment of fabric to tension wire. Match finish of fabric (black)

G. Tension Wire: Provide No. 6 gage coil-spring wire at bottom of fabric. Equip each section with galvanized turnbuckle. Match finish of fabric (black)

H. Concrete Compressive Strength: 3,000 psi, minimum at 28 days, unless otherwise indicated on Construction Drawings.

I. Tension bars shall be of one piece lengths equal to full height of fabric with a minimum cross section of 3/16" x 3/4".

J. Tension Wire (IF APPLICABLE) Contractor shall provide a No. 7 W & M gauge galvanized high carbon coiled, tension wire (vinyl or powder coated), stretched along the bottom of fabric and fastened to the fabric at intervals of not more than 18 inches, using steel hog rings. Tension wire shall be attached with brace band, and nut and bolt. Tension wire shall be terminated around the bolt to itself with a minimum of three complete wraps.

2.4 GATES

A. Construct gate posts and frames of the sizes shown in the Bid Drawings

B. Gate Frames: Size as noted on the Bid Drawings with joints notched and welded to form a rigid frame.

1. Galvanize welded steel gate frames after fabrication as specified. AASHTO M 111. Do not use closed cells that would prohibit dipping to galvanizing tanks.

2. Frames shall be filled with same fabric as fence and fastened in the frame by means of tension bars and fasteners at 1 foot OC.

C. Diagonal Cross-Bracing: 3/8 inch O.D. vinyl coated adjustable truss rods to ensure frame rigidity without sag or twist.

D. Hinges: Pressed steel to suit gate size, non-lift-off type, offset to permit 180-degree gate opening. Provide 2 hinges for each leaf. Drill, tap, and set screw or weld to frame and post to prevent rotation. Hinges are to be Bulldog Industrial hinge with plug by Master Halco or approved equal.

E. Single Gate Door Handle: Provide heavy duty exterior commercial grade lever handle lock set to permit operation from either side of gate. Lever latch plate (bolt keeper) shall be custom made to provide leeway in case of slight movement of gate position.

F. Double Gate Latch: Provide stainless steel drop rod, locking device, and box as integral part of gate. Provide galvanized steel or pvc pipe sleeve, raised ½ inch above finished grade and set in concrete footing.

G. Furnish each gate with the appropriate hinges, latch, and drop-bar locking device.

PART 3 - EXECUTION

3.1 PREPARATION

A. Excavating

1. Drill holes for post footing in firm undisturbed, or compacted soil
2. Post Hole Dimension: as indicated on Construction Drawings
3. Spread soil from excavations uniformly adjacent to the fence line or on adjacent areas of the site if so directed.

3.2 INSTALLATION

A. General

1. Install work in accordance with ASTM F 567 and the manufacturer's recommendations.
2. Install posts at a maximum spacing of 8 feet on center.
3. Install corner or slope posts where changes in line or grade exceed a 30-degree deflection angle.
4. Provide continuous tip rails.
5. Provide bottom rails.
6. Provide braces at end posts, both sides of corer, slope and pull posts.
7. Provide a post top for each post with openings to permit through passage of top rail.

B. Posts

1. Remove loose and foreign materials form sides and bottoms of holes. Moisten soil prior to placing concrete.
2. Center and align posts in holes.
3. Place concrete around posts in continuous pour to 1 inch above grade. Vibrate or tamp for consolidation. Slope top surface to drain away from post.
4. Tops of all footings to be 6" from finish grade if not installed in retaining wall, trowel tops of footings, and slope or dome to direct water away from posts.

5. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
6. Allow concrete to attain at least 75 percent of its minimum 28-day strength before installation of rails, tension wires, and fabric.
7. Do not install such times less than 7 days after placement of concrete.
8. Do not stretch and tension fabric and wire, until concrete has attained full design strength.

C. Rails and Bracing

1. Install fence with a top rail and bottom tension wire.
2. Install rails continuously through post caps and extension arms, bending to radius for curved runs. Splice with 6-inch long rail sleeve.
3. Equip each pull post, and both sides of corer posts, with brace rails and adjustable 3/8-inch diameter truss rods.
4. Provide bracing to the midpoint of the nearest line post at all end, corner, slope pull posts.
5. Provide expansion couplings as recommended by the fencing manufacturer.

D. Fabric

1. Install fabric on outward side of fence and anchor to framework so that fabric remains in tension after pulling force is removed
2. Leave approximately 1 inch between finish grade and bottom selvage.
3. Excavate high points in the ground to clear the bottom of the fence.
4. Place and compact fill to within 1 inch of the bottom of the fabric in depressions.
5. Pull fabric taut and tie to posts, rails and tension wires
6. For tying fabric, refer to construction drawings for spacing and materials section this spec for gauge strength
7. Install stretcher bars by threading through or clamping to fabric at 4 inches on centers, and secure to posts with fabric bands spaced vertically at 14 inches on centers.
8. Install tension wires parallel to the line of fabric by weaving through the fabric and tying to each post with not less than number 6-gage tie wire.
9. Bend end of wire tight to surface to minimize hazards to persons and clothing.

E. Miscellaneous

1. Use U-shaped tie straps, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least two full turns.

F. Fasteners

1. Install nuts for tension band and hardware bolts on side of fence opposite fabric side.
2. Peen the ends of bolts to prevent removal of nuts.
3. Repair coatings damaged in shop or during field erections, using a hot applied repair compound applied in accordance with it manufacturer’s recommendations.

G. Gates

1. Install single gate or double gate as specified. Install plumb, level, and secure for full opening without interference.

2. Install ground¬set items in concrete for anchorage as shown in the Standard Drawing or as recommended by the fence manufacturer. Adjust hardware for smooth operation.
3. Set gate openings according to manufacturer=s dimensions.
4. Fabric description numbers:
   a. First number indicates height.
   b. Second number indicates width of fabric opening.

H. Baseboard

1. Pressure treated lumber backstop baseboard: Boards shall be secured with 5/16 inch x length as required, galvanized carriage bolts drilled and bolted through to all backstop posts. Install carriage bolts with heads toward field. Cut and peen bolt ends flush with nuts. Use lock washers throughout.

3.3 TESTS

A. Upon completion of this portion of the work, conduct fabric tension (deflection) tests.

3.4 ADJUSTING

A. Adjust fabric tension and clean surfaces of the work including wire fabric

B. Touch-up abraded surfaces of galvanizing with manufacturer' recommended paint.

PART 4 – MEASUREMENT

4.1 The measurement of CHAIN LINK COURT FENCE shall be the number of LINEAR FEET constructed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 323113

SECTION 323223 - SEGMENTAL BLOCK RETAINING WALL

PART 1 - GENERAL

1.1 Summary

A. Work shall consist of furnishing and construction of a modular concrete retaining wall.

B. Work includes preparing foundation soil, furnishing and installing leveling pad, unit drainage fill and backfill to the lines and grades shown on the Drawings.

1.2 Related Sections

A. Section 312000 - Earthwork

1.3 Reference Documents

A. American Society for Testing and Materials (ASTM)

1.	ASTM C140	Sampling and Testing Concrete Masonry Units
2.	ASTM C1372	Specification for Dry-Cast Segmental Retaining Wall Units
3.	ASTM D422	Particle-Size Analysis of Soils
4.	ASTM D698	Laboratory Compaction Characteristics of Soil -Standard Effort
5.	ASTM D1557	Laboratory Compaction Characteristics of Soil -Modified Effort
7.	ASTM D4318	Liquid Limit, Plastic Limit and Plasticity Index of Soils
8.	ASTM D4475	Horizontal Shear Strength of Pultruded Reinforced Plastic Rods
9.	ASTM D4476	Flexural Properties of Fiber Reinforced Pultruded Plastic Rods
10.	ASTM D4595	Tensile Properties of Geotextiles - Wide Width Strip
14.	ASTM D6638	Connection Strength - Reinforcement/Segmental Units
16.	ASTM D6916	Shear Strength Between Segmental Concrete Units

D. National Concrete Masonry Association (NCMA)

1. NCMA SRWU-1 Test Method for Determining Connection Strength of SRW
2. NCMA SRWU-2 Test Method for Determining Shear Strength of SRW

1.4 Submittals/Certification

A. Contractor shall submit a Manufacturer's certification, prior to start of work, that the retaining wall system components meet the requirements of this specification and the structure design.

B. Contractor shall submit construction drawings and design calculations for the retaining wall system prepared by manufacturer or by a Professional Engineer registered in the state of the project. The engineering designs, techniques, and material evaluations shall be in accordance with the Manufacturer’s Design Manual, NCMA Design Guidelines For Segmental Retaining Walls, or the AASHTO Standard Specifications for Highway Bridges (whichever is applicable to designer).

C. Contractor shall submit a test report documenting strength of specific modular concrete unit. The connection strength evaluation shall be performed in accordance with ASTM D6638 (NCMA SRWU-1).

1.5 Quality Assurance

A. Contractor shall submit certification, prior to start of work, that the retaining wall system (modular concrete units with fiberglass pins and specific geogrid):

1) Has been successfully utilized on a minimum of five (5) similar projects, i.e., height, soil fill types, erection tolerances, etc.; and

2) Has been successfully installed on a minimum of one thousand (1,000) square feet of retaining walls.

B. Contractor shall submit a list of five (5) previously constructed projects of similar size and magnitude by the wall installer where a similar retaining wall system has been constructed successfully. Contact names and telephone numbers shall be listed for each project.

D. Owner shall/may provide soil testing and quality assurance inspection during earthwork and wall construction operations. Contractor shall provide any quality control testing or inspection not provided by the Owner. Owner's quality assurance program does not relieve the contractor of responsibility for quality control and wall performance.

1.6 Delivery, Storage and Handling

A. Contractor shall check all materials upon delivery to assure that the proper type, grade, color, and certification have been received.

B. Contractor shall protect all materials from damage due to jobsite conditions and in accordance with manufacturer's recommendations. Damaged materials shall not be incorporated into the work.

PART 2 - PRODUCTS

2.1 Definitions

A. Modular Unit - a concrete retaining wall element machine made from Portland cement, water, and aggregates.

B. Unit Drainage Fill - drainage aggregate, which is placed within and immediately behind the modular concrete units.

2.2 Modular Concrete Retaining Wall Units

A. Modular concrete units shall be per KEYSTONE Century Wall Retaining Wall System or approved equal in accordance with these specifications and shall conform to the following architectural requirements:

1. Face color – “Granite”
2. Face finish – standard “weathered” face.
3. Bond configuration – randomly utilize the various shapes to avoid repetition of the same unit size. Avoid stack bonding of unit joint for more than two courses vertically.
4. Exposed surfaces of units shall be free of cracks or major imperfections when viewed from a distance of 10 feet under diffused lighting. Chips and imperfections are expected with the “weathered” rock face texture and are acceptable unless adversely affecting installation or structural performance.

B. Modular concrete materials shall conform to the requirements of ASTM C1372 - Standard Specifications for Segmental Retaining Wall Units.

C. Modular concrete materials shall be manufactured at a facility located within 50-miles of the project site.

D. When assembled modular concrete units shall allow for the free flow of water through the completed wall face (ie. no adhesives shall be used to seal wall units except as specified by manufacturer for attaching capstone units).

E. Modular concrete units shall conform to the following structural and geometric requirements measured in accordance with ASTM C140 Sampling and Testing Concrete Masonry Units:

1. Compressive strength: ≥ 3000 psi.
2. Absorption: ≤ 8 % for standard weight aggregates
3. Dimensional tolerances: ± 1/8" from nominal unit dimensions not including rough split face
4. Unit size: 4” H x 12" D minimum; width of units varies from 7” to 18”.
5. Unit weight: 20 lbs to 90 lbs per unit.

F. Modular concrete units shall conform to the following performance testing:

1. Inter-unit shear strength in accordance with ASTM D6916 (NCMA SRWU-2): 1000-plf minimum at 2-psi normal pressure.
2. Geogrid/unit peak connection strength in accordance with ASTM D6638 (NCMA SRWU-1): 700-plf minimum at 2-psi normal force.

F. Modular concrete units shall conform to the following constructability requirements:

1. Vertical setback: 1/8” per course, or 1” per course, as shown on the plans.
2. Alignment and grid positioning mechanism - fiberglass pins, one for each pin placement series or a minimum of one per unit.
3. Maximum horizontal gap between erected units shall be ≤ 1/2 inch.

2.3 Shear and Reinforcement Pin Connectors

A. Shear and reinforcement pin connectors shall be 1/2-inch diameter thermoset isopthalic polyester resin-pultruded fiberglass reinforcement rods to provide connection between vertically and horizontally adjacent units and the geosynthetic reinforcement, with the following requirements:

1. Pins shall be 5 1/4” long and capped with a 3/4” diameter “shoulder”.
2. Flexural Strength in accordance with ASTM D4476: 128,000 psi minimum.
3. Short Beam Shear in accordance with ASTM D4475: 6,400 psi minimum.

B. Shear and reinforcement pin connectors shall be capable of holding the geogrid in the proper design position during grid pre-tensioning and backfilling.

2.4 Base Leveling Pad Material

A. Material shall consist of a compacted crushed stone base or non-reinforced concrete as shown on the construction drawings.

2.5 Unit Drainage Fill

A. Unit drainage fill shall consist of VDOT No. 57 crushed aggregate.

B. Drainage fill shall be placed within the cores of, between, and behind the units as indicated on the construction drawings. Not less than 1.2 cubic foot of drainage fill shall be used for each square foot of wall face unless otherwise specified.

2.6 REINFORCED BACKFILL

A. Reinforced backfill shall be free of debris and meet the following requirements:

Compacted Fill (Sandy ML, SM, or more granular per ASTM D-2487)
LL < 45, PI < 20 per ASTM D-4318
5 < pH < 9 per ASTM D1293
% Fines (passing the No. 200 U.S. Standard Sieve) = 70 Max. per ASTM D1140
Max. Aggregate Size = 3/4"

B. The maximum aggregate size shall be limited to 3/4 inch (19 mm) unless installation damage tests have been performed to evaluate potential strength reductions to the geogrid design due to damage during construction.

C. Material can be site-excavated soils where the above requirements can be met. Unsuitable soils for backfill (high plastic clays or organic soils) shall not be used in the backfill or in the reinforced soil mass.

D. Contractor shall submit reinforced fill sample and laboratory test results to the Architect/Engineer for approval prior to the use of any proposed reinforced fill material.

2.7 GEOGRID SOIL REINFORCEMENT

A. Geosynthetic reinforcement shall consist of geogrids manufactured specifically for soil reinforcement applications and shall be manufactured from high tenacity polyester yarn or high density polyethylene. Polyester geogrid shall be knitted from high tenacity polyester filament yarn with a molecular weight exceeding 25,000 g/m and a carboxyl end group values less than 30. Polyester geogrid shall be coated with an impregnated PVC coating that resists peeling, cracking, and stripping.

B. Manufacturing Quality Control
The geogrid manufacturer shall have a manufacturing quality control program that includes QC testing by an independent laboratory.
The QC testing shall include:
Tensile Strength Testing
Molecular Weight (Polyester)

2.8 DRAINAGE PIPE

A. If required, the drainage pipe shall be perforated or slotted PVC pipe manufactured in accordance with ASTM D-3034 or corrugated HDPE pipe manufactured in accordance with AASHTO M252.

2.9 GEOTEXTILE FILTER FABRIC

A. When required, geotextile filter fabric shall be a needle punched, nonwoven fabric that meets the requirements of AASHTO M-288, Class III (e.g., MIRAFI 140N or equivalent).

PART 3 - EXECUTION

3.1 EXCAVATION

A. Contractor shall excavate to the lines and grades shown on the construction drawings. Owner's representative shall inspect the excavation and approve prior to placement of leveling material or fill soils. Proof roll foundation area as directed to determine if remedial work is required.

B. Over-excavation and replacement of unsuitable foundation soils and replacement with approved compacted fill will be compensated as agreed upon with the Owner.

3.2 BASE LEVELING PAD

A. Leveling pad material shall be placed to the lines and grades shown on the construction drawings, to a minimum thickness of 6 inches and extend laterally a minimum of 6" in front and behind the wall facing unit.

B. Soil leveling pad materials shall be compacted to a minimum of 95 % Standard Proctor density per ASTM D-698.

C. Leveling pad shall be prepared to insure full contact to the base surface of the concrete units.

3.3 FACING UNIT INSTALLATION

A. First course of units shall be placed on the leveling pad at the appropriate line and grade. Alignment and level shall be checked in all directions and insure that all units are in full contact with the base and properly seated. If vertical unit alignment is chosen, units shall be uniformly tilted back towards the backfill slightly to create and maintain positive wall batter.

B. Place the front of units side-by-side. Do not leave gaps between adjacent units. Layout of corners and curves shall be in accordance with manufacturer's recommendations.

C. Install shear/connecting devices per manufacturer's recommendations.

D. Place and compact drainage fill within and behind wall units. Place and compact backfill soil behind drainage fill. Follow wall erection and drainage fill closely with structure backfill.

E. Maximum stacked vertical height of wall units, prior to unit drainage fill and backfill placement and compaction, shall not exceed one course.

3.4 STRUCTURAL GEOGRID INSTALLATION

A. Geogrid shall be oriented with the highest strength axis perpendicular to the wall alignment.

B. Geogrid reinforcement shall be placed at the strengths, lengths, and elevations shown on the construction design drawings or as directed by the Engineer.

C. The geogrid shall be laid horizontally on compacted backfill and attached to the Keystone, or approved equal, wall pins and within 1” of the face of the units. Place the next course of Keystone concrete units over the geogrid. The geogrid shall be pulled taut and anchored prior to backfill placement on the geogrid.

D. Geogrid reinforcements shall be continuous throughout their embedment lengths and placed side-by-side to provide 100% coverage at each level. Spliced connections between shorter pieces of geogrid or gaps greater than 2” between adjacent pieces of geogrid are not permitted.

3.5 REINFORCED BACKFILL PLACEMENT

A. Reinforced backfill shall be placed, spread, and compacted in such a manner that minimizes the development of slack in the geogrid and installation damage.

B. Reinforced backfill shall be placed and compacted in lifts not to exceed 6 inches (150 mm) where hand compaction is used, or 8 - 10 inches where heavy compaction equipment is used. Lift thickness shall be decreased to achieve the required density as required.

C. Reinforced backfill shall be compacted to a minimum of 95 % Standard Proctor density per ASTM D-698. The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer and shall be dry of optimum, + 0%, -3%.

D. Only lightweight hand-operated equipment shall be allowed within 3 feet from the tail of the concrete facing unit.

E. Tracked construction equipment shall not be operated directly upon the geogrid reinforcement. A minimum fill thickness of 6 inches is required prior to operation of tracked vehicles over the geogrid. Tracked vehicle turning should be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid.

F. Rubber tired equipment may pass over geogrid reinforcement at slow speeds, less than 10 MPH. Sudden braking and sharp turning shall be avoided.

G. At the end of each day's operation, the Contractor shall slope the last lift of reinforced backfill away from the wall units to direct runoff away from wall face. The Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

3.6 CAP INSTALLATION

A. Cap units shall be glued to underlying units with an all-weather concrete construction adhesive.

3.7 AS-BUILT CONSTRUCTION TOLERANCES

A. Vertical alignment: ± 1.5" (40 mm) over any 10' (3 m) distance.

B. Wall Batter: within 2 degrees of design batter.

C. Horizontal alignment: ± 1.5" (40 mm) over any 10' (3 m) distance.
Corners, bends & curves: ± 1 foot (300 mm) to theoretical location.

D. Maximum horizontal gap between erected units shall be ≤ 1/2 inch (13 mm).

3.8 FIELD QUALITY CONTROL

A. Quality Assurance - The Owner shall/may engage inspection and testing services, including independent laboratories, to provide quality assurance and testing services during construction. This does not relieve the Contractor from securing the necessary construction quality control testing.

B. Quality Assurance should include foundation soil inspection. Verification of geotechnical design parameters, and verification that the contractor’s quality control testing is adequate as a minimum. Quality assurance shall also include observation of construction for general compliance with design drawings and project specifications. *(Quality Assurance is usually best performed by the site geotechnical engineer.)*

C. Quality Control – The Contractor shall engage inspection and testing services to perform the minimum quality control testing described in the retaining wall design plans and specifications. Only qualified and experienced technicians and engineers shall perform testing and inspection services.

D. Quality Control testing shall include soil and backfill testing to verify soil types and compaction and verification that the retaining wall is being constructed in accordance with the design plans and project specifications.

PART 4 - MEASUREMENT

4.1 The measurement of SEGMENTAL BLOCK RETAINING WALL shall be the number of FACE SQUARE FEET constructed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 323223

SECTION 329100 - PLANTING PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes erosion control materials, soil amendments, mulching and topsoil.

B. Provide all labor, materials, tools and equipment as required to have topsoil, planting soil mix, soil stabilization, amendments, and mulch applied per the specifications on all areas disturbed by construction to receive plant materials as indicated in the approved plans.

C. Related Sections:

1. Section 311000 Site Clearing, Preparation, Demolition and Removals
2. Section 311300 Tree Protection and Root Pruning
3. Section 312000 Earthwork
4. Section 312500 Temporary Erosion and Sediment Control
5. Section 321819 Fieldstone Boulders
6. Section 329200 Seeding and Sodding
7. Section 329300 Exterior Plants

D. In addition to the specifications contained herein, Work shall be performed in accordance with the:

1. Drawings and general provisions of the contract, including general and supplementary conditions
2. Arlington County Department of Parks & Recreation Design Standards as shown on the plans and available online at: http://parks.arlingtonva.us/design-standards/

1.2 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Imported Topsoil: Soil obtained off-site that meets the specifications herein for topsoil and is suitable for use in planting soil/backfill soil mixture when existing soil quantities are insufficient.

C. Planting Soil/Backfill Soil Mixture: Existing soil modified as specified to be suitable for planting.

D. Bioretention Media: Soil mixture imported from off-site that meets stormwater management specifications (see plans) for stormwater management facilities.

E. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

F. ISA: International Society of Arboriculture

G. CBAY: Chesapeake Bay, typically referring to CBAY watershed.

H. Urban Forester/County Urban Forester: Refers to the Arlington County Urban Forester

I. Landscape Architect: Refers to an Arlington County Landscape Architect or their designee.

1.3 SUBMITTALS

A. Samples of all materials specified shall be submitted to the Project Officer for approval with coordination of the Landscape Architect. All approvals shall be in writing.

B. Samples:

1. Existing Topsoil: Provide 1-pound sample of existing topsoil with the following soil test reports.

   a. Fertility: pH, nitrate nitrogen, ammonia nitrogen, phosphate phosphorous, potassium, calcium, magnesium, zinc, iron, manganese.
   b. Suitability: total salinity, boron, sodium, potassium, calcium, magnesium, chloride, sulfate.
   c. Physical properties including organic content and particle size distribution.

2. Imported Topsoil: If imported topsoil is required, Contractor shall provide a 1-pound sample of the imported topsoil with the soil test reports as noted above for "Existing Topsoil."
3. Imported Topsoil for Bioretention Areas: If bioretention areas are indicated in the approved plans, the Contractor shall submit soil sample per specifications.
4. Bioretention Basin and Planter Box: See Plans for specifications.
5. Mulches and Organic Matter/Compost: Sample of mulch and organic matter/compost may be requested in lieu of inspection.
6. Product certificates: Contractor shall submit for each type of manufactured product, to be approved by the Project Officer in coordination with Landscape Architect or Urban Forester and complying with the following:
7. Manufacturer's certified analysis for standard products.

E. Geotextile/Soil Stabilization/Erosion Control Fabric: Sample

1.4 QUALITY ASSURANCE

A. Contractor shall have all existing and furnished topsoil to be used for seeding and sodding, and for planting areas tested by a state laboratory or recognized commercial soil-testing laboratory in order to determine recommendations for the types and quantities of soil amendments. The results of this test will determine the rates and types of fertilizers, lime, soil conditioners, and other amendments, if necessary.

1. Soil tests shall use a representative sample of on-site soils. If existing soil has been undisturbed and is suitable as determined by the soil test, no additional amendments are required.

2. Adjustments should be made based on soil test results.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials shall conform to those stipulated below, unless otherwise approved in writing by the Project Officer with confirmation by the Landscape Architect or County Urban Forester.

B. Specified materials to be applied in amounts and methods herein stipulated.

C. Delivery tickets indicating date, weight, analysis and vendor's name, to be submitted to Project Officer.

2.2 SOIL AMENDMENTS

A. Lime: Application rates for liming materials and lime material type chosen shall be determined by required soil tests and approved by the Project Officer in coordination with the Landscape Architect or Urban Forester.

1. When required and unless test results indicate otherwise, lime material shall be dry and free flowing pulverized limestone, hydrate lime or burnt lime that contains at least 50% total oxides (calcium oxide plus magnesium oxide). Ground limestone shall be ground to such fineness that at a minimum of 50% will pass through a 100-mesh sieve and 98% - 100% will pass through a 20-mesh sieve. Lime material shall meet the Virginia Agricultural Liming Materials Act, Code of Virginia Section 3.1-126.1.

2. Fertilizer: Fertilizer type and application rate shall be determined by results of required soil tests and approved by the Project Officer in coordination with the Landscape Architect or Urban Forester:

   a. When required and unless test results indicate otherwise, commercial-grade complete fertilizer will be of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

      i. Composition: 10 percent nitrogen, 20 percent phosphorous, and 10 percent potassium, by weight.

   b. All fertilizers shall be uniform in composition, free flowing, and suitable for application with approved equipment.

   c. Fertilizers shall be delivered to the Project Site fully labeled according to applicable state fertilizer laws and shall bear the name, trade name, or trademark and warranty of the product.

3. Delay mixing fertilizer with planting soil if planting will not proceed within 2 days.
4. Spread fertilizer and lime with approved equipment.

2.3 EXISTING TOPSOIL

A. Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation period and stockpiled.

1. Contractor shall verify suitability of stockpiled soil to produce or to be amended to produce viable planting soil for lawns and planting beds as described herein.

B. Existing topsoil is to be used to extent possible for lawn areas and is to be amended per the specifications to become the Planting Soil/Backfill Soil Mixture for use in planting pits and bed areas.

C. Prior to use for lawn areas or in planting soil mix, Contractor shall remove all stones, roots, plants, sod, clods, and clay lumps larger than 1/2 –inch in any direction, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris and other extraneous materials that are harmful to plant growth.

D. After removal of debris and extraneous materials noted above, the Contractor shall obtain soil tests for the existing soil per the requirements in section 1.04 “Quality Assurance.”

E. Contractor shall submit soil test results to the Project Officer for approval with confirmation by the Landscape Architect or Urban Forester.

F. Contractor shall supplement the existing soil as recommended in soil test results to achieve a viable planting soil for lawns and/or planting beds. Contractor shall supplement with imported topsoil per the specifications from off-site sources when quantities of approved, existing topsoil are insufficient for lawns and planting beds.

G. Contractor shall submit a sample of the topsoil that has been amended based on soil test results for approval by the Project Officer with confirmation by Landscape Architect or Urban Forester prior to use in lawn areas or planting beds or pits.

H. Topsoil installed on grade shall attempt to match existing soil texture, except for situations where clay subsoil exists. In the event that clay subsoil exists, use loam or silt loam topsoil.

I. Imported topsoil rather than existing topsoil is to be used for planting in bioretention areas, unless otherwise indicated on the approved plans.

2.4 PLANTING SOIL MIX/BACKFILL SOIL MIXTURE

A. The planting soil mix (also known as backfill soil mixture) shall consist of existing topsoil that has been approved for planting per the specifications above and approved organic matter.

B. The planting soil mix/backfill soil mixture shall be composed of ¾ approved existing topsoil and ¼ approved organic matter as described in the Arlington County DPR Standard planting details, unless otherwise indicated by the Project Officer with confirmation by the Landscape Architect and Urban Forester.

2.5 IMPORTED TOPSOIL

A. Contractor shall add imported topsoil when required on the drawings, when quantity of existing topsoil is insufficient or when determined to be necessary due to soil testing results.

B. Topsoil shall be the natural, original surface soil, a sandy loam uniform in composition and shall be in a friable condition and shall contain less than 3 percent subsoil, hardpan material, stones and clods larger than 1/2 inch in diameter in any direction. It shall also be free of sticks, tree or shrub roots, debris and other material undesirable for plant growth. The area and the topsoil shall be free of undesirable plant such as, but not limited to, Bermuda grass, nut sedge, mugwort or noxious weeds as set forth in the Federal Seed Act.

C. The topsoil shall contain at least 5 percent organic matter. It shall be a sandy loam consisting of at least 5 but not more than 20% clay, at least 10 but not more than 80% sand. It shall have a pH between 5.5 to 6.5. Soluble salts (salinity) shall not exceed 500 ppm. Soil fertility shall be "High" in natural nutrients based on the coordinated ratings in pounds per acre as established by the National Soil and Fertilizer Research Committee.

D. Topsoil which has been manufactured by blending materials which individually do not meet the requirements of this specification will not be accepted even though the resulting blend meets the organic matter, mechanical analysis, pH and soluble salts requirements. Agricultural limestone at not more than 5 pounds per cubic yard of topsoil any be used to adjust the pH provided it is well mixed in a manner which does not destroy the structure of the soil.

2.6 IMPORTED TOPSOIL FOR BIO-RETENTION AREAS

A. Soil for bioretention areas shall comply with the Filter Media and Surface Cover section of the Virginia Department of Environmental Quality's(DEQ) Design Specification No. 9 for Bioretention, Version 2.0, January 1, 2013.

B. Placement of the planting soil in the bioretention area should be in lifts of 12 to 18 inches and lightly compacted. Minimal compaction effort can be applied to the soil by tamping with a bucket from a dozer or backhoe.

2.7 MULCHES AND ORGANIC MATTER

A. Straw Mulch for Seeded Areas: Provide air-dry, clean, mildew and seed-free, salt hay or threshed straw of wheat, rye, oats or barley.

B. Wood Chip Bark Mulch for Planted Areas: Wood Chip Bark Mulch shall be double-shredded hardwood bark mulch, uniform in size and free of stones, clods, non-organic debris or other foreign material and aged for at least 6 months from an approved source. Insufficiently or improperly aged mulch containing high bacterial counts or high levels of bark or other materials resistant to decomposition shall not be used. Mulch shall not contain the trunk of trees.

C. Organic Matter/Compost Mulch: Well-composted, trash-free, stable, and weed-free organic matter such as composted bark, leaf mold or other plant debris material that has been composted to a point of decay and is mature.

1. pH range of 5.5 to 8; moisture content 35 to 55 percent by weight
2. 100 percent passing through 1-inch sieve
3. Peat moss shall not be used.
4. Organic amendments shall be commercially prepared and shall comply with the U.S. Compost Council Seal of Testing Assurance Program's Test Methods for the Examination of Composting and Compost (STA/TMECC) criteria, or as modified in approved plan documents.

2.8 SOIL STABILIZATION/EROSION CONTROL FABRIC

A. ECS-2B Double New Straw Biodegradable Rolled Erosion Control Product, or an approved equal shall be used in all planting beds.

1. Shall meet Type 2.D specifications for ECTC and HFWA FP-03 Section 713.17
2. Shall have two (2) layers of organic jute netting sewn together with biodegradable thread.
3. Overlap sections 12" and secure with manufacturer's recommended steel wire staples, 6 inches long.

B. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.

C. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches.

D. Erosion-Control Mats: Cellular, non-biodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped grades, of 3 inch nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.

1. Products: Subject to compliance with requirements and plan documents, the products below, or an approved equivalent, be used:

a. Curlex Excelsior Erosion Control Mat; American Excelsior, or approved equal.

PART 3 - EXECUTION

3.1 PREPARATION

A. All identified areas within the project limits shall have approved topsoil mix spread on them and be prepared for seeding and sodding by bringing ground surfaces to grades shown on the drawings. Planting pits and bed areas identified on the approved plans shall be prepared in accordance with the applicable DPR Landscape Standard details.

1. No seeding shall be done on frozen ground or when the temperature is 32F or lower. Refer to specification 329200, "Seeding and Sodding." Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties, sidewalks and areas.

2. Rototilling shall not be performed within the critical root zone of trees to be

preserved.

3. The soil shall not be tilled or amended when the soil's moisture capacity is above field capacity or when the soil is frozen.

4. Contractor shall identify utilities, existing irrigation and underground utilities. All areas on either side of the utility marking shall be amended by hand.

5. Contractor shall verify that no foreign or deleterious material or liquid has been deposited in soil within a planting area.

6. Contractor shall proceed with installation only after both unsatisfactory conditions have been corrected and rough grading has been completed and approved by the Project Officer in coordination with the Landscape Architect or Urban Forester.

7. Contractor shall protect structures, utilities, sidewalks, pavements and other facilities, trees, shrubs and plantings from damage caused by planting operations.

   a. Protect adjacent and adjoining areas from hydro-seeding and hydro-mulching overspray.

   b. Protect grade stakes set by others until directed to move them.

8. Surfaces shall conform to finish grade, free of water retaining depressions, soil friable, free of clay and of uniformly firm texture.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches. Remove stones larger than 1/2 inch in any direction and sticks, roots, rubbish, and other extraneous matter including grass vegetation and turf and legally dispose of them off of Arlington County property. Do not mix into surface soil.

1. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix. Delay mixing amendments with soil if planting will not proceed within 2 days.

2. Loosen surface soil to a depth of at least of 6 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture.

3. Spread planting soil mix to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

C. Unchanged Subgrades: If lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare surface soil as follows:

1. Remove stones larger than 1/2 inch in any dimension and sticks, roots, trash, and other extraneous matter. Legally dispose them off of Arlington County property. Do not mix into surface soil

2. Loosen surface soil to a depth of at least 6 inches, apply soil amendments and fertilizers according to the planting soil mix proportion and mix thoroughly into the top 4 inches of soil.

D. Finish Grading: Grade landscape areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Adjust for the thickness of sod, where applicable. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.

E. If bioretention areas are specified in the approved plans, the Contractor shall construct these areas in accordance with the Virginia DEQ Stormwater Design Specification No. 9, Version 2.0, January 1, 2013.

F. Contractor shall avoid unnecessary compaction of the soil during grading.

G. Contractor shall ensure appropriate slopes of the swales, berms and final grades.

H. Immediately following each day's work, contractor shall clean all dirt, excess soil, debris and trash from the Project Site. Contractor shall protect and store additional soils in stockpiles protected from saturation, erosion, weed growth and contamination with plastic sheeting or tarps.

I. Amendments for seeding and sodding areas shall be applied after determining by soils test as follows:

1. Lime as specified shall be spread uniformly over designated area. Rate depends on soil tests. Soil tests shall be made before lime application at 8 to 10 plugs per acre taken by the method prescribed the United States Department of Agriculture.

2. Fertilizer shall be spread after the lime has been applied. Rate shall be as recommended per the soil tests.

3. Fertilizer shall be spread with approved equipment and at an even rate over the area to be seeded or sodded.

4. Work lime and fertilizer into top 4 inches of topsoil and grade to smooth surface ready for seeding.

J. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

K. Prepared lawns and planting areas shall be inspected and approved by Project Officer in coordination with Landscape Architect prior to seeding, sodding or planting.

L. If the graded areas develop volunteer weed growth, the growth shall be eliminated at the expense of the Contractor.

3.2 SOIL STABILIZATION MATERIALS

A. Prepare planting area as specified.

B. Moisten prepared planting area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

C. Install Soil Stabilization from top of slope, overlapping joints by 12 inches, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

D. Plant shrubs, trees and perennials through Soil Stabilization fabric by carefully separating fabric layers to allow space for planting.

E. Remove non-biodegradable stabilization materials after plant establishment.

PART 4 – MEASUREMENT

4.1 The measurement of PLANTING PREPARATION shall be the LUMP SUM constructed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 329100

SECTION 329113 – SOIL PREPARATION (STRUCTURAL SOILS)

PART 1 - GENERAL

1.1 SUMMARY

A. This work consists of supplying, testing, amending, mixing and installing various planting soil categories for use in continuous soil panels (tree pits), covering the following:

1. Planting Soil shall refer to Sand-Based Topsoil.

2. Sand Based Topsoil: soil blend for trees where planting soils are beneath permeable surfaces.

3. Compost: a soil amendment to be used with existing soil

4. Sand: for making the Sand Based Topsoil and for the choker layer around the pipe

1.2 SUBMITTALS AND TESTING

A. Critical Path Processing - Soils Testing Report Submittals.

The Contractor is responsible for recognizing that these project materials warrant timely and serious attention, that the testing process to achieve approved materials shall be considered a lead time item, and that under no circumstance shall failure to comply with all specification requirements be an excuse for a delay or for expedient substitution of unacceptable material(s).

B. Sources for Soil Components and Soil Mixes: Within seven (7) days after notice to proceed, submit information identifying sources for soil components and the firm responsible for mixing of soil mixes:

1. Soil mix supplier shall have a minimum of five years of experience supplying custom planting soil mixes.

2. Submit supplier name, address, telephone and fax numbers and contact name.

3. Submit certification that accepted supplier is able to provide sufficient quantities of materials and mixes for the entire project.

C. Testing Agency**:** Within seven (7) days after notice to proceed, Contractor shall furnish the name and location of the proposed testing agency. Agency proposed for testing of horticultural soils shall be an approved member of the Performance Assessment Program (PAP) administered by the North American Proficiency Testing (NAPT) Oversight Committee. The Testing agency shall be accepted by the Chief Engineer.

D. Product Data: No later than 30 days prior to planned soil construction, submit most recent printed information from manufacturer for:

1. Organic Material: identify the material(s) from of which is it composed and identify the location where material was composted.

2. Fertilizers

3. Ground Limestone

4. Sulfur

E. Samples and Test Reports: Submit representative samples and reports to the Chief Engineer and the Testing Agency as described herein for approval. Delivered materials shall closely match the approved samples.

1. Submit 1 gallon soil samples and horticultural soil test reports in two phases.

a. Planting Soil Base Components:

1) Base Loam

2) Organic Amendment (Compost)

3) Sand

Submit samples of above to the Testing Agency. Submit soil testing reports to SPW no later than 21 days prior to planned soil construction.

b. Only after approval of base components, submit soil blend mixes / mediums for approval.
Mixing and batching of soil mediums in the same manner as bulk soils will be prepared for delivery to site, and shall include:

1) Sand-Based Topsoil

Submit samples of above to the Testing Agency. Submit duplicate samples and soil testing reports to Chief Engineer no later than 14 days prior to planned soil construction.

c. Samples of each soil type delivered to the site shall taken and tested for conformance with the Specification Requirements. Submit duplicate samples and soil testing reports to Chief Engineer.

2. Soil Sampling: Sampling shall be done by the Soil Supplier. Samples shall be representative of the material to be brought to the site. Each sample shall be a Composite Sample, which consists of 5 separate sub-samples taken from a minimum of (5) different locations at each source and mixed together to make the test sample.

3. Test Reports shall be certified and shall cover the items below. All reports must be from recent analyses, less than 90 days old, and represent materials that are available for delivery to the site.

a. Mechanical gradation (sieve analysis) shall be performed and compared to the

USDA Soil Classification System.

b. The silt and clay content shall be determined by a Hydrometer Test of soil passing the #270 sieve. Percent clay (0.002 mm) shall be reported separately in addition to silt (ASTM D- 422-63, hydrometer method).

c. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium Magnesium, Aluminum, Manganese, Cation Exchange Capacity, Soluble Salts, acidity (pH) and buffer pH.

Tests shall be conducted in accordance with Recommended Soil Testing Procedures for the Northeastern United States, Current Edition, Northeastern Regional Publication No. 493; Agricultural Experiment Stations of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont and West Virginia. Tests include the following:

1) Test for soil Organic Matter by loss of weight on ignition, as described in Northeastern Regional Publication No. 493.

2) Test for soil CEC by exchangeable acidity method as described in Northeastern Regional Publication No. 493.

3) Test for soil Soluble Salts shall be by the 1:2 (v:v) soil:water Extract Method as described in Northeastern Regional Publication No. 493.

4) Test for Buffer pH by the SMP method as described in Northeastern Regional Publication No. 493.

5) Certified reports on analyses from producers of composted organic materials are required. Analyses will include all tests for criteria specified herein.

6) Density Tests: In-place density testing is required in all areas by the following: ASTM D1556 Density of Soil and Rock In Place Using Sand Cone Method, ASTM D6398-10 Nuclear Methods or ASTM D2167-08 Rubber Balloon method. AASHTO T-99 (Standard Effort) shall be used for Laboratory Compaction Characteristics of Soil unless otherwise directed by the SPW inspector.

a) Contractor shall perform In-place density tests at a rate of one test per 2,000 square feet for each type of material placed.

7) Test data and recommendations for soil amendments including but not limited to: nitrogen, phosphorus, potassium and limestone

4. Certificates: No later than 7 days prior to planned soil construction, submit certification that soil blend components and soil mediums meet applicable environmental standards of the District of Columbia.

1.3 QUALITY ASSURANCE

A. Due to the natural material used in this specification, adjustments may be made to the following requirements as part of the submittal and approval process in conjunction with the SPW, and the landscape architect, and soil scientist.

1.4 PRE-INSTALLATION EXAMINATION AND PREPARATION

A. Coordinate activities with other project contractors so that there is no soil disturbance from traffic or other construction activities subsequent to placement.

B. Pre-Installation Examination Required: The Contractor shall examine previous work, related work, and conditions under which this work is to be performed and shall notify SPW in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means Contractor accepts substrates, previous work, and conditions. The Contractor shall not place any planting soil until all work in adjacent areas is complete and approved by SPW.

C. Examination of Conditions: Prior to the start of soil placement existing conditions shall be reviewed.
Any deficiencies shall be noted and related to SPW in writing prior to acceptance of the subgrade by the Landscape Contractor. Deficiencies include, but shall not be limited to the following:

1. Construction debris present within the planting areas.

2. The subgrade is at incorrect depths for installing the designed soil profile and/or drainage layer.

3. Incomplete irrigation and/or subsurface drainage installation.

PART 2 – PRODUCTS

2.1 GENERAL – SAND-BASED TOPSOIL MIXTURE

A. Soils mixtures are composed of a blend of three base components: base loam, organic material and sand. The Soil Supplier is responsible for locating and obtaining approval of sources for base loam, organic material and sand that meet the Specification requirements. The Soil Supplier is responsible for mixing the components. Approximate mixing ratios are as specified herein, but may require adjustment, depending on the characteristics of the final base materials.

B. Base Components

1. Base Loam: a natural A-horizon growing medium free from admixtures.

2. Organic Material or Compost: a fully decomposed yard waste organic material.

3. Sand: uniformly-graded medium to coarse sand.

C. Soil medium materials shall fulfill the requirements as specified and be tested to confirm the specified characteristics.

2.2 BASE LOAM

A. Base Loam shall be natural A-horizon topsoil free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots or other objectionable, extraneous matter or debris. Base Loam shall also be free of quack-grass rhizomes, Agropyron Repens, and the nut-like tubers of nutgrass, Cyperus Esculentus, and all other primary noxious weeds. Base Loam shall not be delivered or used for planting while in a frozen or muddy condition.

B. Maximum size shall be one-inch largest dimension. The maximum retained on the #10 sieve shall be 20% by weight of the total sample. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after burning off organic matter by ignition. The organic content shall be between 3.0 and 6.0 percent by weight. Base Loam shall have a well-developed and stable crumb structure.

C. Unless otherwise recommended by the Soil Supplier's Soil Scientist: Soluble Salts shall be not more than 2,000 ppm/2.0 mmhos/cm.

2.3 COARSE SAND FOR SOIL MIXTURES

A. Sand for blending, protection layer above filter fabrics, and drainage below planting soils shall be uniformly graded medium to coarse sand consisting of clean, inert, rounded to sub-angular grains of quartz or other durable rock free from loam or clay, surface coatings and deleterious materials, include no more than 0.5% mica, and have the following gradation for material passing the #10 sieve by weight.

	Percent Passing	
U.S. Sieve Size Number	MIN.	MAX.
10	100	--
18	60	80
35	25	45
60	8	20
140	0	8
270	0	3
0.002mm	0	0.5

B. Maximum size shall be one-inch largest dimension. The maximum retained on the #10 sieve shall be 15% by weight of the total sample. The ratio of the particle size for 70% passing (D70) to the particle size for 20% passing (D20) shall be 3.0 or less (D70/D20 <3.0). Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after burning off organic matter by ignition.

C. Coarse sand shall be non-calcite and shall not be derived from serpentine. pH shall be

less than 7.5.

2.4 ORGANIC AMENDMENT (COMPOST)

A. Organic Matter for amending planting soils shall be a stable, humus-like material produced from the aerobic decomposition and curing of leaf and yard waste composted for a minimum of one year (12 months). The leaf and yard waste compost shall be free of debris such as plastics, metal, concrete or other debris. The leaf and yard waste compost shall be free of stones larger than 1/2", larger branches and roots. Wood chips over 1" in length or diameter shall be removed by screening. The compost shall be a dark brown to black color and be capable of supporting plant growth with appropriate management practices in conjunction with addition of fertilizer and other amendments as applicable, with no visible free water or dust, with no unpleasant odor, and meeting the following criteria as reported by laboratory tests.

1. The ratio of carbon to nitrogen shall be in the range of 12:1 to 25:1.

2. Stability shall be assessed by the Solvita procedure. Protocols are specified by the Solvita manual (latest version). The compost must achieve a maturity index of 6 or more as measured by the Solvita scale. Stability tests shall be conducted by a SPW approved lab.

3. Pathogens/Metals/Vector Attraction reduction for compost material derived from biosolids shall meet 40 CFR Part 503 rule, Table 3, page 9392, Vol. 58 No. 32, (for applications to soils with human activity).

4. Organic Content shall be at least 20 percent (dry weight). One hundred percent of the material shall pass a 3/8-inch (or smaller) screen. Debris such as metal, glass, plastic, wood (other than residual chips), asphalt or masonry shall not be visible and shall not exceed one percent dry weight. Organic content shall be determined by weight loss on ignition for particles passing a number 10 sieve.

5. pH: The pH shall be between 6.5 to 7.2 as determined from a 1:1 soil-distilled water suspension using a glass electrode pH meter American Society of Agronomy Methods of Soil Analysis.

6. Salinity: Electrical conductivity of a one to five soil to water ratio extract shall not exceed 2.5 mmhos/cm (dS/m).

7. The compost shall be screened to 1/2 inch maximum particle size and shall contain no more than 3 percent material finer than 0.002mm as determined by hydrometer test on ashed material.

8. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Aluminum, Magnesium, Iron, Manganese, Lead, Soluble Salts, Cation Exchange Capacity, soil reaction (pH), and buffer pH. The Soil Supplier's Soil Scientist shall provide a recommendation as to the suitability of the compost based on review of the test results.

2.5 SOIL ADDITIVES

A. Ground Limestone: dolomitic limestone and contain not less than 50 percent of total carbonates and 25 percent total magnesium with a neutralizing value of at least 100 percent. Material shall be ground to such fineness that 40 percent will pass through the 100 mesh U.S. standard sieve and 98 percent will pass through the 20 mesh U.S. standard sieve.

B. Acidulant for adjustment of planting soils pH shall be commercial grade sulfur, ferrous sulfate, or aluminum sulfate for horticultural use that are unadulterated. Acidulants shall be delivered in unopened containers with the name of the manufacturer, material, analysis and net weight appearing on each container.

C. Fertilizer: slow-release granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in a composition as recommended by the Soil Testing Laboratory.

D. Use of peat moss is prohibited.

2.6 SAND

A. For the layer underneath structural soil as called for in the Contract Documents shall meet the gradation requirements of Section (C), of this provision.

PART 3 - EXECUTION

3.1 PROPORTIONING

Soil Supplier shall uniformly mix ingredients on an approved hard surface area or with soil blending equipment. Soils and Organic Amendment shall be maintained moist, not wet, during mixing. Amendments shall not be added unless approved to extent and quantity by the owner and additional tests have been conducted to verify type and quantity of amendment is acceptable. Percentages of

components, unless otherwise noted, will be established upon completion of individual test results for components of the various mixes.

After component percentages are determined by the Soil Supplier's Soil Scientist, each planting soil medium shall be tested for physical and chemical analysis.

A. SAND-BASED TOPSOIL

Sand-Based Structural Soil shall consist of a blend of approximately 60% by volume Coarse Sand, 15% by volume Base Loam and 25% by volume Organic Amendment. The components shall be blended to create a uniform mixture. Percentages will be adjusted as necessary to achieve the following grain size distribution and criteria below for material passing the #10 sieve by weight:

Percent Passing

U.S. Sieve Size Number	Minimum	Maximum	
10	100	-	(Coarse Sand)
18	68	90	(Coarse Sand)
35	38	63	(Coarse Sand)
60	18	39	(Fine Sand)
140	10	18	(Fine Sand)
270	8	10	(Silt)
0.002mm	1	4	(Clay)

1. Maximum size shall be one inch largest dimension. The maximum retained on the #10 sieve shall be 15% by weight of the total sample.

2. The ratio of the particle size for 70% passing (D70) to the particle size for 20% passing (D20) shall be 3.0 or less (D70/D20 <3.0).

3. The final mix shall have a saturated hydraulic conductivity of no less than 6.0 inches per hour according to test procedure ASTM D5856-95 (2000) when compacted to a minimum of 88 percent of the maximum density as determined by AASHTO T-99, unless the soil will be placed in an area that experiences loading. If the soil will be placed under sidewalk, curbs or gutter, the density shall be a minimum of 93 percent maximum dry density as determined by AASHTO T-180. The mixes shall be compacted at 60% to 80% optimum moisture content.

4. Organic content shall be between 2.5 and 3.5 percent by weight.

5. Unless otherwise specified or recommended by the Soil Supplier's Soil Scientist: pH shall be between 6.5 and 7.2; CEC shall be a minimum of 6; and Soluble Salts shall be less than 500 ppm/0.5 mmhos/cm.

3.2 PREPARATION AND MIXING OF PLANTING SOIL MIXES

Preparation, amendment, and mixing of the planting soil shall be performed at the Soil Supplier location. The following procedure shall be followed:

A. Soil shall be amended to meet pH requirements and horticultural deficiencies as determined by the Testing Agency.

B. Examine soil and remove foreign materials, stones and organic debris over 1/2” in size.

C. Correct deficiencies in soil as directed by horticultural soil test results. If lime is to be added, it shall be mixed with dry soil before fertilizer is added and mixed.

D. Planting soil mixtures shall be produced with equipment that blends together each component in a thorough and uniform manner.

E. Preparation and mixing shall be accomplished when the soil moisture content is less than field capacity and at a moisture content approved by SPW.

F. Incorporate pre-plant fertilizer as directed.

3.3 DELIVERY, STORAGE AND HANDLING

A. Material shall not be handled or hauled when it is wet or frozen. Soil shall be hauled only when the moisture content is between 60% and 100% of optimum moisture content as determined by AASHTO T-99 for all planting soils except Sand-Based Structural Soil which shall be determined by AASTO T-180. Stockpiles shall be covered during wet weather. The Soil Supplier is responsible for meeting these requirements until the soil is delivered to the site. Soil which is delivered that exceeds the allowable maximum moisture content shall be replaced with new soil that meets the requirements.

B. Contractor shall store and handle packaged materials in strict compliance with manufacturer's instructions and recommendations. Protect all materials from weather, damage, injury and theft.

3.4 SUBGRADE PREPARATION

A. Coordinate the following scarification work to eliminate subgrade compaction resultant from Construction Operations when located in lawn and planting areas.

1. General Site Subgrade Compaction Mitigation for all planting areas that are not heavily compacted:

i. Immediately prior to placing any Planting Soil or any drainage materials beneath planting soils, the entire subgrade shall be loosened to a minimum depth of 3-inches using the teeth of a backhoe or other suitable equipment.

ii. After the subgrade soils have been loosened, re-compressed and inspected, remove any stones or debris 6" or greater and dispose off the project site. Do not bury large stones or debris.

3.5 PREPARATION OF SOILS

The contractor or soil supplier shall not work soil when the moisture content is less than 60% nor more than 100% of optimum moisture content as determined by AASHTO T-99 for all planting soils except Sand-Based Structural Soil which shall be determined by AASTO T-180 or when it is frozen. Apply water, if necessary, or dry the soil to bring soil within the acceptable moisture content range.

3.6 PLACEMENT of DRAINAGE MATERIALS AND SOIL LAYERS

A. Preparation for Placement of Planting Soils

1. Notify SPW of soil placement operations at least seven calendar days prior to

the beginning of work.

2. Prevent compacting soils by beginning work in corner, against walls, or the center of isolated beds, and progressing outwards towards borders.

3. Never move or work Planting Soils when wet or frozen.

4. Place barricades as required to prevent compaction of planting soil from vehicles, equipment, or pedestrian traffic.

B. In accordance with the Contract Documents and Detail Drawings, proceed with placement of base materials as follows:

1. Where geosynthetics are required per the contract plans, place geosynthetic layers in accordance with SPW approved specification for Geosynthetics for Stormwater Management.

2. Where subsurface storage is required, place sand or stone layer as shown on the drawings in accordance with SPW approved specification for Aggregates for Stormwater Management.

3. Where subsurface drainage is required, install in accordance with SPW specifications.

C. General Placement Requirements

1. No rubber-tired equipment or heavy equipment except for a small bulldozer shall pass over the subsoils (subgrade) after they have been loosened and recompressed. If the Contractor plans to utilize such areas for any use of heavy equipment, this work should be carried out prior to beginning the process of loosening soils or filling in that area.

2. Place and spread Planting Soils in layers as specified to a thickness greater than required such that after settlement,

3. The surface area of each lift, including the subgrade after it has been compacted, shall be scarified by raking immediately prior to placing the next lift.

4. Place and spread topmost layers of planting medium to the thickness such that, after settlement, finished grades conform to the lines, grades and elevations shown on the Drawings. Ensure proper drainage in an uninterrupted pattern free of hollows and pockets.

5. All planting soils shall be placed at a moisture content between 60% and 100% of optimum moisture content as determined by AASHTO T-99 for all planting soils except Sand-Based Structural Soil which shall be determined by AASTO T-180.

D. Place Sand Based Topsoil as follows:

1. Spread in lifts not greater than eight inches and compact with a minimum of two passes of vibratory compaction equipment to a density of 85% plus or minus 1% of maximum density as determined by AASHTO T180.

2. The Contractor shall construct a Mock Up of the initial installation of Sand Based Structural Soil in the presence of SPW or its representative. The Mock Up may be part of the permanent installation. The Mock Up shall be conducted with the same equipment that will be used for the duration of the Sand Based Structural Soil installation. Mock Up must be conducted with compliant soil moisture conditions. A geotechnical testing agency shall be on site to conduct soil moisture and compaction/density tests for each lift installed during the Mock Up.

3.7 PROTECTION

A. Protect newly graded areas from traffic, freezing and erosion. Keep free of trash, debris or construction materials from other work.

B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or compaction due to subsequent construction operations or weather conditions. Scarify or remove and replace material to a depth as directed by SPW; reshape and re- compact at optimum moisture content to the required density.

C. Where settling occurs, before final acceptance or during the warranty period, remove finish surfacing, backfill with additional approved soil, compact to specified rates, and restore any disturbed areas to a condition acceptable to the Owner.

3.8 COORDINATION AND EXCESS MATERIALS

A. Coordinate activities with other project contractors so that there is no soil disturbance from traffic or other construction activities subsequent to placement.

B. Excess Planting Soil Mixtures and Materials: Remove excess planting mediums and materials from the site.

3.9 POST-INSTALLATION TESTING

A. In-place density testing shall be performed by the Contractor at a rate of 1 per 2000 square feet for each type of material placed. The standard test for surface and subsurface density shall be ASTM D 2922-01: Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

PART 4 – MEASUREMENT

4.1 The measurement of SOIL PREPARATION (STRUCTURAL SOILS) shall be the number of CUBIC YARDS constructed, including, but not limited to, all labor, materials, equipment, and

incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 329113

SECTION 329200 – SEEDING AND SODDING

PART 1 - GENERAL

1.1 SUMMARY

A. The work includes, but is not limited to the provision of all material, services, labor, and equipment necessary to perform the following as required per the plans for the establishment of turf, meadow grasses and/or wildflowers:
   a. Seeding
   b. Sodding
   c. Hydro-seeding
   d. Plugging

B. Related Sections:
   a. Section 312000 – Earthwork
   b. Section 329100 – Planting Preparation
   c. Section 311300 – Tree Protection and Root Pruning
   d. Section 329300 – Exterior Plants
   e. Section 312500 – Temporary Erosion and Sediment Control

C. In addition to the specifications contained herein, Work shall be performed in accordance with the:
   a. Drawings and general provisions of the contract, including general and supplementary conditions.
   b. Erosion and Sediment Control Ordinance (Chapter 57 of the Arlington County Code)
   c. Arlington County Department of Parks & Recreation (DPR) Design Standards as shown on the plans and available online at:

      http://parks.arlingtonva.us/design-standards/

1.2 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Imported Topsoil: Soil obtained off-site that meets the specifications herein for topsoil and is suitable for use in planting soil/backfill soil mixture when existing soil quantities are insufficient. Refer to Section 329100 “Planting Preparation.”

C. Planting Soil/Backfill Soil Mixture: Existing soil modified as specified to be suitable for planting. Refer to Section 329100 “Planting Preparation.”

D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

E. ISA: International Society of Arboriculture

F. CBAY: Chesapeake Bay, typically referring to CBAY watershed.

G. Urban Forester/County Urban Forester: Refers to the Arlington County Urban Forester

H. Landscape Architect: Refers to an Arlington County Landscape Architect or their designee.

1.3 SUBMITTALS

A. Samples of all materials shall be submitted to the Project Officer for approval with confirmation by the County Landscape Architect prior to delivery to site.

B. Contractor shall submit qualifications per section 1.4 “Quality Assurance” to Project Officer for approval.

C. Samples:

a. Seed Mix: Certification of grass seed including the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and the date of packaging.

b. Sod: Sod grower's name, together with substantiating information as to field location from which sod is to be cut and species, percent purity and mixture of grass sod to be applied. Samples or photos of sod mix may be requested in lieu of inspection.

c. Special Seed Mixes: Contractor shall submit product data.

1.4 QUALITY ASSURANCE

A. Contractor qualifications:

a. Evidence of completion of at least three (3) projects of similar nature and scope to this project completed within the last five (5) years that have resulted in successful turf and meadow establishment

b. Contractor shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.

c. Experience: Three to Five years’ experience in turf installation.

B. Contractor shall maintain an experienced full-time supervisor on Project site when work is in progress.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials shall conform to those stipulated below, unless otherwise approved in writing by the Project Officer with confirmation by the Landscape Architect.

B. Specified materials to be applied in amounts and methods herein stipulated.

C. Delivery tickets indicating date, weight, product data including all analyses for purity and other information as required herein, and vendor's name, to be submitted to Project Officer for approval.

2.2 SEED

A. Grass seed shall be fresh, clean, dry new crop seed complying with purity and germination requirements stipulated herein. All cultivars must be on the current "Virginia Turfgrass Variety Recommendations" or in the top 25 for transitional zone sites-overall of the latest National Turfgrass Evaluation Program (NTEP) as approved by Project Officer with confirmation by the Landscape Architect. The Turf-type Tall Fescue component shall be comprised of a minimum of two cultivars with each cultivar comprising neither less than 30 percent nor more than 70 percent of the blend. The use of K-31 Tall Fescue or Common Kentucky Bluegrass in the mix is prohibited. The mix shall have 2.5 percent maximum inert matter, 0.5 percent maximum crop seed, and 0.1 percent maximum weed seed and 0.0 percent noxious weed. The mix shall comply with the current Virginia Seed Law and Virginia Seed Regulations and approximate the following:

Kind of Seed	% by Weight	% Purity	% Germination
Turf-type Tall Fescue	80	97	85
Bluegrass	10	97	80
Perennial Ryegrass	10	97	90

B. Substitution of seed type or percent only on approval of Project Officer in coordination with Landscape Architect. Seed to be free of noxious weed seed.

2.3 SOD

A. Cultivated Grass Sod shall be certified and obtained from State Certified nurseries and have been grown on natural native mineral soils comparable to those afforded at the job site. Sod containing netting is not acceptable. Sod grower's information and sod information to be submitted for approval by Project Officer per section 1.03 "Submittals." Failure to obtain advance approval will constitute grounds for rejection of all sod delivered to the site. Invoices for all sod to clearly state point of origin and have attached to them a facsimile of the Grower's Nursery Certificate issued by the U.S. Department of Agriculture or Certified Delivery Ticket per truckload. All grass sod shall meet the following basic requirements.

a. Sod shall be free of disease and soil borne insects.

b. Sod shall be free of clover, broadleaf weeds and noxious weeds. Sod considered free of such weeds if less than 2 such plants are found per 100 square feet of area.

c. Sod shall be of uniform color and density and contain:

Kind of Seed	% by Weight
Turf Type Tall Fescue	90
Kentucky Bluegrass	10

d. All cultivars must be on the current approved list of the Virginia Turfgrass Variety Recommendations and the sod shall be certified by the Virginia Sod Certification Program. Provide appropriate certifications at the time of installation.

e. Sod sample shall be submitted to and approved by Project Officer in coordination with the Landscape Architect before cutting. Sod placed on the job shall conform to the approved sample or shall be removed and replaced at the Contractor's expense.

f. Sod shall have been mowed prior to stripping and shall have been maintained for a minimum of three months.

g. Sod shall be relatively free of thatch. Thatch build up that significantly detracts from the appearance of the sod may be sufficient cause for rejection.

h. Sod shall be machine stripped at a uniform soil thickness of approximately ¾-inch. Measurement for thickness to exclude tip growth and thatch.

i. Individual pieces of sod shall be cut to supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be 5%. Broken pads, torn or uneven ends shall not be permitted.

j. Root development shall be such that standard size pieces will support their own weight and retain their size and shape when suspended vertically from a firm grasp on uppermost 10% of the area.

k. Under moderate moisture conditions, weight shall not exceed 7 pounds per square foot. Minimum weight shall not be less than 4 lbs. per square foot.

2.4 SPECIALTY SEED (WILFLOWERS, BIORETENTION, and/or REFORESTATION)

A. When specialty seed is explicitly specified in approved plans, and unless otherwise indicated, the specialty seed mix shall be as follows:

a. Virginia Northern Piedmont Riparian Mix variation. Fresh, clean and dry new weed, of mixed species as follows:

i. 22% River Oats, PA/VA Ecotype (Chasmanthium latifolium)

ii. 15% Indiangrass, PA Ecotype (Sorghastrum nutans)

iii. 15% Virginia Wildrye, PA Ecotype (Elymus virginicus)

iv. 10% Beaked Panicgrass, VA Ecotype (Panicum anceps)

v. 10% Big Bluestem, 'Niagara' (Andropogon gerardii)

vi. 10% Switchgrass (Panicum virgatum 'Shelter')

vii. 10% Autumn Bentgrass, PA ecotype (Agrostis perannans)

viii. 8% Mistflower, VA Ecotype (Eupatorium coelestinum)

b. Seed carrier: Inert material, sharp clean sand mixed with seed at a ratio of not less than two parts seed carrier to one part seed.

B. Contractor shall supply the germination test results and the percent purity of the seeds upon delivery to the site to the Project Officer. All seed shall be cleaned, processed, analyzed for purity, stored, and germination tested before being used. Every seed variety contains different germination rates and requirements.

C. Execution:

a. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

b. Brush seed into top 1/8 inch of soil, roll lightly and water with light spray.

c. Protect seeded areas by applying compost mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch and roll surface smooth.

d. Water newly planted areas and keep moist until established.

2.5 SOILS & SOIL AMENDMENTS

A. Refer to Section 329100 "Plant Preparation" soils and soil amendment specifications.

2.6 MULCHES/ ORGANIC MATTER

A. Refer to Section 329100 "Planting Preparation" for mulch specifications.

2.7 SOIL STABILIZATION/EROSION CONTROL FABRIC

A. Refer to Section 329100 “Planting Preparation” for specifications.

PART 3 - EXECUTION

3.1 PREPARATION

A. Refer to Section 329100 “Planting Preparation” for specifications.

3.2 SEEDING - GRASS

All areas within the project limits that are not shown for paving, sodding, or special treatment shall be seeded with the specified seed mix.

B. Seeding shall take place between August 15th and October 15th or between March 15th to May 15th. Approval from Project Officer/Landscape Architect will be required before seeding is to begin.

C. Use 4” of prepared topsoil as base for areas to be seeded.

D. No seeding shall be done during windy weather (winds over 5 mph) or when ground is wet or otherwise non-tillable. No seed shall be done on frozen ground or when the temperature is 32 or lower.

B. Seed shall be uniformly distributed by hydro-seeding methods as specified:

a. Slurry

i. Seed as specified at a rate of 350 lbs./acre.
ii. Mulch: virgin wood fiber type applied at a rate of 1200 lbs./acre.
iii. Tackifier: Guar type or approved equal applied at a rate of 40 lbs./acre.
iv. Fertilizer: 19-19-19 granular applied at a rate of 500 lbs./acre.
v. Lime: Flowable liquid lime at a rate of 5 gallons per acre.
vi. Dye: Slurry must be green with dye added if not included with the mulch.
vii. Application rate: 3000 gallons per acre. Agitation must be maintained throughout mixing and application.
viii. Slurry shall be applied within 8 hours of the start of mixing.

C. In lieu of hydro-seeding, seed may be drilled or an alternate method may be used. If an alternate method is used, seeding will have to be run in two directions. The second direction being at right angles to the first direction. Requests for using alternate methods shall be approved by the Project Officer prior to application of seed.

D. Sow seed at the rate of 5 to 8 lb/1000 sq. ft.

E. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray.

F. Protect seeded areas with slopes not exceeding 6:1 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in

loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.

G. Areas indicated on plan or exceeding 6:1 slope shall be protected with erosion control fabric, jute mat, or similar slope protection, installed according to manufacturer's written instruction, and/or as approved by the Project Officer.

3.3 SODDING

A. All sod shall be transplanted within 24 hours from the time it is harvested unless stacked at its destination in a manner satisfactory to the Project Officer. Do not lay down if dormant or if the ground is frozen or muddy.

B. All sod in stacks shall be kept moist and protected from exposure to air and sun and from freezing. Any sod permitted to dry out may be rejected whenever, in judgment of Project Officer, its survival after placing is doubtful. No payment shall be made for rejected sod. In any event, no more than forty-eight hours shall lapse between cutting and planting of sod is permitted.

C. Before placing or depositing sod upon any surfaces, all shaping and redressing of such surfaces as described under Seeding Soil Preparation shall be completed. The bed area for sod shall be dug out so that when the sod is installed the adjacent soil will be flush with the top of the sod root mat. Areas shall be watered lightly before the placing of sod; sod shall not be placed on dry surfaces. Completed areas to be sodded shall be a smooth, uniform, well-tilled surface true to line and cross section. Any raking required shall be done immediately prior to placement of the sod at no additional cost to Owner.

D. No sod shall be placed at any time temperature is below 32 degrees Fahrenheit. No frozen sod shall be used and no sod shall be placed upon frozen, powder dry or excessively wet soil.

E. Use 4" of prepared topsoil as base for areas to be sodded.

F. Sod shall be lifted from trucks or storage piles by hand and placed with closed joints and no overlapping. All cracks, seams and voids shall be closed with small pieces of sod. After laying sod shall be sprinkled thoroughly and then tamped. "Tamping" consists of firmly closing seams between strips by use of hand tampers or approved rollers. All sod shall be thoroughly rolled after closing all seams. Correct any slipping of sod.

G. Adequate water and watering equipment must be on hand before sodding begins and sod shall be kept moist until root system adheres to original seed bed and becomes established and accepted by Project Officer.

H. Sod shall be laid with long edges parallel to contours, except in swales or ditches where it shall be placed perpendicular to the flow line. Only sod placed in swales or ditches shall be staked using 2 stakes per roll of sod. Stakes shall be wood wedges ½" x 1" x 12". Successive strips to be neatly matched and all joints staggered. Sod will be laid in all areas as indicated on landscape plans.

3.4 REFORESTATION

A. Prepare planting area per the specifications.

B. Reforestion process:

a. Reforestation seed mix shall be applied prior to installation of Erosion Control Fabric. Rake seed lightly into the top 1/8 inch of soil, roll lightly and water with fine spray.

i. Do not use wet seed or seed that is moldy or otherwise damaged.

ii. Do not seed against existing trees or vegetation to remain within reforested area limits.

iii. Top dress seed by applying composted mulch within 24 hours after seeding operation. Soak areas, scatter mulch uniformly to a thickness of 1/2 inch and roll surface smooth.

b. Install erosion control fabric from top of slope, overlapping joints by 12 inches, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

c. Moisten prepared planting area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

d. Plant shrubs, trees and perennials through erosion control fabric by carefully separating fabric layers to allow space for planting.

C. Remove non-degradable erosion-control measures after grass establishment period.

3.5 PROTECTION

A. Install post and rope barriers around seeded areas. Tie cloth or ribbon to rope at 10’ intervals.

B. Install “KEEP OFF LAWN” signs at appropriate locations.

C. Remove non-biodegradable erosion control measures after plant establishment period.

3.6 MAINTENANCE

A. Maintain surfaces and supply additional topsoil where necessary, including areas affected by erosion.

B. Water to ensure uniform seed germination and to keep surface of soil damp:

a. Each watering shall consist of 1 gallon per 3 sq. yd. of seed or sod

b. Apply water slowly so that surface of soil will not puddle and crust

C. Cut lawn areas when grass reached height of 3". Maintain minimum height of 2". Do not cut more than 1/3 of blade at any one mowing.

D. After first mowing of lawn, water grass sufficiently to moisten soil from 3" to 5" deep.

E. Reseed damaged grass areas showing root growth failure, deterioration, bare or thin spots and erosion.

3.7 GUARANTEE

A. The Contractor shall be responsible for maintaining all sodded and seeded areas in a healthy, vigorous condition in accordance with Section 3.6 "Maintenance" at his/her own expense until all contracted work is completed and accepted by Project Officer with confirmation by the Landscape Architect or Urban Forester.

B. The Contractor shall, at his own expense, replace any seed or sod which has died or been damaged during the establishment period.

C. Cost of seed and sod will be withheld from final payment until final approval is given by Project Officer.

3.8 ACCEPTANCE

A. Seeded areas will be accepted when an even, healthy, close and uniform stand of turf, 3" tall, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10sq. ft. and bare spots not exceeding 4 by 4 inches is properly established. Bare spots in excess of 4" shall be re-seeded at a rate per section 3.2 of this specification.

B. Sodded areas shall be accepted provided all requirements, including maintenance, have been complied with and sod is well established in a healthy, vigorous growing condition. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

C. Upon completion, all debris and waste material resulting from seeding/sodding/mulching activities shall be removed from the project area and legally disposed of. Any damaged areas shall be restored to their original condition.

D. Upon acceptance by Project Officer at Final Completion, Arlington County shall assume all lawn maintenance responsibilities.

PART 4 - MEASUREMENT

4.1 The measurement of SEEDING & TOPSOIL shall be the number of SQUARE FEET installed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

4.2 The measurement of SODDING & TOPSOIL shall be the number of SQUARE FEET installed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

4.3 The measurement of COMPOSTED MULCH shall be the number of CUBIC YARDS installed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 329200

SECTION 329300 - EXTERIOR PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Double Shredded Hardwood Mulch
   2. Canopy and Understory Trees
   3. Shrubs
   4. Herbaceous Perennials / Ornamental Grasses
   5. Vines
   6. 5” Steel Edging
   7. Plant Protection Fencing
   8. Reforestation Area

B. Related Sections:
   1. Section 311000 Site Clearing, Demolition, and Removals
   2. Section 311300 Tree Protection and Root Pruning
   3. Section 312000 Earthwork
   4. Section 312500 Temporary Erosion and Sediment Control
   5. Section 329100 Planting Preparation
   6. Section 329113 Soil Preparation (Structural Soils)
   7. Section 329200 Seeding and Sodding

C. In addition to the specifications contained herein, Work shall be performed in accordance with the:
   1. Drawings and general provisions of the contract, including general and supplementary conditions
   2. Erosion and Sediment Control Ordinance (Chapter 57 of the Arlington County Code)
   3. Arlington County Department of Parks & Recreation Design Standards as shown on the plans and available online at:
      a. http://parks.arlington.us/design-standards/

1.2 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Imported Topsoil: Soil obtained off-site that meets the specifications herein for topsoil and is suitable for use in planting soil/backfill soil mixture when existing soil quantities are insufficient. Refer to Section 329100 “Planting Preparation.”

C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

D. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

E. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

F. ISA: International Society of Arboriculture.

G. CBAY: Chesapeake Bay, typically referring to CBAY watershed.

H. Urban Forester/County Urban Forester: Refers to the Arlington County Urban Forester.

I. Landscape Architect: Refers to an Arlington County Landscape Architect or their designee.

1.3 SUBMITTALS

A. All submittals specified in Section 329100 “Planting Preparation” shall be provided to Project Officer for approval with confirmation by Landscape Architect or Urban Forester. All approvals shall be in writing.

B. Product Data: For each type of product indicated.

C. Product certificates: Contractor shall submit for each type of manufactured product, to be approved by the Project Officer and complying with the following:
1. Manufacturer’s certified analysis for standard products.

D. Refer to Section 329100, “Planting Preparation” for soil test requirements.

E. Contractor shall submit State Nursery inspection certificates to the Project Officer.

F. Contractor shall submit to Project Officer the verification of Landscape Industry Certified Technician and Landscape Industry Certified Officer certificates for those responsible for plant installation.

G. Planting Schedule: Contractor shall submit the planting schedule to the Project Officer for approval with confirmation by the Landscape Architect. The plant schedule will indicate anticipated planting dates for exterior plants. Contractor shall be responsible for furnishing and installing all plant material shown on the drawings and plant list, as submitted with the contract. Contractor shall have investigated the sources of supply and satisfied himself/herself that he/she can supply all of the plants specified on the drawings in the size, variety, quantity and quality noted prior to submitting the bid. Failure to take this precaution will not relieve the successful bidder from the responsibility of furnishing and installing all of the plant material in strict accordance with the contract documents..

H. Substitutions:
1. The Contractor shall submit a written request for a substitute plant a minimum of NINETY (90) calendar days prior to planting date if specific plants will not be available in time for the scheduled planting. Contractor shall submit the request to the Project Officer for approval with confirmation by the Landscape Architect or Urban Forester.

2. Contractor shall be responsible for documenting any plant suitability or availability problems.
3. If a substitute plant is offered to the County, it shall be of the same size, value and quality as the plant originally specified on the plan, as determined by the Landscape Architect or Urban Forester. If the County does not accept the substitute plant, the Contractor shall provide the type and size of plant material specified on the plans, or a substitute requested by the Landscape Architect or Urban Forester.

I. Maintenance Instructions: Recommended procedures to be established by Project Officer for maintenance of exterior plants during a calendar year.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer who maintains an experienced full-time supervisor on Project site when exterior planting is in progress.
1. Shall possess a "Landscape Industry Certified Technician" certificate, certified by the Professional Landcare Network (PLANET).
2. The Contractor shall identify to the Project Officer at least one full-time on-site supervisor who is the Contractor's competent, qualified, and authorized person on the Project Site and who is, by training or experience, familiar with the policies, regulations and standards applicable to the work being performed, and capable of sufficiently communicating with the Project Officer.
3. Crew leader and supervisor may be the same individual.

B. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory.

C. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in the most current version of ANSI Z60.1, "American Standard for Nursery Stock." Plants shall be nursery grown stock and conform to the requirements described in the most current issue of the American Standard for Nursery Stock (ANSI) published by the American Nursery and Landscape Association. The Landscape Architect or Urban Forester may reject any non-conforming stock and has the option to field-select plant materials prior to purchasing.

D. Collected material may be used only when approved by the Arlington County Urban Forester and/or DPR PNR Natural Resource Manager.

E. Nomenclature shall be in accordance with *Hortus III*, by L.H. Bailey. All trees and shrubs shall be labeled with a securely attached, waterproof tag bearing legible designation of botanical and common name. Perennials and groundcovers shall be clearly identified with a waterproof tag bearing legible designation of botanical and common name within the container.

F. Preinstallation Conference: Conduct conference at Project Site with Project Officer, Arlington County Urban Forester and/or Department of Parks and Recreation (DPR) representative and County Landscape Architect.

G. Urban Forester Notification: Notify the Project Officer at least 72 hours prior to commencement of tree planting operations, so that the County's Urban Forester can be present on-site to supervise the work.

H. The Contractor shall provide a minimum of seven (7) business days' notice to the Project Officer prior to installing the plant material (this is not the same as inspection notification).

I. At the request of the Project Officer in coordination with the Urban Forester or Landscape Architect, the Contractor shall supply information specifying the provenance of the plant material. Provenance is the geographical origin of the seed or cutting used in propagation and can have a direct effect on plant vigor and survivability.

J. Inspections:
   1. Urban Forester may perform periodic inspections to check on tree plantings.
   2. Contractor shall arrange a meeting on the Project Site with the Project Officer in coordination with the Urban Forester and Landscape Architect to perform final inspection of plantings. Refer to section 1.8 "Final Inspection."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery.

B. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants trees in shade, protect from weather and mechanical damage, and keep roots moist.

1.6 WORKMANSHIP

A. Any tree pruning shall conform to the most current version of ANSI A-300 Standard Practices for Trees, Shrubs, and Other Woody Plant Maintenance. Do not prune trees and shrubs before delivery.

B. Protect bark, branches, and root systems from sun-scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery. Plants shall not be bound with wire or rope at any time so as to damage the bark or break branches. Plants shall be handled from the bottom of the root ball only.

C. All plants in transit shall be tarped or covered and shall be kept from drying out. Desiccation damage shall be cause for rejection. Plants damaged in handling or transportation may be rejected by the Project Officer with confirmation by the Urban Forester/Landscape Architect. Any tree or shrub found to have wounds over 12.5% of the circumference of any limb or trunk, or over 1 inch in any direction, whichever is smaller, shall be rejected.

D. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants trees in shade, protect from weather and mechanical damage, and keep roots moist. Plants shall not remain unplanted for longer than a three-day period after delivery. Any plants not installed

during this time period shall be rejected, unless Project Officer and contractor provide otherwise by written agreement. All plants kept on Project Site for any period of time shall be watered and cared for using ANSI A300 standards.

E. Plants shall be installed immediately following excavation of the hole. No holes shall remain open overnight. The Contractor shall cover and barricade any open holes to effectively prevent any danger of injury to pedestrians.

F. During delivery and installation, the landscape contractor shall perform in a professional manner, coordinating his/her activities so as not to interfere with the work of other trades, and leaving his/her work area(s) clean of litter and debris at the close of each workday.

G. During planting, all areas shall be kept neat and clean, and precautions shall be taken to avoid damage to existing plants, trees, turf and structures. Where existing trees are to be preserved, additional precautions shall be taken to avoid unnecessary accumulation of excavated materials, soil compaction, or root damage. The Contractor shall cover sidewalks or pavers with plywood, and cover turf with plywood, burlap or tarp during excavation.

H. Any damaged areas caused by the Contractor shall be restored to their original condition at no cost to the County. All debris and waste material, including small stones and clumps of clay or dirt exceeding 1” by 1” in any direction, resulting from planting operations shall be removed from the Project Site, **legally disposed,** and the area cleaned up by the Contractor.

I. Plants with soil covering the root flare, if not removed by Contractor, shall be rejected by the Landscape Architect or Urban Forester.

J. Contractor shall take full responsibility for any cost incurred due to damage of utilities by their operations.

K. The Contractor will not be held responsible for uncommon concealed conditions such as concrete/asphalt/stone spoils encountered in excavation work which are not apparent at the time of bidding. Rocks, tree roots and hard clay are common elements of “urban” soils and will frequently be encountered in the execution of the contract.

L. No plants shall be planted in locations where drainage may, in the opinion of the Contractor, be unacceptable. Such situations shall be brought to the attention of the Project Officer before work continues and, if deemed necessary by the Project Officer with confirmation by the Landscape Architect/Urban Forester, the plants shall be relocated or the contract shall be modified to allow for drainage correction at a negotiated cost. Any such modification shall be in writing and signed by both parties.

M. The Contractor shall layout plants according to the project’s landscape plan. The Landscape Architect and Urban Forester shall approve the layout prior to plant installation. Plants installed without layout approval from the Landscape Architect are subject to removal and replanting by the Contractor at no additional cost to Arlington County.

1.7 WATER REQUIREMENTS

A. Initial Waterings: The Contractor shall supply water for all plantings and shall water all plants at time of installation and 48 hours after installation, even if it is raining. Contractor shall then

water plantings at least twice per week at amounts specified below until Final Completion of work. The bioretention facilities shall be watered by hand throughout the warranty period.

B. Each watering shall consist of:
   1. 20 gallons per individual tree
   2. 4 gallons per individual shrub
   3. 1 gallon per 1 sq. yd. of shrub or perennial bed
   4. 1 gallon per 3 sq. yd. of seed or sod

1.8 FINAL INSPECTION

A. Contractor shall schedule the final inspection with the Project Officer in coordination with the Urban Forester and/or Landscape Architect.
   1. Contractor shall notify Project Officer at least one week in advance to arrange final inspection meeting with the Urban Forester and/or Landscape Architect.
   2. Contractor shall conduct the final inspection of the landscape materials no less than three months after the installation of the plants or Final Completion of construction work, whichever comes last, and in the presence of the Project Officer, the Urban Forester and/or Landscape Architect.
   3. The landscaping inspection will review all landscape work under the contract.
   4. All plants shall be alive and in good health at the time of final inspection.
   5. Any plant material that is 25% dead or more shall be considered dead and shall be replaced at no charge to the County. A tree shall be considered dead when the main leader has died back, or 25% of the crown is dead.
   6. It shall be the Contractor’s responsibility to provide in writing the results of this inspection.
   7. The Contractor shall make replacements during the next planting period unless the County specifies an earlier date.
   8. The replacement plants will be reviewed for Final Completion no less than three months after installation. Contractor is responsible for maintenance and watering of replacement material per Section 1.7 and Section 1.9 after planting and until the replacement plantings are finally accepted by Project Officer.
   9. A replacement plant shall be of the same size as the original plant with no additional soil additives to be used.
   10. The Contractor will not be responsible for plants that have been damaged by vandalism, fire, removal or other activities beyond the control of the Contractor.

1.9 WARRANTY

A. Special Warranty: Warrant the following exterior plants, for the warranty period indicated, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, or incidents that are beyond Contractor's control.

   1. Warranty Period for Trees and Shrubs: One year from date of Final Completion.
   2. Warranty Period for Ground Cover and Plants: One year from date of Final Completion.

1.10 MAINTENANCE

A. Trees and Shrubs: Maintain during warranty period by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease.

B. Ground Cover and Plants: Maintain during warranty period by watering, weeding, fertilizing, and other operations as required to establish healthy, viable plantings.

C. Pruning: Remove all sucker growth, dead or broken branches at initial planting and as needed during the warranty period. Pruning will conform to ANSI-300 Tree Pruning Standards.

D. Fertilizing: No plants shall be fertilized without prior approval of Project Officer with confirmation by the Urban Forester or Landscape Architect.

E. Mulching: Contractor shall re-mulch areas to a depth of two to three inches prior to Final Completion if the time between planting and Final Completion extends beyond six months. Mulch will be of the same quality as mulch provided at the time of planting. Keep mulch six-inches away from trunks of trees and shrubs.

F. Weeding: Contractor shall perform weeding until Final Completion to keep the planting area as free of weeds as possible. A minimum of one weeding per month from April through October is required if time between planting and Final Completion extends through any months of the growing season.

G. Stakes, Guy Supports, Plant Protection Fencing, 5” Steel Landscape Edging: Where installed, Contractor shall monitor and adjust all stakes and guy supports until Final Completion.

PART 2 - PRODUCTS

2.1 EXTERIOR PLANTS

A. Contractor shall select plants only from nurseries that have been inspected by state or federal agencies and shall have been grown in USDA Plant Hardiness Zones 4, 5, 6, or 7, and in one of the following states: Maryland, Virginia, Delaware, New Jersey, North Carolina or Pennsylvania.

B. Tree and Shrub Material: Furnish nursery-grown trees and shrubs complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Provide balled and burlapped or container-grown trees and shrubs, as indicated on the Drawings.

2. Balled and Burlapped (B&B) plants shall be dug with firm root balls of earth and free of noxious weeds. There shall be no extra soil on top of the root ball or around the trunk. Balled and burlapped trees shall be securely held in place by untreated burlap and stout

rope. Nylon rope is NOT acceptable. Loose, broken or manufactured balls are unacceptable.

3. Ball sizes shall be in accordance with current ANSI standards.

4. In size-grading B&B single stem trees, caliper shall take precedence over height. For multiple-trunk trees, height measurement shall take precedence over caliper.

5. Trees over 1" in caliper shall have a strong central leader (free and clear of branches or splits in the trunk) from the top of the root ball to a height of at least 6'-6". Only minimal bends in the trunk will be acceptable. Co-dominant stems and V-crotches shall be cause for rejection.

6. The root system of container-grown plants shall be well developed and well distributed throughout the container.

7. All container-grown trees and shrubs that have circling and matted roots shall be rejected.

8. Field grown trees and shrubs shall be grown in soils of the Piedmont region, or west of that region in the above approved states and zones.

C. Perennials/Groundcovers/Grasses: Provide healthy, field-grown plants or bulbs (as indicated) from a commercial nursery, of species and variety shown in the Drawings. All container grown plants shall be healthy, vigorous, well rooted and established in the container in which they are growing. A container grown plant shall have a well-established root system reaching the sides of the container to maintain a firm root ball, but shall not have excessive root growth outside the container.

D. All plant materials shall be labeled by grower to identify genus, species, and cultivar, if applicable, in accordance with Section 1.04 "Quality Assurance," above.

E. Plant Materials for ecologically sensitive areas: Plant materials identified on planting plan as being located within an Arlington County Natural Resource Conservation Area (NCRA) shall be native species of local provenance.

2.2 PLANTING MATERIALS

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 2 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.

1. Topsoil Source: Reuse surface soil stockpiled on-site and supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Verify suitability of stockpiled surface soil to produce topsoil.

B. Inorganic Soil Amendments:

1. Lime: ASTM C 602, Class T or O, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.

2. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 sieve and a maximum 10 percent passing through No. 40 sieve.

C. Organic Soil Amendments:

1. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve.
2. Peat: Sphagnum peat moss, partially decomposed, finely divided or granular texture, with a pH range of 3.4 to 4.8.
3. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.

D. Fertilizer:

1. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
2. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

a. Composition: 10 percent nitrogen, 6 percent phosphorous, and 4 percent potassium, by weight.

E. Wood Chip Mulches:

1. Organic Mulch: Shredded hardwood.
2. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve.

F. Weed-Control Barriers:

1. Nonwoven Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. minimum.
2. Composite Fabric: Woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, 4.8 oz./sq. yd..

2.3 PLANTING SOIL MIX

A. Planting Soil Mix: Mix topsoil with the following soil amendments and fertilizers in the following quantities:
1. Planting Soil Mix: Shall be 1/2 clean existing soil (no subsoil, clay, gravel, rocks, etc.), mixed with 1/4 approved topsoil, and 1/4 approved organic material.
2. Weight of Lime per 1000 Sq. Ft.: 90 lbs.
3. Weight of Commercial Fertilizer per 1000 Sq. Ft.: 23 lbs.

2.4 5” STEEL LANDSCAPE EDGING

A. Install 5” Steel Landscape Edging according to Detail 6 on Contract Drawing Sheet LP3.

B. Provide Product Submittal for review and approval by Construction Manager and Landscape Architect. Submittal shall include manufacturer's literature and a sample 3" section of specified size and finish.

C. Manufacturer: Sure-Loc Edging Corporation or approved equal.
   1. Address: 494 E. 64th Street, Holland, MI, 49423
   2. Phone: 800-787-3562
   3. Fax: 616-392-5135
   4. Website: www.surelocedging.com
   5. Edging Color: Powder Coated Black
   6. Edging Thickness: ¼"
   7. Edging to be manufactured from steel with interlocking system and stake punchouts fabricated into each strip.
   8. Locking system: sections to lock together without offset or double thickness at the joints and secured with two (2) 15" steel stakes at every joint.

2.5 TEMPORARY PLANT PROTECTION FENCING

A. Install Temporary Plant Protection Fence according to Detail 5 on Contract Drawing Sheet LP3.
   1. Provide Product Submittal for review and approval by Construction Manager and Landscape Architect.
   2. Example Image (photo credit: Home Depot):

PART 3 - EXECUTION

3.1 EXTERIOR PLANTING

A. Contractor shall install plant materials in accordance with the current Arlington County Standard Planting Details as published on the Arlington County website and as specified below.

B. Refer to Section 329100 “Planting Preparation” for specifications on soil amendments.

C. Contractor shall install plantings in accordance with Arlington County DPR standard details available online at: http://parks.arlingtonva.us/design-standards/. Refer to plans for appropriate planting details.

D. Handling: Prepare pit and/or planting bed per standards. Place plant in pit by carrying by the root ball (not by branches or trunk) and plant per the DPR Standards. Make sure the plant remains plumb during the backfilling procedure.

E. Bed Establishment:

1. Loosen subgrade of planting beds to a minimum depth of 8 inches.
2. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
3. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.
4. Spread planting soil mix to a depth of 8 inches but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
5. Finish Grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

F. 5” Steel Edging

1. Check to ensure that all underground utilities, irrigation lines and all other underground site improvements are installed below the maximum depth of edging to be used.
2. Trench: Edge all landscape beds specified for edging on Planting Plans. Define the area to be edge using string, garden hose, or paint.
   a. Arlington County Landscape Architect shall approve the marked edge line before any trenching.
   b. Using a spade or mechanical trencher, cut a trench along area to be defined to a depth so that top of edging will not exceed ½” to 1” above finish grade.
3. Install edging with stake pockets on inside of bed.
4. A minimum of 5 stakes per section are to be used with each section of edging.
5. Backfilling: Backfill on both sides of edging during installation leaving no more than two sections unsupported at one time. Compact back fill along edging ensuring that top edge is no more than ½-1” above finish grade.

G. Plant Layout

1. The Contractor shall layout and space plants according to the project landscape plan.
2. When the layout is complete, the Contractor shall notify the Project Officer for approval with confirmation by the Landscape Architect prior to installation of the plants. The

County Landscape Architect reserves the right to be on the Project Site during plant layout to direct changes in the field.

H. Trees and Shrubs:

1. Pits and Trenches: Excavate circular pits with sides sloped inward. Trim base leaving center area raised slightly to support root ball and assist in drainage. Do not further disturb base. Scarify sides of plant pit smeared or smoothed during excavation. Excavate approximately three times as wide as ball diameter.
2. Set trees and shrubs plumb and in center of pit or trench with top of root ball 1 inch above adjacent finish grades.

    a. Balled and Burlapped: Remove burlap and wire baskets from tops of root balls and partially from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
    b. Container Grown: Carefully remove root ball from container without damaging root ball or plant.
    c. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix. Never cover top of tree ball with soil.

3. Organic Mulching: Apply 3-inch average thickness of organic mulch extending 12 inches beyond edge of planting pit or trench. Do not place mulch within 3 inches of trunks or stems.

I. Tree and Shrub Pruning: Prune, thin, and shape trees and shrubs according to the most current version of ANSI A-300 Tree Pruning Standards. Prune trees to retain required height and spread. Do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character. Shrub sizes indicated are sizes after pruning. Make all cuts back to a lateral branch or bud. Cuts should be perpendicular above branch collar. Final pruning shall be done after the tree is in place. Do not prune into old wood on evergreens.

J. Ground Cover, Vine, and Perennials Planting:

1. Set out and space ground cover and plants as indicated.
2. Dig holes large enough to allow spreading of roots, and backfill with planting soil.
3. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
4. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
5. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

K. Planting Bed Mulching:

1. Completely cover area to be mulched, overlapping edges a minimum of 6 inches.
2. Mulch backfilled surfaces of planting beds and other areas indicated. Apply 3-inch average thickness of mulch, and finish level with adjacent finish grades. Do not place mulch against plant stems.

L. Contractor shall remove all tags, labels, strings and wire from the plants, unless otherwise directed.

M. Plant Protection:
   1. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged exterior planting. Injured roots shall be pruned to clean ends before planting with clean, sharp tools per most current ANSI 300 specifications.
   2. Protect shrubs, groundcovers and perennials from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.
   3. Install Temporary Plant Protection Fence at locations shown on Planting Plans. Final placement shall be approved by Landscape Architect.
      a. Contractor shall remove temporary fence from Project Site at the end of the maintenance period, or when directed by Landscape Architect and Construction Manager.

N. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

O. Staking and Guying Trees
   1. Contractor shall stake and guy trees only if required by Urban Forester.
   2. If staking and guying is required, the Contractor shall provide and install stakes and guying in accordance with DPR standard staking details for deciduous and evergreen trees.

PART 4 – MEASUREMENT

4.1 The measurement of SHRUBS shall be the number of EACH installed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

4.2 The measurement of PERENNIALS/GROUNDCOVERS/GRASSES shall be the number of EACH installed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

4.3 The measurement of MEADOW SEED MIX-REFORESTATION ONLY shall be the LUMP SUM installed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

4.4 The measurement of TREES - ORNAMENTAL shall be the number of EACH installed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

4.5 The measurement of TREES - OVERSTORY shall be the number of EACH installed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 329300

SECTION 334000 - STORM DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the following:

1. Pipes and fittings

B. Provide all labor, materials, tools and equipment necessary to install storm drain pipes and fittings.

C. Related Sections

1. Section 312000 – Earthwork

D. In addition to the specifications contained herein, work shall be performed in accordance with the following:
1. Underground Utility Protection Ordinance – Chapter 55 Arlington County Code
2. Arlington County Department of Environmental Services (DES) Construction Standards and Specifications

1.2 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM) latest edition.

1. D1785 Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40
2. D2466 Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
3. D2564 Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems

1.3 SUBMITTALS

A. Product Data: For each type of product

B. Shop Drawings: Provide shop drawings for drain basin installation.

1. Drain Basins: Include plans, elevations, sections, details, frames, covers and grates.

1.4 PROJECT CONDITIONS

A. Accurately record actual locations of pipe runs, connections, inlets, cleanouts, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

C. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

a. Notify Project Officer no fewer than two days in advance of proposed interruption of service.
b. Do not proceed with interruption of service without Project Officer's written permission.

D. Coordinate work with connection to existing storm sewer system.

1.5 QUALITY ASSURANCE

A. A manufacturer's certification that the product was manufactured, tested, and supplied in accordance with this specification, together with a report of the test results, and the date of each test was completed, shall be signed by a person authorized by the manufacturer.

PART 2 - PRODUCTS

2.1 PVC PIPE AND FITTINGS

A. Pipe: Schedule 40 PVC with plain or bell ends for solvent-cemented joints.

B. Fittings: Schedule 40

C. Adhesive Primer: ASTM F656

D. Solvent Cement: ASTM D2564

2.2 STONE JACKET FOR UNDERDRAIN AND/OR STORAGE LAYER

A. Clean washed 5"-8" diameter Delaware River Gravel.

B. VDOT No. 57 coarse aggregate.
a. One-inch stone should be double-washed and clean and free of all fines.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 – Earthwork.

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawings and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install gravity-flow, non-pressure drainage piping according to the following:

1. Install piping pitched down in direction of flow.
3. Install piping according to ASTM D 2321.

3.3 DRAIN BASIN INSTALLATION

A. Form bottom of excavation clean and smooth to correct elevation.

B. Refer to Construction Drawings and manufacturer's instructions and requirements.

3.4 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earthwork." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.5 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.
b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Re-inspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.

2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Air Tests: Test storm drainage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

    a. Option: Test plastic gravity sewer piping according to ASTM F 1417.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

PART 4 - MEASUREMENT

4.1 The measurement of 4" PERFORATED SCH. 40 PVC shall be the number of LINEAR FEET installed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

4.2 The measurement of 4" SOLID SCH. 40 PVC shall be the number of LINEAR FEET installed, including, but not limited to, all labor, materials, equipment, and incidental expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 334000