ARLINGTON
VIRGINIA

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

22-DPR-ITB-24

Project Manual

Department of Parks and Recreation

Thomas Jefferson Park Upper Field Conversion (By Right)

3501 2nd Street South
Arlington, Virginia 22204

Project includes, but is not limited to, demolition, tree protection, erosion and sediment control, storm drainage, site work, synthetic turf and stone subbase, picnic shelter, retaining walls, sports equipment, park walkways, fencing, site furnishings, signage, tree planting, and general landscaping (turf grass establishment).

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Exhibit B "Project Technical Specifications"

Refer to Plan Set for Exhibit C "Project Drawings & Construction Notes"

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SUMMARY AND GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.

2. Use of premises.

3. General requirements.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Thomas Jefferson Park Upper Field Conversion

B. Project Location: 3501 2nd Street South, Arlington, VA 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. Site Clearing, Preparation, Demolition and Removals

2. The demolition of the existing site and construction of proposed site improvements as shown on the plans and specifications.

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

4. Tree Protection and Preservation, such as fencing, trunk/limb protection, root pruning

5. Erosion & Sediment Control

6. Storm Drainage

7. Earthwork & Grading

8. Construction Stakeout

9. Deepening of existing conduit for existing field lighting

10. Segmental Block Walls & Concrete Curbing

11. Soccer Equipment, Shade Structure, and Synthetic Turf Surfacing & stone layers beneath

12. Concrete Pavement, including Ramp and Handrails

13. Chain Link Fencing (various heights)

14. Planting (Soil Preparation, Sodding, Tree Planting)

15. Site Furnishings

16. Signage

17. 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, topsoil, seeding and sodding

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

1.03 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. Use of Site: Do not disturb portions of Project Site beyond areas in which the Work is indicated. 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. Contractor shall provide Project Officer with 72-hour notice when work within a tree protection area is necessary, so that the County's urban forester can be notified for approval.

2. Maintain public access to areas outside the limits of work whenever possible. The Project Officer shall be notified 72 hours in advance when closures outside the limits of work are necessary.

1.04 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.

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:

3. The County shall provide the Virginia Stormwater Management Permit (VSMP) and the building permit to the Contractor.

4. 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).

5. 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.

6. Permits: Contractor shall be required to obtain any necessary permits except the following that will be provided by the County:

i. Building Permit for pre-engineered structure*

ii. Land Disturbance Activity (LDA) Permit

* If contractor elects to use an 'approved equal' for pre-engineered structure, the contractor shall be required to provide the Building Permit.

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:

i. Unsatisfactory work on previous County contracts.

ii. 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 issuance 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 workday 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 the County.

AA. Record "As-Built" Drawings: The Contractor shall submit digitized PDFs and CAD files of marked-up plans at the end of the construction period indicating any and all conditions that differ from the original Contract drawings. The as-builts shall be stamped and signed by a registered PE or Land Surveyor. As-builts shall meet the 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 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

1.01 RELATED DOCUMENTS

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

1.02 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, 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 sanitary facilities

3. Providing on-site all OSHA required notices and establishment of safety programs.

4. Obtaining all required permits for Final Completion of the project.

5. Having the Contractor's superintendent at the jobsite full time.

6. 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.

7. Submitting initial submittals and log.

The determination of the adequacy of the Contractor's facilities, except as noted above, shall be made by the Contractor.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 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

4.01 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.

4.02 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.

4.03 The LUMP SUM price bid for mobilization shall include furnishing, maintaining and demobilization of all services, and facilities noted in this specification, to the extent and at the time the Contractor deems them necessary for his operations, consistent with the requirements of this work and this contract.

END OF SECTION 012000

SECTION 013300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

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

1.02 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.

1.03 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. Long lead items shall be submitted within 30 days from NTP.

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.

1.04 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 a submittal number.

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 a transmittal form. 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

2.01 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:

i. Manufacturer's written recommendations.

ii. Manufacturer's product specifications.

iii. Manufacturer's installation instructions.

iv. Manufacturer's catalog cuts.

v. Compliance with specified referenced standards.

vi. Testing by recognized testing agency.

4. Number of Copies: Submit three (3) copies 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:

i. Dimensions.

ii. Identification of products.

iii. Fabrication and installation drawings.

iv. Schedules.

v. Notation of coordination requirements.

vi. Notation of dimensions established by field measurement.

vii. Relationship to adjoining construction clearly indicated.

viii. Seal and signature of professional engineer if required.

ix. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

1. 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.

2. Number of Copies: Submit three (3) copies 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:

i. Generic description of sample.

ii. Product name and name of manufacturer.

iii. Sample source.

iv. 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.

i. 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.

i. 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.

2.02 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

3.01 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.

3.02 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. Approved: A marking of “approved” indicates approval of a submittal for general conformance with the design concept of the Project and with the drawings and specifications.

i. 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.

ii. Approval of submittals does not relieve Contractor from responsibility for full compliance with the Contract Documents.

2. Approved as noted: A marking of “approved as noted” indicates conditional approval of a submittal.

i. 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.

ii. 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.

iii. 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.

END OF SECTION 013300

SECTION 015000

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 SUMMARY

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

1. Measures shall include, but are not limited to:

i. Stone Construction Entrance with Concrete Washout Structure

ii. Super Silt Fence

iii. Inlet Protection

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. 013300 – Submittal Procedures

2. 311000 – Site Clearing, Preparation, Demolition and Removals

3. 311300 – Tree Protection and Root Pruning

4. 312000 – Earth Moving

5. 329100 – Planting Preparation

6. 329200 – Turf and Grasses

7. 329300 – Exterior Plants

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 Root Pruning – as contained in Arlington County Landscape Standards http://parks.arlingtonva.us/design-standards/.

PART 2 - PRODUCTS

2.01 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

3.01 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.

3.02 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.

3.03 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

4.01 The unit price for (TEMPORARY) STONE CONSTRUCTION ENTRANCE WITH CONCRETE WASHOUT STRUCTURE shall be LUMP SUM and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work, in accordance with the plans and specifications, and to the approval of the Project Officer.

4.02 The unit price for (TEMPORARY) SUPER SILT FENCE shall be LINEAR FOOT and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work, in accordance with the plans and specifications, and to the approval of the Project Officer.

4.03 The unit price for (TEMPORARY) INLET PROTECTION shall be EACH and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work, in accordance with the plans and specifications, and to the approval of the Project Officer.

END OF SECTION 015000

SECTION 016000

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 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 017700 "Closeout Procedures" for submitting warranties for Contract closeout.

C. See Divisions 3 through 33 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.02 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.

1. Substitution Requests after contract award:
   Documentation: Show compliance with requirements for substitutions and the following, as applicable:

   i. Reasons why the specified product cannot be provided.

   ii. Coordination information, including a list of changes or modifications needed to other parts of the Work that will be necessary to accommodate proposed substitution.

   iii. Detailed comparison of significant qualities of proposed substitution with those of the product specified.

   iv. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

   v. Samples, where applicable or requested.

   vi. List of similar installations for completed projects with project names and addresses and names and addresses of Landscape Architects, Engineers, and owners, if requested.

   vii. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

viii. 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.

ix. Cost information, including a proposal of change, if any, in the Contract Sum.

x. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.

xi. 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.

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

1.03 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.

1.04 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.

1.05 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 more rights for Arlington 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 16 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

2.01 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.

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. Product or 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 a bidder Submission of Proposed equivalent items for consideration by the Project Officer in accordance with process described in the solicitation documents.

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 a "Bidder Submission of Proposed Equivalent" for consideration by the Project Officer.

END OF SECTION 016000

SECTION 017700

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 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. Final cleaning.

B. See Divisions 3 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.02 PRE-FINAL INSPECTION

A. Preliminary Procedures: Before requesting inspection for determining date of Final Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.

2. Advise Project Officer of pending insurance changeover requirements.

3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

4. Obtain and submit releases permitting Project Officer unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

5. Prepare and submit as-built drawing markups, operation and maintenance manuals, and similar final record information.

6. Deliver tools, spare parts, extra materials, and similar items to location designated by Project Officer. Label with manufacturer's name and model number where applicable.

7. Make final changeover of permanent locks and deliver keys to Project Officer. Advise Project Officer and Arlington County Staff of changeover in security provisions.

8. Complete startup testing of systems.

9. Terminate and remove temporary facilities from Project Site, along with

mockups, construction tools, and similar elements.

10. Advise Project Officer of changeover in utilities.

11. Submit changeover information related to Arlington County's occupancy, use, operation, and maintenance.

12. Complete final cleaning requirements, including touchup painting.

13. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

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.

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

14. Results of completed inspection will form the basis of requirements for Final Completion.

1.03 FINAL COMPLETION

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 Substantial 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. Instruct Project Officer and Arlington County staff 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.

1.04 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.

1.05 AS-BUILT DRAWING

A. The contractor will be responsible for providing certificated final redlined as-built drawings of the project and obtain approval and closeout of all permits. The contractor will also supply all documents related to the project to the Project Officer.

B. The Contractor shall provide the Project Officer with electronic versions of all submittals, shop drawings, correspondence, material certifications, operating manuals, inspections, and testing results related to completed project at the time of as-built submission.

C. Digital files shall be in AutoCAD format as well as a set of vectored PDFs of the approved As-Built plans. All supporting documents must be submitted to the Project Officer. Contactor is responsible for submitting As-Built drawings to permitting agencies, as required by the jurisdictional agencies.

D. Throughout construction, the Contractor shall maintain all pertinent records of construction materials, testing, and inspections required to document that the actual construction is in conformance with the Contract Documents and regulatory permits.

E. At the completion of the project, the contractor shall develop certified final redlined as-built drawings of the project and obtain approval and closeout of all permits. Preparation of As-Built plans includes, but is not limited to:

1. Confirming the horizontal locations and vertical elevations of all new facilities built throughout the Project Site.

2. Storm drain as well as storm water management facilities shall be surveyed during installation. This includes facility and structure inverts and top elevations and dimensions for base of core trench, infiltration trench, filters, underground structures and pipe networks, bioretention layers and geotechnical information as required by DES, etc.

3. Underground utilities, irrigation systems, septic tanks, etc. including profiles, inverts and top of facility elevations

4. Footprint of utility structures and top of curb elevations

5. Any considerable change or shift in the size or location of any facilities from approved drawings

6. Any utility certification as required for as-built certification of the underground utilities such as DES.

7. All the survey work required for As-Built plans is the sole responsibility of the contractor

8. Any significant deviations from the approved drawings

9. A digital file in AutoCAD format including scans of all approved electronic copies including permit drawings.

10. Electronic version of the approved As-Built plans and of all supporting documents must be submitted to the Project Officer.

F. In addition to the standard requirements of Arlington County and the Project Officer, the Contractor shall also be responsible for completing all As-Built requirements related to any permits issued for the project. The Contractor shall prepare As-Built plans in accordance with the standards, procedures, and requirements of the permit agency at the time of construction. This includes any required survey, inspection, and professional certification by an independent firm familiar with the work performed. For example, the completed As- Built package for Stormwater Managements facilities shall include all supporting documents and information as required on the latest DES "Construction Inspection Checklist" for Dry Swales, Bioretention and Urban Bioretention. Furthermore, the Contractor shall make any and all repairs and/or modifications required to obtain As-Built approval and final release of permit at no additional cost to the owner. The Contractor shall submit certified As-Built plans and support documents directly to the permitting agency, with two (2) hard copies and electronic copies to the Project Officer. Once the appropriate agency approves the As-Built plans and the Project Officer concurs, the Contractor shall submit to Arlington County a digital file including vectored PDFs of all approved permit drawings. The Contractor shall coordinate with the permitting agency and inspectors as required to obtain final approval and permit release which includes a final field inspection with staff from the permitting agencies involved and the Project Officer present. The Contractor shall consider the As-Built preparation, review, and approval as part of the overall construction schedule and shall complete this work within the Contract Period established for the project. The design documents in electronic file format including base survey information will be provided to the contractor.

1.06 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

2.01 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

3.01 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:

   i. 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.

   ii. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

   iii. Remove tools, construction equipment, machinery, and surplus material from Project Site.

   iv. Remove snow and ice to provide safe access to site.

   v. Remove labels that are not permanent.

   vi. 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.

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

   vii. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

   viii. Replace parts subject to unusual operating conditions.

ix. 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.

x. 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 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

DIVISION 03

CONCRETE

SECTION 033000

CAST IN PLACE CONCRETE

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Concrete Footings for Chain Link Fences, Site Furnishings, Three Row Metal Seating, Shade Structure

2. Concrete Curbing

B. Related Sections:

1. Section 013300 – Submittal Procedures

2. Section 055213 – Pipe and Tube Railings

3. Section 101400 – Signage

4. Section 129300 – Site Furnishings

5. Section 133416 – Spectator Seating

6. Section 133419 – Fabricated Engineered Structures

7. Section 312000 – Earth Moving

8. Section 015000 – Temporary Erosion and Sediment Control

9. Section 321123 – Aggregate Base Course and Underdrainage

10. Section 321313 – Concrete Paving

11. Section 321813 – Synthetic Turf Surfacing

12. Section 323113 – Chain Link Fences

13. Section 323233 – Segmental Retaining Walls

14. Section 334000 – Storm Drainage

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with blended hydraulic cement; subject to compliance with requirements.

1.04 SUBMITTALS

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

B. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Curing compounds.
6. Bonding agents.
7. Joint-filler strips.
8. Repair materials.
9. Sealant
10. Expansion Joint Sealant Colors

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Concrete materials and mix designs.

E. Placement schedule.

F. Samples: For each of the following materials:

1. Form-facing panels.
2. Form ties.
3. Form liners.
4. Chamfers and rustications.

G. Certified mill test reports provided by the steel fabricator for the reinforcing steel and accessories to be incorporated in the work.

H. 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.

I. Field quality-control reports.

1.05 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.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Concrete Testing Service: Project Officer shall engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

i. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

ii. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.

2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

F. Pre-installation Conference: Conduct conference at Project Site.

1. Following approval of submittals, but prior to in-place mockup, conduct a meeting to review detailed requirements for preparing concrete design mixes and to determine procedures for satisfactory concrete operations. Review requirements for submittals, status of coordinating work, and availability of materials. Establish preliminary work progress schedule and procedures for materials inspection, test-

ing, and certifications. Require representatives of each entity directly concerned with cast-in-place concrete to attend conference, including, but not limited to, the following:

i. Contractor's Superintendent.

ii. Independent testing agency responsible for concrete design mixtures.

iii. Project Officer

iv. Concrete Subcontractor

v. Landscape Architect

G. Provide Field Samples of the full range of samples for approval by the Project Officer with confirmation form the Landscape Architect of all Architectural Finish vertical concrete walls to demonstrate the color, texture, and final finish

1.06 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 – PRODUCTS

2.01 FORM-FACING MATERIALS

A. Rough-Formed Finished Concrete:

1. Exterior-grade plywood panels, lumber, or other suitable for concrete forms, complying with DOC PS 1.

2. The forms must be completely cleaned and approved by the Project Officer under advisement by the Landscape Architect for reuse for other curbs on the project.

3. Rustication Strips: Metal or rigid plastic, or with sides beveled and back kerfed; nonstaining; in longest practicable lengths.

4. Chamfer Strips: Metal, rigid plastic, or elastomeric rubber wood, size as indicated on drawings, non-staining; in longest practicable lengths.

5. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

i. Furnish units that will leave no corrodible metal closer than 2 inch to the plane of exposed concrete surface.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

2.02 CONCRETE MIXTURES FOR SITE ELEMENTS

A. Curbing, Footings around Light Poles (exposed concrete): Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength after 28 Days: 3,500 PSI

2. Maximum Water-Cementitious Materials Ratio: 0.50.

3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).

4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch (25-mm) nominal maximum aggregate size.

B. Footings for Bottom Slab and Walls Around Light Poles, Fencing, Site Furnishings, Sign(s), Three Row Metal Seating and Shade Structure(non-exposed concrete): Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength after 28 Days: 3,500 PSI

2. Maximum Water-Cementitious Materials Ratio: 0.50.

3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).

4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch (25-mm) nominal maximum aggregate size.

C. 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.

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

2.03 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.

C. Deformed-Steel Wire: ASTM A 496/A 496M.

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

E. Bar Supports: Bolsters, chairs, spacers, and other devises 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."

2.04 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar support contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.05 CONCRETE MATERIALS FOR ROUGH-FORMED FINISHED CONCRETE:

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I/II. Supplement with the following:

i. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

2. Blended Hydraulic Cement: ASTM C 595, Type IS, portland blast-furnace slag cement.

B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 1-inch nominal.

2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.07 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

2. Retarding Admixture: ASTM C 494/C 494M, Type B.

3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.08 CURING MATERIALS (non-stained concrete)

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

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

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

D. Water: Potable.

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

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

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

2.08 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork. ½" inch preformed.

B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. 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 selected 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:

   i. SikaFlex-1a by Sika Corporation.

   ii. Sonoclastic NP-1 by Sonneborn and Chem Rex Inc.

   iii. The sealing materials shall be delivered to the Project Site in unbroken original packages bearing the manufacturer's name.

2.09 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 and ACI 303R-12

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Limit use of fly ash to not exceed: 25 percent of cement content by weight.

2. The use of blast furnace slag is prohibited.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.

2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 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*.

3.02 PREPARING THE SUBGRADE

A. Thoroughly prepare and compact the subgrade as specified in Section 310000 – 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.

3.03 LAYOUT

A. 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.

3.04 DEWATERING

A. Remove water from excavations before concrete is deposited. Divert any flow of water through proper side drains and remove water without washing over freshly-deposited concrete. Remove hardened concrete, debris, ice, and other foreign materials from the interior of the forms, and from the inner surfaces of mixing and conveying equipment. 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.

3.05 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch (3.2 mm) for sand blasted, smooth-formed finished concrete:

2. Class B, 1/4 inch (6 mm) for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete as indicated in drawings.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.06 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.

3.07 REMOVING AND REUSING FORMS

A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained. Concrete shall remain undisturbed long enough 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. Clean faces of forms to be reused in the Work. If the form needs to be repaired, it may not be used. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent 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.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Project Officer.

3.08 STEEL REINFORCEMENT

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

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

1. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

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.

3.09 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Project Officer with confirmation by the Landscape Architect. See Joint Layout Plan.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.

2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete, up to ¼ slab thickness.

3. Space vertical joints in walls as indicated.

4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Expansion Joint: 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. 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. Tool the concrete edges at expansion or contract joints to a 1/8” radius.

3.10 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project Site, or during placement unless approved by Project Officer.

C. Before test sampling and placing concrete, water may be added at Project Site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.

2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.11 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Related Unformed Surfaces: At tops of curbs, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

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.

3.12 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

3.13 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   i. Water.

   ii. Continuous water-fog spray.

   iii. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

   i. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.

   ii. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.

   iii. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

   i. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor coating used on Project.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Project Officer and Landscape Architect. Remove and replace concrete that cannot be repaired and patched to Project Officer's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one-part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Project Officer.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defec-

tive areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Project Officer's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Project Officer's approval.

3.15 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.

3.16 FIELD QUALITY CONTROL

A. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

B. Inspections:

1. Steel reinforcement placement.

2. Steel reinforcement welding.

3. Verification of use of required design mixture.

4. Concrete placement, including conveying and depositing.

5. Curing procedures and maintenance of curing temperature.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

2. Testing Frequency: Obtain at least one composite sample for each 100-cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.

i. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.

6. Compression Test Specimens: ASTM C 31/C 31M.

   i. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.

7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

   i. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.

   ii. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

9. Strength of each concrete mixture will be satisfactory if every average of any three-consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

10. Test results shall be reported in writing to Project Officer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Project Officer but will not be used as sole basis for approval or rejection of concrete.

12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive

strengths, or other requirements have not been met, as directed by Project Officer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Project Officer.

13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

PART 4 – MEASUREMENT

4.01 The unit price for CAST IN PLACE CONCRETE shall be CUBIC YARD and shall include the cost of all labor, materials, equipment, and incidental expenses necessary to complete the work, including expansion material, sealant, color steel reinforcement, curing material, concrete, aggregate subbase, all in accordance with the plans and specifications, and to the approval of the Project Officer.

Does not include excavation.

END OF SECTION 033000

DIVISION 05

METALS

SECTION 055213

PIPE AND TUBE RAILINGS

PART 4 - GENERAL

1.01 SUMMARY

C. Section Includes:

1. Aluminum pipe and tube railings.

D. Related Sections:

1. Section 013300 – Submittal Procedures
2. Section 033000 – Cast-in-Place Concrete
3. Section 321123 – Aggregate Base Course and Underdrainage
4. Section 321313 – Concrete Paving
5. Section 323113 – Chain Link Fences
6. Section 323233 – Segmental Retaining Walls
7. Construction Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification, apply to this Section.

1.02 ACTION SUBMITTALS

C. Product Data: For the following:

1. 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.
2. Grout, anchoring cement

D. Shop Drawings: Before any fabrication has begun, submit detailed shop drawings of all miscellaneous metal items showing sizes of metal components, method of assembly, hardware, and anchorage or connection to other work. Include plans, elevations, sections, details, and attachments to other work.

E. Samples: submit 4” long metal pipe product samples with each type of product used.

F. For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.03 INFORMATIONAL SUBMITTALS

C. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E894 and ASTM E935.

1.04 QUALITY ASSURANCE

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

D. 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. American Welding Society (AWS)

E. 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.

6. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

7. ASTM D822 - Tests on Paint and Related Coatings Using Filtered Open-Flame Carbon-Arc Exposure Apparatus.

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.

F. Aluminum fabricator to be experienced in steel fabrication including cutting, bending, fastening, and finishing.

1.05 DESIGN REQUIREMENTS

C. 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.

1.06 DELIVERY, STORAGE AND HANDLING

C. Ship, store, and handle all items 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.

1.07 WARRANTY

C. Provide 5-year warranty for factory finish against cracking, peeling, and blistering under normal use.

PART 2 - PRODUCTS

2.01 HANDRAIL AND POSTS

A. Standard material for handrails, posts, fittings, connections, cover flange and hardware shall be aluminum. Handrails and post shall be 1.5" diameter Schedule 40 in Aluminum Alloy 6063.

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

2.02 FACTORY FINISHES

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

2.03 FABRICATORS

D. 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.

A. 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.

B. 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

C. 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.

2.04 METALS

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

B. Aluminum:

1. Extruded Aluminum Bars and Tubing: ASTM B 221, 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, Alloy 6063-T832.

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

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

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

2.05 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.

2.06 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, 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.

2.07 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 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 Trim: Fabricate units from aluminum 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.

2.08 FINISHES

A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

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

C. Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Preparation for Shop Priming: Prepare uncoated 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 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

4. Color: Provided physical samples of manufacturer’s full range for selection by Arlington County Landscape Architect.

PART 3 - EXECUTION

3.01 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.

3.02 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.

3.03 INSTALLATION, GENERAL

A. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.

3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

B. 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.

C. 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.

D. Connect handrail pipe to chain link fence as shown on the Drawings. Handrails to be set straight, true, and plumb without curves and bends from vertical.

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

F. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.

3.04 ANCHORING POSTS

A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members.

3.05 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.

3.06 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. Repairs cannot be made when the air is moist, of if raining or temps falling below 55 after installation of touch up.

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

PART 4 - MEASUREMENT

4.01 The unit price for TYPICAL METAL HANDRAIL shall be LINEAR FOOT and shall include the cost of all labor, materials, equipment, and incidental expenses necessary to complete the work, all in accordance with the plans and specifications, and to the approval of the Project Officer. Excavation shall be measured for separately.

END OF SECTION 055213

DIVISION 06

WOODS, PLASTICS, AND COMPOSITES

SECTION 061300

HEAVY TIMBER CONSTRUCTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Timber Curbing (@ Long Jump Sand Box)

2. Timber Retaining Wall (@ Existing Storm Drain Structure #3)

B. Related Requirements:

1. Section 013300 – Submittal Procedures

2. Section 311300 – Tree Protection and Root Pruning

3. Section 321216 – Asphalt Paving

4. Section 321816.13 – Playground Protective Surfacing (Long Jump Sand)

5. Section 321123 – Aggregate Base Course and Underdrainage

6. Section 334000 – Storm Drainage

1.02 DEFINITIONS

A. Timbers: Lumber of 5 inches nominal or greater in least dimension.

B. Inspection agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.

2. NHLA: National Hardwood Lumber Association.

3. NLGA: National Lumber Grades Authority.

4. SPIB: Southern Pine Inspection Bureau (The).

1.03 ACTION SUBMITTALS

A. Product Data: For preservative-treated wood products and other associated hardware (i.e., timber screws, geotextile/filter fabric, rebar, etc.)

1.04 INFORMATIONAL SUBMITTALS

A. Certificates of Inspection: Issued by lumber-grading agency for exposed timber not marked with grade stamp.

B. Material Certificates: For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained.

C. Evaluation Reports: For preservative-treated wood products, from ICC-ES.

1.05 COORDINATION

A. Hold a preconstruction meeting on site with the General Contractor, Fence Installer, Landscape Architect, and Project Officer before fence installation.

B. Coordinate with site work, planting, and other appropriate sections of the specifications to maintain proper provisions of the work specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Schedule delivery of materials to avoid extended on-site storage and to avoid delaying the Work.

B. Store materials under cover and protected from weather and contact with damp or wet surfaces. Provide for air circulation within and around stacks and under temporary coverings.

PART 2 - PRODUCTS

2.01 TIMBER

A. Comply with DOC PS 20 and with grading rules of lumber-grading agencies certified by ALSC's Board of Review as applicable.

1. Factory mark each item of timber with grade stamp of grading agency.

2. For exposed timber indicated to receive a stained or natural finish, apply grade stamps to surfaces that are not exposed to view, or omit grade stamps and provide certificates of grade compliance issued by grading agency.

B. Timber Species and Grade: Southern pine; No. 1 SPIB.

C. Structural Properties: Provide any species and grade that, for moisture content provided, complies with required structural properties.

1. Allowable Stress Ratings for 12-Inch Nominal Depth: Fb 1500 psi and E 1,500,000 psi

D. Moisture Content: Provide timber with 19 percent maximum moisture content at time of dressing.

E. Dressing: Provide dressed timber (S4S)

2.02 TIMBER CONNECTORS

A. Timber Wall: Structural Timber Screws, per construction detail.

A. Long Jump Sand Box: Rebar (countersunk), per construction detail.

2.03 PRESERVATIVE TREATMENT

A. Pressure treat lumber with waterborne preservative according to AWPA U1; Use Category UC4a for items in contact with the ground.

1. Treatment with CCA shall include post-treatment fixation process.

B. Preservative Chemicals: Acceptable to authorities having jurisdiction.

C. After treatment, redry to 19 percent maximum moisture content.

D. Mark treated wood with treatment quality mark of an inspection agency approved by ALSC's Board of Review.

2.04 MISCELLANEOUS MATERIALS

A. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.

2.05 FABRICATION

A. Shop fabricate members by cutting and restoring exposed surfaces to match specified surfacing. Finish exposed surfaces to remove planning or surfacing marks, and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.

B. Coat crosscuts with end sealer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Erect heavy timber framing true and plumb. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.

B. Fitting: Fit members by cutting and restoring exposed surfaces to match specified surfacing.

1. Predrill for fasteners using timber connectors as templates.

2. Finish exposed surfaces to remove planing or surfacing marks, and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.

3. Coat crosscuts with end sealer.

C. Install timber connectors as indicated.

1. Install fasteners with orientation as indicated or, if not indicated, as shown on construction drawings and as approved by Landscape Architect.

3.02 ADJUSTING

A. Repair damaged surfaces and finishes after completing erection. Replace damaged heavy timber framing if repairs are not approved by Architect.

PART 4 - MEASUREMENT

4.01 The unit price for TIMBER CURBING (@ LONG JUMP SAND BOX) shall be EACH and shall include the cost of all labor, materials, and incidental expenses necessary to complete the work, including, concrete footings, hardware, in accordance with the plans and specifications, to the satisfaction of the Project Officer. Does not include excavation.

4.02 The unit price for TIMBER WALL (@ EXISTING STORM DRAIN STRUCTURE #12987) shall be EACH and shall include the cost of all labor, materials, and incidental expenses necessary to complete the work, including, concrete footings, hardware, in accordance with the plans and specifications, to the satisfaction of the Project Officer. Does not include excavation.

END OF SECTION 061300

DIVISION 10

SPECIALTIES

SECTION 101400

SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Field Rules Signs

1.02 RELATED SECTIONS

A. Section 013300 – Submittal Procedures

B. Section 323113 – Chain Link Fences

1.03 SUBMITTALS

A. Product Data: For each product indicated.

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

C. Fastening Technique and Bolts

1.04 WARRANTY

A. Sign panel shall be guaranteed for a period of five (5) years against fading or defects in materials/ paint from the date of Final Completion.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver until conditions are ready for installation.

B. Store products in a protected, dry area until ready for installation.

C. Handling: Protect product from damage during handling and installation.

D. Schedule delivery of materials to avoid extended on-site storage and to avoid delaying the Work.

E. Store materials under cover and protected from weather and contact with damp or wet surfaces. Provide for air circulation within and around stacks and under temporary coverings.

F. If delivered and not installing immediately, store units to avoid damage from other construction activities and elements.

1.06 COORDINATION

A. Coordinate with site work and other appropriate sections of the specifications to maintain proper provisions of the work specified.

1.07 QUALITY ASSURANCE

A. Manufacturer shall have worked in the field of sign manufacturing for a minimum of ten (10) years.

B. Examples: Three (3) examples of similar products including location of installation and client contact information

PART 2 - PRODUCTS

2.01 PRODUCTS

A. MANUFACTURER

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

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

   or

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

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

2. Manufacturers Not listed above must meet the following requirements:

   i. 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.

   ii. The vendor(s) shall have a long-term relationship with municipalities and public entities in the region, such as Arlington County.

   iii. The vendor(s) shall be prepared to fabricate sign(s) on time and within acceptable budget provisions while providing the expected quality of craftmanship.

B. MATERIALS

1. 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.

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

3. Colored Coating 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.

4. Steel Plate: ASTM A36.

5. Steel Tubing: ASTM A500, Grade B

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

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

C. SIGN PANELS

1. Unframed Single-Sheet Panels: Provide unframed single-sheet sign panels with edges mechanically and smoothly finished.

2. Panel Material: 0.125-inch-thick aluminum sheet

3. Panel Finish: per plans.

D. TEXT

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

E. GRAPHICS

1. 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.

F. ALUMINUM FINISHES

1. 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.

2. Color: as selected by Landscape Architect from manufacturer’s full range.

G. ACCESSORIES

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

PART 3 - EXECUTION

3.01 ASSEMBLY/FABRICATION

A. Shop assemble the sign to dimensions, profiles and details indicated by approved shop drawings.

B. Sand all sides and ease all edges a minimum of 1/16" unless otherwise noted

C. Fit each component together to allow for wood expansion and contraction movement.

D. Locate hardware accurately using templates or roughing-in diagrams to produce an accurately sized and shaped letting of integral hardware.

3.02 METAL FABRICATION

A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines and angles. Separate metals from dissimilar materials to prevent electrolytic action.

B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

C. Exposed Surfaces: Polished, sanded or otherwise finished. All surfaces smooth, free of burrs, barbs, splinters and sharpness. All edges and ends rolled, rounded or capped.

D. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark items for assembly in the field.

3.03 EXAMINATION

A. Examine area to receive sign

B. Notify Project Officer of conditions that would adversely affect installation or subsequent use.

C. Do not begin installation until unacceptable conditions are corrected.

3.04 INSTALLATION

A. Install signs level, plumb, and at height indicated, with surfaces free from distortion and other defects in appearance.

B. Attach each individual sign to chain link fence Use tamper resistant fasteners placed through predrilled holes.

C. After installation, clean soiled sign surfaces according to manufacturer's printed instructions. Protect signs from damage until Final Completion as determined by Project Officer with confirmation by the Landscape Architect.

3.05 CLEANING

A. Clean sign promptly after installation in accordance with manufacturer's instructions.

B. Do not use harsh cleaning materials or methods that could damage finish.

3.06 PROTECTION

A. Protect installed sign to ensure that, except for normal weathering, sign will be without damage or deterioration at time of Final Completion.

PART 4 - MEASUREMENT

4.01 The unit price for FIELD RULES SIGN (SET OF 2) shall be EACH and shall include the cost of all labor, materials, hardware 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

DIVISION 11

EQUIPMENT

SECTION 116823

ATHLETIC FIELD EQUIPMENT

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide all equipment and materials and do all work necessary to furnish and install the athletic equipment, as indicated on the drawings and as specified herein. Athletic equipment shall include, but not be limited to:

1. 24’ x 8’ Full-Size (Regulation) Soccer Goal, Including Net, Lockdown Safety System, and Wheel Kit Mobility System (all by same manufacturer)

2. 18’ x 6’ Youth-Size Soccer Goal, Including Net, Lockdown Safety System, and Wheel Kit Mobility System (all by same manufacturer)

3. Soccer Goal Corner Flags with Weighted Base

1.02 RELATED WORK

A. Examine contract documents for requirements that affect work of this section. Other specification sections that directly relate to the work of this section include, but are not limited to:

1. 013300 – Submittal Procedures

2. 033000 – Cast-in-Place Concrete

3. 312000 – Earth Moving

4. 321123 – Aggregate Base Course and Underdrainage

5. 321813 – Synthetic Turf Surfacing

6. 334000 – Storm Drainage

1.03 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. Manufacturers Data and Recommended Installation Requirements

1.04 SUBMITTALS

A. Manufacturers Product Data

1. Provide manufacturers qualifications as described in section 1.5 and product data for all products listed in this specification prior to actual field installation work, for landscape architect's review and approval.

B. Shop Drawings

1. Provide drawings of the soccer goals (including all accessories specified above and on plans) and foundation requirements for the lockdown system prior to purchase of equipment, and prior to installation of synthetic turf, for landscape architect's review and approval. All footing sizes and dimensions shall be submitted for review and approval.

C. Operation and Maintenance Data: Submit operation, cleaning, maintenance data for equipment provided, including lists of replacement parts and sources. Include a copy of this information in the final "Project Information Manual".

D. Installer qualifications as described in section 1.5

1.05 QUALITY ASSURANCE

A. Manufacturers warranties shall pass to the landscape architect and certification made that the product materials meet all applicable grade trademarks or conform to industry standards and inspection requirements.

B. Installer Qualifications: Not less than 5 years documented, successful experience with work comparable to the work of this project, and licensed by the manufacturer.

1.06 PRODUCT DELIVERY AND STORAGE

A. Materials delivered to the site shall be examined for damage or defects in shipping. Any defects shall be noted and reported to the landscape architect. Replacements, if necessary, shall be immediately reordered, so as to minimize any conflict with the construction schedule. Sound materials shall be stored above ground under protective cover or indoors so as to provide proper protection.

PART 2 - PRODUCTS

2.01 APPROVED SUPPLIER/ MANUFACTURERS

A. Sportsfield Specialties, 41155 State Highway 10, PO Box 231, Delhi, NY, 13753, 888-975-3343, or approved equivalent.

2.02 PRODUCTS

A. Goals:

1. Regulation Size Soccer Goal (8'x24'), Round-Faced Soccer Goal, Model SG824R (SG4950)

i. Meets and exceeds ASTM F2950-14 Standard Safety and Performance Specification for soccer goals

ii. Meets and exceeds ASTM F1938-98 Standard Guide for Safe Use of Movable Soccer Goals

iii. 4” round faced aluminum extrusion crossbar and uprights

iv. 2”x2” square aluminum tube rear ground bar

v. 3”x2” rectangular aluminum tube end frames

vi. Powder coat white finish

vii. Soccer net mounting clip

viii. 5mm braided, knotless polypropylene white net with rope bound perimeter and 4” square mesh

ix. Quantity: 2, as shown on plans

2. Youth-Size Soccer Goal (6’-6”x18’-6”), Round-Faced Soccer Goal, Model SG618R

i. Meets same criteria listed in 2.2A(1).

ii. Quantity: 4, as shown on plans

3. Kwikgoal Premier Soccer Corner Flags, Model SG6B1404

i. Red nylon flags with white cloth edges

ii. 5’3” H x 1” O.D. high impact, white PVC upright

iii. 12” diameter, stackable, UV-resistant black weighted rubber base, suitable for all athletic surfaces.

iv. Spring-loaded corner flags are not acceptable.

v. Quantity: 4 sets (4 flags in 1 set), total quantity = 16 individual flags

4. Stand Alone Soccer Goal Safety System with Infill Retainer for Synthetic Turf Applications (Lockdown), Model SG2S

i. Retractable clamp over soccer goal rear ground bar

ii. Anchor Bolts

iii. Cover plug (all aluminum construction with gasket seal)

iv. Factory provided 3/8” diameter perforated drain holes

v. 1-1/4” high flexible gasket seals (Factory pre-installed both interior and exterior perimeters)

vi. Synthetic infill turf attachment ledge

vii. 1” PVC drain stub for positive connection to subsurface drainage system

viii. Quantity: 6 (one per each soccer goal)

5. Round Faced Soccer Goal Integrated Wheel Kit, Model SG4955

i. Mobility handle with cushioned rubber grip

ii. Retractable mobility wheel and U.H.M.W plastic roller

iii. Quantity: 6 (one per each soccer goal)

PART 3 - EXECUTION

3.01 INSTALLATION OF EQUIPMENT

A. Examine supporting structure and conditions under which the work will be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. All athletic equipment shall be installed as recommended with manufacturer's written directions, and as indicated on the drawings. Install equipment only after completion of contiguous work and according to final shop drawings and manufacturer's instructions and recommendations.

C. Set work accurately as measured from established building lines and levels and from soccer field playing lines. Set work true and plumb and in alignment with previously completed work.

3.02 TESTING

A. Before final acceptance, test operation of assemblies in presence of Architect and Owner to demonstrate satisfactory operation acceptable to Owner.

3.03 CLEANING AND ADJUSTMENT

A. Clean all surfaces exposed to view before final acceptance.

B. Clean and lubricate joints and bearings in accordance with manufacturer's instructions.

C. Protect units during remaining construction period so that units will be without damage or wear at time of final acceptance.

PART 4 - MEASUREMENT

4.01 The unit price for YOUTH SOCCER GOAL (INCLUDING LOCKDOWN SYSTEM, WHEEL KIT MOBILITY SYSTEM & NET) shall be EACH and shall include the cost of all labor, materials, footings, equipment and incidental expenses necessary to complete the work, in accordance with the plans and specifications, and to the approval of the Project Officer.

4.02 The unit price for FULL-SIZE (REGULATION) SOCCER GOAL (INCLUDING LOCKDOWN SYSTEM, WHEEL KIT MOBILITY SYSTEM & NET) shall be EACH and shall include the cost of all labor, materials, footings, equipment and incidental expenses necessary to complete the work, in accordance with the plans and specifications, and to the approval of the Project Officer.

4.03 The unit price for SOCCER GOAL CORNER FLAGS WITH WEIGHTED RUBBER BASE (SET OF 4) shall be EACH and shall include the cost of all labor, materials, footings, equipment and incidental expenses necessary to complete the work, in accordance with the plans and specifications, and to the approval of the Project Officer.

END OF SECTION 116823

DIVISION 12

FURNISHINGS

SECTION 129300

SITE FURNISHINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Sections includes all site furnishings and related installation, including but not limited to, trash receptacles and recycling receptacles, as shown on the Drawings and specified herein.

1.02 RELATED SECTIONS

A. Section 013300 – Submittal Procedures

B. Section 321313 – Concrete Paving

1.03 REFERENCES

A. ADA - Americans with Disabilities Act requirements.

B. ASTM A 36 - Standard Specification for Carbon Structural Steel.

C. ASTM A 123 - Standard Specification for Zinc (hot-dip galvanized) Coatings on Iron and Steel Products.

D. ASTM A 53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

E. ASTM A312 Standard Specification for Seamless and Welded Stainless Steel Pipes.

F. ASME SA312 Standard Specification for Seamless and Welded Stainless Steel Pipes.

G. ASTM D 522 – Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings

H. ASTM D 523 – Standard Test for Specular Gloss

I. ASTM A 536 - Standard Specification for Ductile Iron Castings.

J. ASTM D 2247 – Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity

K. ASTM D 2794 – Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)

L. ASTM D 3359 – Standard Test Methods for Measuring Adhesion by Tape Test

M. ASTM D 3363 – Standard Test Method for Film Hardness by Pencil Test

N. ASTM G 155 – Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

O. ISO 1520 Paints and Varnishes – Cupping Test

P. ISO 2815 – Paints and Varnishes – Bucholz Indentation Test

1.04 SUBMITTALS

A. Submittals shall be provided to Project Officer for approval by Landscape Architect under provisions of Section 013300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.

3. Available colors, styles, patterns and textures

4. Installation qualification and methods.

5. Fastener Data

C. Selection Samples: Color selections shall be made from the manufacturer's brochure representing manufacturer's full range of available colors and patterns. Provide color chip samples to the Project Officer for confirmation by the Landscape Architect for all metal products and site furnishings and a wood sample for the wood benches.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1. Manufacturer qualifications.

2. Material Certificates

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

F. Maintenance Data

G. Manufacturers warranties as described in Section 1.08.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum of 10 years experience manufacturing site furnishings. A firm experienced in manufacturing site furnishings similar to those required for this project and with a record of successful in-service performance.

B. Installer Qualifications: Minimum of 5 years experience assembling and installing site furnishings. An experienced installer who has completed installation of receptacles similar in material, design, and extent to that indicated for this project and whose work has resulted in construction with a record of successful in-service performance.

C. Source Limitations: Obtain each color, finish, shape and type of site furnishing from a single source with resources to provide components of consistent quality in appearance and physical properties.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's original, unopened containers and packaging (with labels clearly identifying product name and manufacturer) until ready for installation. Store in a clean, dry area in accordance with manufacturer's instructions.

B. Do not deliver until conditions are ready for installation.

C. Handle powder coated furnishings with sufficient care to prevent any scratches or damage to the finish.

1.07 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 WARRANTY

A. All site furnishings shall carry a one-year manufacturer's limited warranty against defects in materials and workmanship. The warranty period begins on the date of Final Completion by the Project Officer.

B. All site furnishings that are powder coated shall carry a five-year warranty. The warranty period begins on the date of Final Completion by the Project Officer.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Trash and Recycling Receptacles Manufacturer: Victor Stanley, Inc., P.O. Drawer 330, Dunkirk, MD 20754, 1-800-368-2573

2.02 TRASH RECEPTACLE

A. Victor Stanley Ironsites Model SD-42.

1. Height: 41-3/4 inches (1156 mm)

2. Diameter: 28 inches (841 mm)

3. 3/8" x 1" (9.53mm x 25.4mm) vertical solid steel bar

4. 1/4" x 2-1/2" (6.35mm x 63.5mm) horizontal solid steel bands

5. 3/8" x 3" (9.53mm x 76.2mm) steel support bars

6. 5/8" (15.88mm) solid steel top ring

7. Leveling feet with a 3/8” (9.53mm) diameter threaded steel shaft

8. 36-gallon (136 liter) capacity high density plastic liner

9. Include optional S-2 formed dome lid with opening for depositing trash

10. Metal Finish and Colors: VS Black Powder coated, as selected by Landscape Architect from manufacturer’s full range of colors.

11. Mounting plate: Include optional (3) anchor bolt holes.

12. Quantity: 1

2.03 RECYCLING RECEPTACLE

A. Victor Stanley Ironsites Model SD-42.

1. Height: 41-3/4 inches (1156 mm)

2. Diameter: 28 inches (841 mm)

3. 3/8” x 1” (9.53mm x 25.4mm) vertical solid steel bar

4. 1/4” x 2-1/2” (6.35mm x 63.5mm) horizontal solid steel bands

5. 3/8” x 3” (9.53mm x 76.2mm) steel support bars

6. 5/8” (15.88mm) solid steel top ring

7. Leveling feet with a 3/8” (9.53mm) diameter threaded steel shaft

8. 36-gallon (136 liter) capacity high density plastic liner

9. Include optional S-2 formed dome lid with opening for depositing trash and recycling label

10. Metal Finish and Colors: VS Blue Powder coated, as selected by Landscape Architect from manufacturer’s full range of colors.

11. Mounting plate: Include optional (3) anchor bolt holes.

12. Include optional recycling package with lid, plaque, and decals; with opening for depositing recyclables in top.

13. Custom dome lid and band decals: Layout ID#2712-02E and #4260-03B.

14. Quantity: 2

2.04 MANUFACTURER FINISH REQUIREMENTS FOR TRASH RECEPTACLES AND RECYCLING RECEPTACLES

A. Site furnishings shall receive an 18-stage finishing process to ensure an extremely durable finish to resist corrosion, chipping, abrasion, cracking and UVA damage.

B. The steel substrate shall be mechanically and chemically etched to ensure proper finish adhesion, followed by a zinc phosphate bath for corrosion resistance.

C. The site furnishing shall then be primed by immersion into a non-chrome seal rinse to enhance and supplement the corrosion resistance.

D. The site furnishing shall then be immersed into an environmentally friendly e-coat epoxy liquid bath to ensure that all surfaces, joints and crevices are covered. The use of silicone caulk for gap filling of joints shall not be allowed.

E. The site furnishing shall be powder coated after complete fabrication with triglycidyl isocyanurate (TGIC) powder, a polyester coating that is electrostatically applied and baked at 400 degrees for 20 minutes.

2.05 FOOTING MATERIAL

A. Concrete, Grout, Sealers, etc.: shall conform to Specification Section 033000, "Cast-in-Place Concrete."

PART 3 - EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Project Officer of unsatisfactory preparation before proceeding.

C. Notify Project Officer of conditions that would adversely affect placement or installation of Site Furnishings. Do not begin installation or placement until unacceptable conditions are corrected.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions unless more stringent requirements are indicated.

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. Surface mounting. Location and drilling of holes for inserts included. Stainless Anchor bolts and inserts to be provided by Contractor.

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

F. Concrete Footings. Shall comply with requirements in Division 3 Section, Cast in Place Concrete.

G. Benches shall be pre-assembled before being installed in their final location in the work. After assembly, benches shall be installed in their final position and properly secured in place.

H. Provide grout specifically recommended by manufacturer for exterior applications, nonshrink, nonmetallic grout complying with ASTM C 1107.

I. Epoxy Sealer. After the grout has hardened, the remaining space shall be filled with an epoxy sealer fillet, such as Sonneborn Epo-Grip and Epo-Gel Epoxy system, as manufactured by Sonneborn, Shakopee, Mn., or "PG-2089" as manufactured by Permagile Corp., Plainview, N.Y., or approved equal.

J. Threads of all bolts shall have the ends upset after installation of nuts so as to render the connection vandal resistant.

K. After installation, clean soiled surfaces according to manufacturer's written instructions. Provide touch-up paint at finish such that repair is not visible from a distance of six feet.

L. Nuts, washers and ends of all bolts shall be painted with touch-up paint.

3.04 CLEANING AND PROTECTION

A. Protect installed products from damage during construction with temporary protection coverings. Remove protective coverings at time of Final Completion as determined by Project Officer.

B. Restore finishes damaged during installation and construction so no evidence remains of correction work. Restore in accordance with manufacturer's instructions/recommendations.

C. Remove and replace damaged components that cannot be successfully repaired as determined by Project Officer.

D. Clean site furnishings promptly after placement in accordance with manufacturer's instructions. Do not use harsh cleaning materials or methods that could damage finish.

PART 4 - MEASUREMENT

4.01 The unit price for TRASH RECEPTACLES shall be EACH and shall include the cost of all labor, materials, and incidental expenses necessary to complete the work, including concrete footings, hardware, custom decals, in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

4.02 The unit price for RECYCLING RECEPTACLES shall be EACH and shall include the cost of all labor, materials, and incidental expenses necessary to complete the work, including concrete footings, hardware, custom decals, in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

END OF SECTION 129300

DIVISION 13

SPECIAL CONSTRUCTION

SECTION 133416

SPECTATOR SEATING

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish a non-elevated, 3-Row bleacher. 3-Row Bleacher shall contain no railing, aisle or fencing.

1.02 RELATED SECTIONS

A. Section 013300 – Submittal Procedures

B. Section 321313 – Concrete Paving

C. Section 133419 – Pre-Engineered Structures

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

1.03 REFERENCES

A. BC 2009

B. AISC Steel Manual Thirteenth Edition

C. ACI 318-05

D. Aluminum Association Aluminum Design Manual 2010

E. ASTM E985

F. AWS D1.2

1.04 SUBMITTALS

A. Submit product data on all materials required to construct the bleacher including seatboards, footboards, riserboards, etc.

1. Submit standard powder coat colors for riser boards.

B. Structural drawings/ calculations stamped by a professional engineer in the Commonwealth of Virginia.

C. Full drawings including attachment to slab, end elevation indicating riser and row depth, deck configuration, railings – if any, size of framing members, and walkway.

1.05 DESIGN CRITERIA

A. All material and workmanship shall be in accordance with the following:

1. Latest edition of the IBC

2. Latest edition of AISC Manual

3. ACI Building Code for Reinforced Concrete

4. Aluminum Association of America

B. Design Loads:

1.	Dead Load	10 psf	seat and footboards risers, etc.
2.	Live Load	120 psf	to structural member
		120 plf	seatboards
		120 plf	footboards (individually)
3.	Design Wind Speed		90 mph on projected vertical surface
4.	Sway	24 plf	parallel per ft. of seat parallel to seat run
		10 plf	perpendicular per foot of seat

C. Understructure Criteria: The following criteria are used to establish a minimum requirement for strength, stiffness and rigidity of the understructure components.

1. Footboard Support Members:

   i. Moment of Inertia: 0.72 in^4

   ii. Minimum Section Modulus: 0.37 in^3

2. Vertical Support Members (Seating Frames):

   i. Cross Sectional Area: 0.65 in^2

   ii. Radius of Gyration: 0.97 in

3. Vertical Support Members (Press Box Frames):

   i. Cross Sectional Area: 0.86 in^2

   ii. Radius of Gyration: 0.97 in

4. Cross Brace Members:

   i. Cross Sectional Area: 0.45 in^2

   ii. Radius of Gyration: 0.24 in

iii. Code Compliance: Submittals shall be based on specifications contained in the bid documents. Determination of code compliance is the responsibility the manufacturer.

1.06 QUALITY ASSURANCE

A. Experience: Manufacturer of bleacher system shall have a minimum of (5) years experience in fabrication of bleacher structures and shall, upon request, provide references to successful projects of similar size and project specific requirements.

B. Engineer Qualifications: The bleacher shall be designed under the supervision of a registered professional Engineer in the Commonwealth of Virginia.

C. Installation: Installation shall be performed by factory trained and/or certified representatives of the bleacher manufacturer.

1.07 WARRANTY

A. Warranty: Product shall be guaranteed for five (5) years on the structure and three (3) years on the finish together with labor. Damage resulting from vandalism is not applicable.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. 3 Row non-elevated aluminum bleacher to be manufactured by Dant Clayton Corporation, 1500 Bernheim Lane, Louisville, KY 40210, 1-800-626-2177 & 502-634-3626 or approved equivalent.

1. Number of rows shall be 3.

2. Overall length shall be 21 ft.

3. Rise per row shall be 8 in.

4. Depth per row shall be 24 in.

5. Net seating capacity is approximately 42 based on 18 in. per seat.

6. Footboard decking system to be fully closed with slip resistant decking per 2.02.D.

7. Footboard extrusions are to be 1 3/4 in. thick, 9 ½ in. wide.

8. Riserboards shall be 1 in. x 8 in.

9. Seatboards shall be 1 3/4 in. thick x 9 ½ in. wide.

2.02 COMPONENTS

A. UNDERSTRUCTURE

1. Primary structural members shall be bolted together, or calculations must be submitted verifying that the structure has taken into account the weakening of aluminum associated with welding per 2005 AA ADMI sections 7.2.1 and 7.2.3

B. Decking System shall be a Fully Closed arrangement.

1. Each individual footboard must be designed to support the resulting stress from a 120 plf live load.

2. Decking joints shall be covered with a 4" aluminum joint cover

3. The ends of the aluminum extrusions shall be covered with a one-piece cast aluminum end cap.

4. All decking splices shall consist of an internal splice sleeve and shall occur directly over a steel support.

5. The decking system shall snap in place into the understructure.

6. See Section 2.4.B for decking finishes.

7. The area under the seatboard shall be filled with an extrusion profile matching depth and fluting pattern of other footboards. Aluminum angle is not permitted for closure.

2.03 MATERIALS

A. UNDERSTRUCTURE

1. Understructure shall be fabricated from 6061-T6 alloy aluminum extrusions.

2. Vertical members shall be 2 7/8” o.d. tubing.

3. Horizontal members and footboard supports shall be 3” x 2 7/8” channel.

4. Cross braces and diagonals shall be 2 ¼” x 7/8” channel.

5. Handrail support shall be 2 5/8” o.d. tubing.

6. The understructure shall be assembled from the above items in an interlocking design and 7/16” x 3 ½” hot-dipped galvanized bolts.

7. The structure shall be designed so that in the event of accidental damage, the sub-component parts may be replaced using common hand tools. Field welding for repair purposes shall not be considered.

B. ALUMINUM EXTRUSIONS

1. All footboards & seatboards shall consist of 6063-T6 aluminum alloy with minimum yield strength of 25 ksi.

2. All straight grab & hand rails shall consist of 6061-T6 aluminum alloy with minimum yield strength of 35 ksi.

3. All bent grab & hand rails shall consist of 6061-T4 aluminum alloy with minimum yield strength of 21 ksi.

4. All aluminum finishes shall be per section 2.4

C. RAILING

1. Guard railing shall be provided to meet the height and loading requirements

of all local building codes.

2. Guardrail shall be a chain link fence system with posts consisting of a 2-7/8"x2" 7/8" aluminum rectangular tube, 6060-T6 alloy.

3. Guardrail infill shall be 1" mesh 6-gauge black vinyl-coated fabric chain link.

D. HAND & GRAB RAILS

1. Hand and Grab Rails shall be located in all areas required by building code.

2. Hand and Grab Rails shall be 1 15/16" O.D. extruded aluminum pipe.

3. Two-Line mid-aisle handrails shall be located in all interior aisles. All mid-aisle rails shall feature internal fittings for both lines of rail. External fittings are not permitted.

E. SEATING

1. Bench seating shall be provided as shown in the drawings.

2. Benches shall be 1-3/4" thick by 9-1/2" wide.

2.04 FINISHES

A. ALUMINUM

1. All aluminum footboards shall have an enhanced stain resistant and slip resistant finish at all locations intended for use as a walking surface.

i. This finish shall be produced by the grandstand manufacturer in addition to the mill extrusion process.

ii. This surface finish shall prevent oxidation staining during initial installation.

iii. Oxidation staining prior to substantial completion shall be grounds for product replacement at the manufacturer's expense.

iv. This surface finish shall exhibit enhanced slip resistance beyond the mill extrusion process, resulting in an improved coefficient of friction under wet conditions in all directions of travel.

v. Untreated mill finish aluminum with raised extruded "flutes" or "ribs" does not meet this requirement.

2. All Seatboards shall have a Clear Anodized finish.

3. Powder coat system shall meet or exceed the following test requirements:

i. Direct Impact Resistance: ASTM D 2794-93, up to 140 in.-lbs.

ii. Flexibility: ASTM D 522-93, Method B, 100% Pass

iii. c. Pencil Hardness: ASTM D 3363-93a, 3H-4H

iv. d. Crosshatch Adhesion: ASTM D 3359-97, Method B, 5B, 100% Pass

v. e. Salt Spray Resistance: ASTM B 117, plus 1,000 hours

vi. f. Humidity Resistance: ASTM D 2247, plus 1,000 hours

4. All hand and Grab Rails shall be clear anodized

2.05 COLORS

A. All colors shall match the colors used at the Thomas Jefferson lower field or per manufacturer's full range of colors. Contractor to verify colors and submit standard color palette for selection by Arlington County DPR Landscape Architect.

2.06 REINFORCED CONCRETE

A. All concrete work and materials shall be in accordance with ACI 318-83 and Section 321313.

B. Cast-in-place concrete shall have minimum compressive strength of 4,000 psi at 28 days.

C. All exterior concrete shall be air entrained to 6% +/- 1%.

D. All reinforcing steel shall be in accordance with ASTM A615 with a minimum yield strength of 60 ksi.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine all existing conditions with installer present for compliance with requirements for installation tolerances and other conditions affecting performance of the work.

B. Prepare written report, endorsed by installer, listing conditions detrimental to performance of the work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install bleacher and all components according to manufacturer's written instruction and the approved shop drawings. Each frame shall be held to the concrete pad by a stainless steel wedge anchor as shown on plans.

3.03 CLEANING

A. Clean all surfaces according to manufacturer's recommendations.

B. Use cleaning solutions and methods that do not damage the finishes or the adjacent surfaces.

C. Remove all metal burrs, sharp edges or other cutting, unsafe conditions.

D. Touch up finishes as recommended by manufacturer to the satisfaction of the Project Officer.

PART 4 - MEASUREMENT

4.01 The unit price for THREE ROW METAL SEATING shall be EACH and shall include the cost of all labor, materials, and incidental expenses necessary to complete the work, including hardware, in accordance with the plans and specifications, to the satisfaction of the Project Officer.

END OF SECTION 133416

SECTION 133419

PRE-ENGINEERED STRUCTURES

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes prefabricated cantilevered shade structures.

1.02 RELATED SECTIONS

A. Section 013300, “Submittal Procedures”

B. Section 033000, “Cast-In-Place Concrete”

C. Section 133416, “Spectator Seating”

D. Section 312000, “Earth Moving”

E. Section 321123, “Aggregate Base Course and Underdrainage”

F. Section 321313, “Concrete Paving”

1.03 REFERENCES

A. American Institute of Steel Construction (AISC)

B. American Iron and Steel Institute (AISI) Specifications for Cold Formed Members.

C. American Society of Testing of Materials (ASTM)

D. American Welding Society (AWS)

E. OSHA Steel Erection Standard 29 CFR 1926.750 Part R

F. Steel Structures Painting Council (SSPC-SP2) as outlined in AISC 6.5

1.04 SYSTEM DESCRIPTION

A. Provide a system complying with the Virginia Uniform Statewide Building Code requirements for roof snow or live load, basic wind speed, and seismic zone. B. Design Method: Per applicable building code. Manufacturer shall use three-dimensional structural analysis to determine member load and forces.

B. Column to concrete base will be surface mounted with all anchor bolts hidden within the column. There shall be no exposed anchor bolts. The column foundation connections will be in compliance with OSHA Standard 29 CFR 1926.750 Part R. Recessed footings with an extra concrete pour will not be allowed.

1.05 SUBMITTALS

A. Submit shop drawings, including structural calculations, to be signed and sealed by a Professional Engineer licensed in the Commonwealth of Virginia.

B. Structural calculations shall show the following code information complying with the Virginia Uniform Statewide Building Code (USBC): Roof snow or live load, basic wind speed, and seismic zone.

C. Structure selection is not approved until all submittals and shop drawings are approved by Arlington County Project Officer.

1.06 QUALITY ASSURANCE

A. Comply with codes of authorities having jurisdiction. If codes conflict, the more stringent requirements apply.

B. If the County approves an equivalent, the Contractor shall be solely responsible for obtaining required permits from Arlington County Department of Environmental Services Inspection Services Division prior to shelter construction. Contractor shall obtain and provide necessary drawings and engineer certifications as required by the Inspection Services Division. Contractor shall promptly obtain building permit as soon after Contract Award as possible. No claims for delay will be granted for delays relating to Contractor's failure to obtain a building permit.

C. The Contractor shall coordinate all inspections required by the Arlington County Department of Environmental Services Inspection Services Division.

D. SUPPLIER QUALIFICATIONS:

1. The supplier has been in the business of making steel frame pre-manufactured shelters for a minimum of five years and shall provide evidence of similar projects at the request of the Project Officer.

1.07 DELIVERY AND STORAGE

A. Store materials covered out of weather and keep out of direct sun. Inspect parts within 48 hours of delivery, compare with manufacturer's bill of material, and report any missing or non-conforming parts to manufacturer.

1.08 WARRANTY

A. Supply manufacturer's standard warranty, ten-year minimum.

PART 2 - PRODUCTS

2.01 SHELTER MODEL

A. Manufacturers: Subject to compliance with requirements, provide products by the following **or approved equal**: Cedar Forest Products Co., available from MTS Recreations, https://www.mtsrecreations.com/contact/, 1-800-337-3963.

B. Style: Shelter shall be Mono-Slope Cantilever, 11'-6" x 32'-0", Model #MC11.532, by Cedar Forest Products or approved equal.

C. Frame Color: RAL 6007 (Brilliant Blue). Color selection shall be selected from manufacturer's full range and approved by Landscape Architect. Color shall match color of the shelter used at Thomas Jefferson Park Lower Field.

D. Roof Color: Charcoal. Color selection shall be selected from manufacturer's full range and approved by Landscape Architect. Color shall match color of the shelter used at Thomas Jefferson Park Lower Field.

D. All components, framing, roofs, finishing, hardware, steel shall match that of the shelter used at Thomas Jefferson Park Lower Field.

E. See Drawings A-01 through A-03.

2.02 MATERIALS

A. Steel columns:

1. As shown on Drawings A-01 through A-03.

2. Anchors Bolts, Washers, Hex Nuts, and Bracing Template shall be provided by general contractor and as shown on Drawings A-01 through A-03.

B. Structural framing: Hollow structural steel tube minimum ASTM500 grade B or better, unless shown otherwise on as shown on Drawings A-01 through A-03.

C. Roofing: 24-guage ribbed galvanized steel in a standing seam pattern. As shown on Drawings A-01 through A-03.

D. Fasteners:

1. Anchor bolts shall be as noted on Drawings A-01 through A-03.

2. Structural fasteners shall be zinc plated ASTM A325 high strength bolts and A563 high strength nuts unless noted otherwise on Drawings A-01 through A-03.

3. Structural fasteners shall be hidden within framing members wherever possible.

4. No field welding shall be required to construct the shelter.

5. All welds shall be free of burrs and inconsistencies.

6. Exposed structural bolts shall be painted by manufacturer prior to shipment to match frame color.

7. Manufacturer shall provide extra structural fasteners.

E. Roofing Materials: as shown on Drawings A-01 through A-03

2.03 ACCESSORIES

A. As shown on Drawings A-01 through A-03.

2.04 FABRICATION

A. Welded connections shall be made by certified welders in accordance with AWS Specifications and be supervised by an AWS certified welding inspector.

2.05 FINISHING STEEL

A. Shall be TGIC powder coated, colors to be selected by the Project Officer from the manufacturers full range of colors.

PART 3 - EXECUTION

A. Set shelter on prepared footings with a concrete slab with anchor bolts. Footing details shall be verified by a structural engineer retained by the Contractor or the manufacturer. See Drawings A-01 through A-03 for footing layout spacing and instruction.

B. Geotechnical Engineering report will be provided by the County.

C. Foundation shall be constructed to local codes, and industry standard construction practices for the specific site conditions.

D. Install all components according to manufacturer's installation instructions and recommendations.

E. Handle components carefully to avoid scratching powder coat finish.

F. Clean steel and touch up scratches and chips in powder coat finish using touch up paint from manufacturer.

PART 4 - MEASUREMENT

4.01 The unit price for PRE-ENGINEERED SHADE STRUCTURE shall be EACH and shall include the cost of furnishing all labor, materials, equipment, and incidental expenses necessary to complete the work, including excavation and footings, all in accordance with the plans and specifications and to the approval of the Project Officer.

END OF SECTION 133419

DIVISION 26

ELECTRICAL

SECTION 260101 - ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. General provisions and requirements for electrical work.

1.2 RELATED SECTIONS

A. Requirements of this section generally supplement requirements of Division 01.

1.3 REFERENCES

A. NFPA 10: Portable Fire Extinguishers.

B. NFPA 241: Safeguarding Construction, Alteration, and Demolition Operations.

1.4 SYSTEM DESCRIPTION

A. The full set of Contract Documents applies to work of Division 26.

B. Visit the site and study all aspects of the project and working conditions, as required by General and Supplementary Conditions, Bidding and Contracting Requirements, Drawings, and Specifications. Verify field dimensions.

C. The work covered in technical sections includes the furnishing of all labor, equipment and materials, and the performance of all operations pertinent to the work described.

D. Except as required otherwise in Division 01, promptly obtain and pay for, all necessary signatures and paperwork, all permits, fees and inspections required for work of this division by authorities having jurisdiction, including any utility connection or extension charge. No payment will be made until a copy of the permit is forwarded to the Owner.

E. Electrical work of this project includes, as a brief general description, the following:
   1. Deep Conduit of existing field lighting to 12-24” below proposed finish grades.
   2. Adjust existing electrical handhole to finish grade

F. See Division 01 for requirements related to limits on use of site, time restrictions on work, limits on utility outages or shutdowns, and phasing (sequencing) and scheduling.

1.5 PRODUCT OPTIONS

A. Except as modified by provisions of Bidding and Contracting Requirements and Division 01, these options apply to Division 26 specifications.

B. General: Where Contractor is permitted to use a product other than the specified item and model named as the basis of design, Contractor is responsible for all coordination and additional costs as specified in article "Substitutions" below for substitutions.

C. Products specified by reference standards or by description only: Any product meeting those standards or description.

D. Products specified by naming one or more manufacturers, or model name or catalog reference number: Products specified establish a standard of quality, options to be included, and performance.

1. Where other acceptable manufacturers are named, Contractor may provide products of those named manufacturers only, which meet the specifications.
2. Where specification permits "equal" products, without naming other acceptable manufacturers, Contractor may use products of any manufacturer, which meet the specifications.

E. Products specified by naming one manufacturer and particular product, with no provision for other options: No options or substitutions allowed.

1.6 SUBSTITUTIONS

A. Substitutions will be considered only as permitted or required by the Bidding and Contracting Requirements and Division 01. Except as modified by those requirements, the requirements below apply to Division 26 specifications.

B. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.

C. Document each request with complete data substantiating compliance of proposed substitution with contract documents.

D. A request constitutes a representation that the Bidder or Contractor:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
2. Will provide the same warranty for the substitution as for the specified product.
3. Will coordinate installation and make changes to other work which may be required for the work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension which may subsequently become apparent.
5. Will reimburse Owner for review or redesign services associated with re-approval by authorities.

E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

F. Substitution submittal procedure is specified in Bidding and Contracting Requirements and Division 01.

1.7 MATERIALS AND EQUIPMENT

A. All materials and equipment shall be new and the best of their respective kinds, suitable for the

conditions and duties imposed on them by the project, and of representative manufacturer. The description, characteristics and requirements of the materials to be used shall be in accordance with the specifications.

B. All equipment, construction and installation must meet requirements of local, state and federal governing codes.

C. Singular number: In cases where material, a device, or part of the equipment is referred to in the singular number in the specifications, it is intended that such reference shall apply to as many items of material, devices, or parts of the equipment as are required to complete the installation as shown on the drawings or required for proper operation of the system.

D. Terms have the following meanings:

1. Furnish: Supply item
2. Install: Mount and connect item
3. Provide: Furnish and install

E. All materials and equipment shall be installed and completed in a first class and workmanlike manner and in accordance with the best modern methods, practice and manufacturers' instructions. Any work which shall not present an orderly and neat or workmanlike appearance shall be removed and replaced with satisfactory work when so directed in writing by the Project Officer.

F. The specifications and drawings are intended to define the minimum requirements, as to quality of materials, construction, finish and overall workmanship.

G. General Conditions describe the correlation and intent of the Contract Documents. In case of discrepancies between the specifications and drawings, the specifications should be followed as to the general methods and principles and the drawings followed as to sizes, capacities and specifics for corresponding parts. If sizes are omitted, the Project Officer will determine sizes to be utilized.

H. In all cases of doubt, uncertainty, or conflict as to the true meaning of the specifications or drawings, it is the responsibility of the Contractor to notify the Project Officer of said uncertainty, doubt, or conflict and obtain a decision as to the intent prior to initiating any work which may be affected by this decision.

1.8 COORDINATION

A. Should a situation develop during construction to prevent the proper installation of any equipment or item where shown on the drawings, call the situation to the attention of the Project Officerand await a written decision.

B. Plan and coordinate all work to proceed in an orderly and continuous manner without undue delay, and in conformance with the project schedule. Submit samples, shop drawings, schedules, insurance policies and certificates, and the like in time to avoid delays in actual construction. Coordinate electrical work so that work of each trade is completed before other construction begins which would obstruct it.

C. Coordinate trades to ensure that proper clearances between work of the various trades allow access to items which require operation and maintenance.

D. Coordinate location and elevation of all conduit, light fixtures, equipment, and appurtenances in such a manner that the finished installation is as indicated on drawings. In the event difficulties are encountered which prevent this, it is the Contractor's responsibility to bring this to the attention of the Project Officer prior to initiation of work. Correct improperly coordinated installation at no additional cost.

E. The Contractors' assistants shall include a competent electrical foreman, who shall be on the premises at all times to check, layout, coordinate and superintend the installation of work. The foreman shall establish all basic requirements relative to the work before starting, and be responsible for the accuracy thereof.

1.9 SUBMITTALS

A. Manufacturers' and subcontractors' lists:

1. As specified in Division 01, submit a complete list of proposed manufacturers for all equipment, materials and subcontractors used for the work of this division. Lists shall follow the sequence of the specifications. No considerations will be given for partial or incomplete lists. After review of lists, submit shop drawings and product data.

B. Shop drawings and product data:

1. Submit in accordance with the requirements of Division 01 or as established at the preconstruction conference, the required number of copies of Shop Drawings and Product Data for every item of equipment. Shop drawings or product data will not be considered until Manufacturers' Lists have been approved. Shop drawings and product data shall be submitted, as required by the General Conditions, with sufficient time for checking, return to Contractor, and resubmission as required before Contractor shall install any item.
2. Each item submitted shall be properly labeled, indicating the specific service for which the equipment or material is to be used, section and paragraph number of specification or drawing number to which it applies, Contractor's name and project name and number. Data submitted shall be specific and shall include product data and printed information in sufficient detail and scope to verify compliance with requirements of the contract documents. Clearly identify each item within the data. Data of a general nature will not be accepted. Each sheet must clearly show the project name and number.
3. The review of a shop drawing or product data shall not be considered as a guarantee of the measurements or conditions or that the shop drawings or product data have been checked to see that item submitted properly fits the conditions. This review shall not relieve the Contractor of the responsibility for furnishing material or performing work as required by the contract documents, for correctness of dimensions and quantities, or for proper coordination of details and interfaces among trades.
4. All exclusively electrical items furnished as items associated with mechanical items but not specifically described in the mechanical item submission, shall be submitted as a separate submittal but shall be clearly marked as associated with the mechanical item by identified specification paragraph.
5. Product data sheets shall be 8.5-inches by 11-inches cut sheets for operating and maintenance manual.

C. Submit at least three copies of the results of every test required under any section in this division.

D. Specialist shall submit a list of at least three projects similar to this project in type, size, and quality, which have been in place and operating satisfactorily for at least five years.

1. Include project name, address, name and phone number of owner's representative, and project type and size.

E. After the work is completed, submit all required certificates of approval from approved inspection agencies and authorities having jurisdiction over work of this division. Certificates of approval must be received by the Project Officer prior to final acceptance of the work.

1.10 SPECIALIST

A. The term "Specialist" as used in the specification shall mean an individual or firm of established reputation (or, if newly organized, whose personnel have previously established a reputation in the same field,) which is regularly engaged in, and which maintains a regular force of workers skilled in either (as applicable) manufacturing or fabricating items required by the contract, installing items required by the contract, or otherwise performing work required by the contract. Where the specification requires installation by a specialist, the term shall also be deemed to mean the manufacturer of the item, an individual or firm licensed by the manufacturer, or an individual or firm who will perform the work under the manufacturer's direct supervision.

1.11 REGULATORY REQUIREMENTS

A. When these specifications call for materials or construction of a better quality or larger sizes than required by the following codes and standards, the provisions of the specifications shall take precedence.

B. Provide, without extra charge, any additional materials and labor which may be required for compliance with these codes and standards even though the work is not mentioned in these specifications or shown on the contract drawings.

C. Perform the work of this division in strict accordance with the following authorities. The latest revision of these codes accepted by the authority having jurisdiction as of the date of the contract documents shall apply.

1. The electrical, building, fire, and safety codes of the state and county or city in which the work is being performed.
2. The National Electric Code, NFPA 70 (NEC).
3. The National Fire Protection Association Code (NFPA).
4. International Building Code (IBC).
5. International Energy Conservation, Fire, and Electrical Codes (ICC).

1.12 REFERENCE STANDARDS

A. Perform the work of this division using the standards of the following organizations, as referred to in technical sections, as a minimum requirement for construction and testing. Unless specified otherwise in Bidding and Contract Documents or Division 01, the latest revision current as of the date of the

contract documents shall apply.

1. Factory Mutual (FM)
2. American National Standards Institute (ANSI)
3. American Society for Testing and Materials (ASTM)
4. International Code Council (ICC)
5. Institute of Electrical and Electronics Engineers (IEEE)
6. National Electrical Code (NEC) (NFPA 70)
7. National Electrical Manufacturer's Association (NEMA)
8. National Fire Protection Association (NFPA)
9. The Occupational Safety and Health Act (OSHA)
10. Underwriters Laboratory Inc. (UL)
11. American Association of State Highway and Transportation Officials (AASHTO)
12. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)
13. Illuminating Engineering Society of North America (IESNA)

1.13 PROTECTION

A. Each trade and subcontractor is responsible for preventing damage and soiling of work performed by other trades or subcontractors. Each trade and subcontractor is responsible for providing temporary protection of its own work.

1. Protect work from spills, splatters, drippings, adhesives, bitumens, mortars, paints, plasters, and damage from welding or burning.
2. Protect finished work from damage, defacement, staining, or scratching.
3. Protect finishes from cleaning agents. or grinding and finishing equipment.
4. Protect adjacent and finished work from damage, using tape, masking, covers or coatings and protective enclosures.
5. Coordinate installations and temporarily remove items to avoid damage from finishing work.

B. Repair all damage or soiling to the complete satisfaction of the Project Officer; replace any materials or work damaged to such an extent that they cannot be restored to their original condition, all at no addition to the Contract sum.

C. Protect electrical materials and products from weather events and accidents of construction.

D. Use of sidewalk or roadway areas outside of the property lines shall be with permission and approval of the local authorities having jurisdiction.

1.14 PROJECT CONDITIONS

A. Drawings showing utilities in concealed locations are based on the best information available but are not represented as being precisely correct. Work of the contract includes digging, cutting, drilling, using nondestructive methods, and other methods of locating concealed utilities in the field, as well as patching and repairing as specified in "Cutting and Patching" below.

B. If, in the course of the work, workers encounter a material they suspect to present some hazard:

1. Promptly notify the Owner and Project Officer in writing.

2. Do not perform any work which would disturb the suspected material until written instructions have been received.

1.15 WARRANTY

A. All work and equipment provided as work of this division shall be fully warranted under the general project warranty. In addition, provide added special warranties as specified in individual sections.

B. During the correction period, the Contractor shall begin correcting any work found to be not in accordance with the requirements of the Contract Documents within 4-hours of receiving written notice from the Owner. Provide detailed schedule for completion of work within 24-hours of receiving written notice from the Owner and revise schedule based on any Owner comments generated. Except as otherwise required in General Conditions and Division 01, the correction period is one year after the date of substantial completion of the work. Work requiring correction shall promptly be repaired or completely replaced at no addition to the Contract Sum.

1. Service reports for warranty work shall be provided to the Owner

C. Special warranties are warranties required by individual specification sections, incidental product warranties, manufacturers' standard warranties, installer or subcontractor service agreements, and other individual warranties in addition to the general project warranty.

D. Provide copies of warranties as required for Operation and Maintenance Manual specified above, and by Division 01.

E. For items of work delayed beyond date of substantial completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

PART 2 - PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

PART 4 – MEASUREMENT

Not used.

END OF SECTION 260101

SECTION 260195 - ELECTRICAL IDENTIFICATION

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Nameplates and tape labels.

B. Wire and cable markers.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

PART 2 – PRODUCTS

2.01 UNDERGROUND WARNING TAPE

A. Description: 6-inch-wide plastic tape, colored yellow, with suitable warning legend describing buried electrical lines.

PART 3 – EXECUTION

3.01 APPLICATION

A. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches below finished grade.

PART 4 – MEASUREMENT

4.01 The unit price for NAMEPLATES, WIRE MARKERS, AND UNDERGROUND WARNING TAPE is incidental to the LUMP SUM price for electrical work, and shall include the cost of all labor, materials, and incidental expenses necessary to complete the work, including hardware, in accordance with the plans and specifications, to the satisfaction of the Project Officer.

Does not include excavation.

END OF SECTION 260195

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements applicable to work of more than one section of Division 26.

B. Testing wiring systems.

1.2 DEFINITIONS

A. Project correction period: A period after Substantial Completion of the work during which the Contractor shall correct every part of the work found to be not in accordance with the requirements of the contract documents, promptly after receipt of written notice.

B. Qualified testing agency: A Nationally Recognized Testing Laboratory (NRTL), a National Voluntary Laboratory Accreditation Program (NVLAP), or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1.3 DESIGN REQUIREMENTS

A. The contract drawings are generally descriptive, and do not indicate all fittings or offsets in conduit or all pull boxes, access panels, or other specialties required.

1.
2. Pull boxes and other appurtenances which require operation or maintenance shall be easily accessible.

1.4 SUBMITTALS

A. Test reports: Show that tests specified in Part 3 below demonstrate the specified results.

1.5 QUALITY ASSURANCE

A. Provide materials and perform work in accordance with the electrical, building, fire, and safety codes and regulations of the state, county, or city in which the work is performed.

B. Electrical equipment, materials and devices provided or installed as work of Division 26 shall bear UL label, or, if UL label is not available, the item shall be tested and labeled by a qualified testing agency, acceptable to authorities having jurisdiction, and in accordance with NFPA 70. Provide testing, if required, without addition to the contract sum.

C. VOC content: Field-applied adhesives and sealants, limits per South Coast Air Quality Management

District (SCAQMD), Rule No. 1168.

D. Products shall contain no urea-formaldehyde content.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 TESTS

A. During the progress of the work and after completion, test the branch circuits and distribution system.

B. Results of the tests shall show that the wiring meets the requirements of this specification. Should any test indicate defect in materials or workmanship, immediately repair, or replace with new, the faulty installation, and retest the affected portions of the work.

C. Furnish equipment and instruments necessary for testing.

D. Tests shall demonstrate the following:

1. Lighting, power, and control circuits are continuous and free from short circuits.
2. Circuits are free from unspecified grounds.
3. The resistance to ground of each non-grounded circuit is not less than one megohm.
4. Circuits are properly connected in accordance with the applicable wiring diagrams.
5. Circuits are operable. Demonstration shall include functioning of each control not less than ten times, and continuous operation of each lighting and power circuit for not less than 0.5 hour.

E. Test circuit breakers larger than 100 amps at full voltage.

F. Make voltage built-up tests with a voltage sufficient to determine that no short circuits exist.

G. Immediately repair defects and retest until systems are operating correctly.

H. Submit test reports.

3.2 OPERATING INSTRUCTIONS

A. Furnish the necessary technicians, skilled workers, and helpers to operate the electrical systems and equipment of the entire project for one 8-hour day.

B. Where specified in technical sections, provide longer periods required for specialized equipment.

C. Instruct the Owner or designated personnel in operation, maintenance, lubrication, and adjustment of systems and equipment.

D. The Operating and Maintenance Manual shall be available at the time of the instructions for use by instructors and Owner personnel.

E. Schedule the general and specialized instruction periods for a time agreed upon by the Owner and Project Officer.

PART 4 – MEASUREMENT

4.1 The unit price for COMMON WORK RESULTS FOR ELECTRICAL is incidental to the LUMP SUM price for electrical work, and COMMON WORK RESULTS FOR ELECTRICAL is incidental to the LUMP SUM price for the electrical work, and shall include the cost of all labor, materials, and incidental expenses necessary to complete the work, including hardware, in accordance with the plans and specifications, to the satisfaction of the Project Officer.

END OF SECTION 260500

SECTION 260501 - EXCAVATION AND FILL FOR ELECTRICAL WORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Trenching, backfilling, and compacting for electrical work underground.

1.2 RELATED SECTIONS

A. Underground electrical duct banks: Section 260544.

B. Conduit: Section 260533.

1.3 REFERENCES

A. ASTM D 1557: Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbs/cu ft (2700 kN-m/cu m).

1.4 SUBMITTALS

A. Shop drawings: Showing field verified locations of utilities, and proposed detailed trenching plan.

B. Certifications: Test reports showing that compaction meets specified requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Backfill: Earth materials, free from perceptible amounts of wood, debris, or topsoil, free of frost at the time of placement, and not containing marl or other elements which tend to stay in a plastic state.

2.2 EQUIPMENT

A. Mechanical tampers for compacting backfill: Capable of exerting a blow equal to 250 pounds per square foot (12 kPa) of area of the tamping face.

PART 3 - EXECUTION

3.1 PREPARATION

A. Contact local utility company underground information service Dominion Virginia Power (Miss Utility) before beginning excavation.

B. The general locations of underground utilities are indicated on the drawings and are not to be assumed to be accurate or complete. Before beginning work, field check the area with the most accurate instruments available.

3.2 INSTALLATION

A. Perform all excavating, cutting of paved areas, trenching, sheeting, shoring, backfilling, and compacting required for the proper installation of the work.

B. Where obstructions are encountered, obtain written approval and make necessary changes in line, grade or location.

C. Protect existing utilities from damage during excavation and backfilling. Repair damaged new or existing work at no addition to the contract sum. Bracing, shoring and other protection of existing utilities is part of this work.

D. Do not damage or remove existing shrubs or trees including their root systems, without prior notification to the Project Officer.

3.3 TRENCHING

A. Excavations shall generally follow the routes indicated on the drawings. Stockpile topsoil separately for later replacement. Excavations shall be of sufficient depths to provide, unless indicated otherwise on the drawings, a minimum cover as follows:

1. Electrical conduit: Depth required by NFPA 70 (NEC).

B. Trenches shall be of necessary depth and width for the proper laying of conduit with a minimum of 8 inches (205 mm) on each side of the joint.

1. The sides shall be as nearly vertical as practicable. Unless local regulations are more strict, trenches 4 ft. (1220 mm) and deeper shall have shored sides as required by OSHA trenching regulations.
2. The bottoms of trenches shall be accurately graded to provide uniform bearing and support for each section of conduit on undisturbed soil at every point along its entire length, except for bell holes.
3. No greater length of trench shall be left open, in advance of the completed structure placed in it, than can be completed in that day's operation.
4. Except where rock is encountered, do not excavate below the depths required. Where rock excavation is required, excavate to a depth of at least 6 inches (150 mm) below the trench depth and fill the overdepth with compacted crusher run or bank run stone or sand. Unauthorized overdepths in excavation shall be backfilled with crushed stone, slag or gravel, thoroughly compacted.
5. Whenever wet or otherwise unstable soil is encountered, it shall be removed to the depth and extent directed, and the trench backfilled to the proper grade with crushed stone, slag or gravel.

C. Should springs be encountered within the work area, or soft soil conditions at the elevations required for load bearing, immediately notify the Project Officer and do not place any portion of the work on such surfaces until instructions are received.

D. Furnish and maintain pumps, flumes, gutters, and appurtenances if required to keep the excavations free from water. Water shall be directed to a point remote from building operations, shown on the approved shop drawing.

3.4 Excavation for handholes and similar structures shall be sufficient to leave a minimum of 12 inches (305 mm) and a maximum of 24 inches (610 mm) clearance on all sides. BACKFILL

A. Place no backfill until the adjacent construction or the utility to be covered has been inspected, tested, and approved.

B. Installing underground warning tape: Install in backfill above exterior buried lines not encased in concrete. Select legend and color appropriate for type of line. Install metallic lined tape for non-metallic lines. Install approximately 12 inches (305 mm) below grade.

C. Electrical systems backfill:

1. Backfill and compact in 8-inch (200-mm) layers, to level finished grade with the excavated materials approved for backfilling.

D. Structure backfill:

1. Do not backfill against structures with cement mortar joints until the mortar is at least twelve hours old.

3.5 COMPACTION

A. Test in accordance with the requirements of ASTM D 1557.

B. Compact under slabs, roads, and sidewalks to a 95 percent density.

C. Compact unpaved areas to a 90 percent density.

D. Backfill and compact trench in unpaved areas to within 4 inches (102 mm) of existing grade. Furnish and install compacted select topsoil for the final layer to finish even with existing grade. Remove surplus earth and rake unpaved areas for final planting.

E. Take particular care in compaction of earth under joints of mechanical piping.

3.6 RESURFACING

A. Resurface sidewalks, roads, streets, and other paved areas as work of this section, matching the construction and finish of adjacent paving. Paving shall meet the requirements of Division 32.

PART 4 – MEASUREMENT

4.1 The unit price for EXCAVATION AND FILL FOR ELECTRICAL WORK is incidental to the LUMP SUM price for electrical work, and shall include the cost of all labor, materials and incidental expenses necessary to complete the work, including hardware, in accordance with the plans and specifications, to the satisfaction of the Project Officer.

END OF SECTION 260501

SECTION 260519 - WIRES AND CABLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wire and cable rated 600-volts and less.

B. Type MC, Type AC-HCF, and Type NM cables are not permitted.

C. Wiring connectors and connections.

1.2 RELATED SECTIONS

A. Underground ducts and utility structures: Section 260544.

B. Conduits: Section 260533.

1.3 REFERENCES

A. ANSI/NEMA WC 70 – Power Cables rated 2000 Volts or Less for Distribution of Electrical Energy.

B. ASTM B3 – Standard Specification for Soft or Annealed Copper Wire.

C. ASTM B8 – Standard Specification for Concentric-Lay-Stranded Copper Conductors.

D. UL 44 – Standard for Thermoset-Insulated Wires and Cables.

E. UL 83 – Standard for Thermoplastic-Insulated Wires and Cables.

F. Additional UL Standards as indicated.

1.4 SUBMITTALS

A. Product data:

1. Each type of wire and cable, including accessories.
2. Include copies of UL certifications showing compliance with requirements in “Quality Assurance” below.

1.5 QUALITY ASSURANCE

A. Electrical components, devices, and accessories: Listed and labeled as defined in NFPA 70 Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Products and installation shall comply with NFPA 70 and other applicable national, state, and local

electrical codes.

1.6 DELIVERY, STORAGE, AND HANDLING

A. General requirements: Deliver, store, and handle wire and cable in accordance with the manufacturer's instructions.

1. Wire and cable shall be packaged in a manner that protects them during ordinary handling and shipping. Ship from manufacturer with ends temporarily sealed against moisture.
2. Protect wire and cable during storage (both onsite and offsite).
   a. Store in a clean and dry location. Elevate from surfaces where water can accumulate, and cover cable rolls to protect against weather.
3. Handle wire and cable as recommended by the manufacturer. Do not pull from the center or periphery of the cable reel.
4. Damaged wire and cable shall be removed from the project site.

PART 2 - PRODUCTS

2.1 Wire, wiring accessories, underground conductors – replace in kind as previously installed.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Provide wire and cable indicated in accordance with national, state, and local electrical codes.

B. Conceal wire and cable in new construction and in locations with finished walls, ceilings, and floors unless otherwise noted on drawings.

C. Wire and cable serving systems over 100-volts shall be installed in raceways, except where otherwise noted on drawings.

D. Wire and cable serving systems rated below 100-volts shall be installed in raceways, except where otherwise noted in individual specification sections. Refer to paragraph "INSTALLING CABLE RATED BELOW 100-VOLTS" below for additional information.

3.2 INSTALLING EXTERIOR WIRING

Sizes: Replace in kind as required to provide full functionality of existing Lights.

A. Wiring methods and locations: Replace in kind.

B. Splicing shall be done in outlet boxes and junction boxes and not in conduit. Treat these boxes as wet locations.

PART 4 – MEASUREMENT

4.1 The unit price for WIRING CONDUCTORS is incidental to the LUMP SUM price for electrical work, and shall include the cost of all labor, materials, and incidental expenses necessary to complete the work, including hardware, in accordance with the plans and specifications, to the satisfaction of the Project Officer.

END OF SECTION 260519

SECTION 260533 - CONDUITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conduit and accessories, aboveground and below ground where not in duct banks.

1.2 RELATED SECTIONS

A. Exterior duct banks and handholes: Section 260544.

B. Trenching: Section 260501.

1.3 DEFINITIONS

A. FMC: Flexible metal conduit.

B. LFMC: Liquid-tight flexible metal conduit.

1.4 SUBMITTALS

A. Product data:

1. Each type of conduit included in the work, and related fittings.
2. Accessory materials.
3. Hangers and fasteners.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:

B.

C. Nonmetallic conduit, tubing and fittings:

1. Allied Tube & Conduit; a Tyco International Ltd. Co.
2. Arnco Corp.
3. Beck Manufacturing
4. CANTEX Inc.
5. Certainteed Corp.; Pipe and Plastics Group
6. Lamson & Sessions; Carlon Electrical Products

D. Fasteners:

1. Caddy Fasteners by Erico Products Inc
2. ITW Ramset “Red Head”
3. Wej-It Fastening Systems

2.2 CONDUIT AND FITTINGS

A. Plastic conduit: Polyvinyl chloride (PVC) Schedule 40, rated for use with 90-degree conductors, for exposed, underground, and encased applications, complying with NEMA Specification TC-2 and UL 651.

B. Plastic conduit fittings and cement:

1. Fittings: Complying with NEMA TC 3 and UL 514.
2. Cement: Solvent cement made by the manufacturer of the conduit and fittings.

2.3 ACCESSORY MATERIALS

A. Pull rope: Polypropylene, thickness, tensile strength, and work load selected to meet project load requirements.

B. Caps and plugs: Equal to Thomas & Betts Series 1470.

C. Lubricant: Equal to Ideal Industries, Inc. “Yellow 77”. UL approved.

2.4 FASTENERS

A. General: Select fasteners such that load applied does not exceed one-fourth of manufacturer’s load capacity in 3500 psi (24000 kPa) concrete.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Provide complete, separate and independent raceway system for each of the various wiring systems including, but not limited to, the following:

   1. Power

B. Do not install conductors or pull rope during installation of conduit.

C. Where conduit is connected to a cabinet, junction box, pull box, or auxiliary gutter, protect the conductors with an insulating bushing. Provide locknuts both inside and outside the enclosure. Where conduit is stubbed up to above ceilings for future wiring, close ends with bushings.

D. Make turns in conduit runs with manufactured elbows or using machines or tools designed to bend conduit. Turns shall be not less than the various radii permitted by NFPA 70.

E. Sizes:

   1. Do not use conduit smaller than 1 inch, except where otherwise indicated.
   2. Conduit sizes shown on drawings are based on Type THHN/THWN wire.

F. Make vertical runs plumb and horizontal runs level and parallel with building walls and partitions.

G. Ground conduits as required by NFPA 70.

H. Immediately after each run of conduit is completed, test it for clearance, smooth the joints, and close at each end with caps or plugs to prevent entrance of moisture or debris.

I. Conduit installed outdoors shall provide a liquidtight seal. Use steel or malleable iron hub fittings. Coat exposed threads with bituminous protective coating.

3.2 INSTALLING PULL BOXES, JUNCTION BOXES

A. Install pull or junction boxes in long runs of conduits or where necessary to reduce the number of bends in a run.

   1. Select inconspicuous locations. Do not install until locations have been approved by the Landscape Architect.

3.3 INSTALLING FLEXIBLE CONDUIT

A. Installation shall comply with NFPA 70.

   1. Minimum length: Two feet (610 mm).
   2. Maximum length: Six feet (1830 mm).

B. In wet locations, install liquidtight type, in such a manner that liquid tends to run off the surface and not drain toward the fittings.

C. Where fittings are brought into an enclosure with a knockout, install a gasket assembly consisting of an O ring and retainer on the outside.

3.4 INSTALLING PULL ROPE AND CONDUCTORS

A. After conduit is installed, fish pull rope. After completion of the work of this project, pull rope shall remain in conduits identified as to be left empty.

B. Do not use a pull rope that has a tensile strength of more than one of the conductors of a two-wire circuit, more than two of the conductors of a three-wire circuit, or more than three of the conductors of a four-wire circuit.

C. Do not pull conductors into the conduits until the system is entirely completed and wet building materials are dry.

D. Use only a lubricant approved for use with conductor materials and pull rope materials.

3.5 INSTALLING UNDERGROUND CONDUIT, GENERAL

A. Depth:
   1. Outside building: Top of conduit 12-24 inches below finish grade.

B. Cleaning: At the completion of each run, in each conduit, first run a testing mandrel not less than 12 inches (305 mm) long with diameter 0.25 inch (6.35 mm) less than the inside diameter of the conduit; then draw through a stiff-bristled brush until all particles are removed. Immediately install conduit plugs.

C. Except at conduit risers, make changes in direction of runs, either vertical or horizontal, by long sweep bends. Bend may be made up of one or more curved or straight sections or combinations. Use manufactured bends with a minimum radius of 36 inches.

3.6 INSTALLING UNDERGROUND CONDUIT WITHOUT CONCRETE ENCASEMENT

A. Run conduit in straight lines except as necessary.

B. Trenches: At least three inches (80 mm) clearance on each side of the conduit.

C. Warning tape: Install in backfill approximately 12 inches (300 mm) below grade.

PART 4 – MEASUREMENT

4.1 The unit price for CONDUITS (DEEPEN AND REPLACE AS NEEDED BETWEEN LIGHT POLES) is incidental to the LUMP SUM price for the electrical work, and shall include the cost of all labor, materials and incidental expenses necessary to complete the work, including hardware, in accordance with the plans and specifications, to the satisfaction of the Project Officer.

END OF SECTION 260533

SECTION 260544 - UNDERGROUND DUCTS AND UTILITY STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the following:
   1. Handholes and handhole accessories.

1.2 REFERENCES

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

   1. AASHTO-HB 17: Standard Specifications for Highway Bridges. Includes the AASHTO categories for structural loads:
      a. Heavy traffic: HS20.
      b. Medium traffic: HS15.
      c. Light traffic: H10.

B. ASTM International (ASTM)

   1. ASTM C 478: Precast Reinforced Concrete Manhole Sections.
   2. ASTM C 857: Minimum Structural Design Loading for Underground Precast Concrete Utility Structures. Includes classes which correspond to AASHTO categories:
      a. Heavy traffic: Class A-16.
      b. Medium traffic: Class A-12.
      c. Light traffic: Class A-8.
      d. Walkway: Class A-0.3, 300 lb/sq ft (1465 kg/sq m).
   3. ASTM C 858: Specification for Underground Precast Concrete Utility Structures.

C. Society of Cable Telecommunications Engineers (SCTE):

   1. SCTE 77: Specification for Underground Enclosure Integrity. Light duty and pedestrian traffic only. Includes Tiers for specific applications, and static vertical wheel load ratings:
      a. Tier 5: Sidewalk applications with a safety factor for occasional nondeliberate vehicular traffic.
      b. Tier 8: Sidewalk applications with a safety factor for nondeliberate vehicular traffic.
      c. Tier 15: Driveway, parking lot, and off-roadway applications subject to occasional nondeliberate heavy vehicular traffic.

1.3 SUBMITTALS

A. Product data: For the following:

   1. Precast polymer concrete enclosures.
   2. Conduit and ducts, including elbows, bell ends, bends, fittings, and solvent cement.

1.4 QUALITY ASSURANCE

A. Electrical components, devices, and accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with ANSI C2.

C. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver ducts to project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.

B. Store precast polymer concrete units at project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.

C. Lift and support precast polymer concrete units only at designated lifting or supporting points.

1.6 PROJECT CONDITIONS

A. 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 at least two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Project Officer's written permission.

1.7 COORDINATION

A. Coordinate layout and installation of ducts and handholes with final arrangement of other utilities and site grading, as determined in the field.

B. Coordinate elevations of ducts and duct bank entrances into manholes with final profiles of conduits as determined by coordination with other utilities and underground obstructions. Revise locations and elevations from those indicated as required to suit field conditions and to ensure duct runs drain to manholes, and as approved by Project Officer.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Available 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. Precast polymer concrete enclosures for underground construction:
      a. Quazite/Strongwell (Hubbell Power Systems, Inc.).
      b. Synertech (Division of Oldcastle Precast).

2.2 CONDUIT

A. Conduit and fittings are specified in Section 260533.

2.3 HANDHOLES

A. Polymer concrete handholes: Molded of sand and aggregate bound with polymer resin, and reinforced with steel, with 6-inch (150-mm) square cable entrance at each side and weatherproof cover with nonskid finish and legend. Unit, when buried, shall be designed to support SCTE 77 Tier 22 loading.

B. Cover legend: “ELECTRIC”.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Handholes: Underground precast polymer concrete enclosures.

3.2 EARTHWORK

A. Excavation and backfill: Comply with Section 260501, Excavation and Fill for Electrical Work, but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restore surface features at areas disturbed by excavation and reestablish original grades, unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
   1.

3.3 HANDHOLE INSTALLATION

A. Waterproofing: Apply according to Manufacturer’s recommendations. After ducts have been connected and grouted, and before backfilling, waterproof joints and connections and touch up abrasions and scars.

B. Hardware: Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated.

C. Precast concrete handhole installation: Unless otherwise indicated, comply with ASTM C 891.

1. Install units level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances.
2. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch (25-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
3. Do not install handholes within synthetic turf playing area. Contractor shall notify Project Officer immediately if Contractor believes that a handhole may be needed in the playing area.

3.4 FIELD QUALITY CONTROL

A. Testing: Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.

B. Correct installations if possible and retest to demonstrate compliance. Remove and replace defective products and retest.

PART 4 – MEASUREMENT

4.1 The unit price for PRECAST POLYMER HANDHOLE is incidental to the LUMP SUM price for electrical work, and shall include the cost of all labor, materials, and incidental expenses necessary to complete the work, including hardware, in accordance with the plans and specifications, to the satisfaction of the Project Officer.

END OF SECTION 260544

DIVISION 31

EARTHWORK

SECTION 311000

SITE CLEARING, DEMOLITION AND REMOVALS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Cleaning Project Site of debris, grass, trees, and other plant life in preparation for site or earthwork and removing above-grade items.
2. Protection of existing structures, trees, or vegetation indicated on the Construction Drawings to remain.
3. Application of temporary measures throughout the life of the project to control erosion and siltation associated with any activity related to the construction of this project.
4. Stripping topsoil and stockpiling from areas that are to be incorporated into limits of project and where so indicated on Construction Drawings.
5. Demolition of existing pavement, curbing, walls, compacted mulch and any other surfacing, equipment and foundations no longer needed, abandoned utilities, and structures, which interfere with proposed construction.
6. Demolition of abandoned subgrade debris or unsuitable fill that may potentially remain underground following the previous site use. Abandoned debris or unsuitable fill shall be removed to a depth that does not interfere with proposed construction, as determined by Project Officer.
7. Removal of above-grade site items as indicated and as necessary to facilitate new construction.
8. Disconnecting and capping or sealing Project Site utilities.

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

C. Related Sections:

1. 015000 – Temporary Erosion and Sediment Control
2. Division 26 - Electrical
3. 311300 – Tree Protection and Root Pruning
4. Footings, bases, and foundations for the above-mentioned removals shall be removed under Section 312000 – Earth Moving
5. 33 4000 - Storm Drainage, for proposed storm drain infrastructure and connection to, and protection of, existing storm drain system, including pipes and structures.

D. 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/.

1.02 ENVIRONMENTAL REQUIREMENTS

A. Construct temporary erosion control systems as shown on Construction Drawings and in accordance with applicable County requirements to protect adjacent properties and water resources from erosion and sedimentation.

B. Contractor shall not begin construction without a "Land Disturbing Activity (LDA) Permit" issued by Arlington County DES.

C. Contractor shall be totally responsible for conducting storm water management practices in accordance with LDA and for enforcement action taken or imposed by Federal or State agencies, including cost of fines, construction delays, and remedial actions resulting from Contractor's failure to comply with provisions of LDA permit.

1.03 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by demolition operations.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.05 PROJECT CONDITIONS

A. Conditions existing at time of inspection for bidding purposes will be maintained by the County in so far as practical.

B. Variations to conditions or discrepancy in actual conditions as they apply to site preparation operations are to be brought to attention of the County prior to commencement of site work.

C. Temporary storage of removed items or materials on-site will not be allowed without prior approval from DPR. Carefully remove items indicated by the Project Officer to be salvaged and store on Arlington County's premises as determined at Pre-Construction meeting.

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

1.06 MATERIAL OWNERSHIP

A. Except for stripped topsoil, items identified by the Project Officer salvage, or other materials indicated to remain on Arlington County's Property, cleared materials shall become the Contractor's property and shall be removed from the Project Site. Any materials determined to be retained shall be delivered to the location selected by the County, at no additional expense to the County.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Off-site materials shall be transported to project and on-site materials transported from the project using well-maintained and operating vehicles. Once on Project Site, transporting vehicles shall stay on designated haul roads and shall at no time endanger improvements.

2.02 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section "Earth Moving."

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

2.03 CONSTRUCTION FENCE & TEMPORARY ROOT PROTECTION MATTING

A. Shall adhere to Specification Section 311300.

B. Location: As shown on Construction Plans.

PART 3- EXECUTION

3.01 PREPARATION

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

B. Protect existing items to remain from damage during construction. Restore damaged existing site items to their original condition, as acceptable to the Project Officer.

C. Identify existing plant life that is to remain and verify clearing limits are clearly tagged, identified, and marked in such manner as to ensure their safety throughout construction operations. Limits of clearing and grading shall be staked and approved by Project Officer before commencing work. Install Tree Protection Fence (TPF) according to Arlington County Specifications around trees to be preserved and as shown on the construction drawings.

D. No grading operations will be allowed until temporary sediment and erosion control measures have been installed in accordance with the approved plan conforming to the

requirements of Arlington County Erosion and Sediment Control Ordinance. No work, storage of materials or parking of vehicles/ equipment shall occur within designated tree protection areas.

E. Erosion and Sediment Control measures shall be periodically cleaned of sediment and maintained. Immediately after every rainstorm, all control measures shall be inspected and any deficiencies corrected by the Contractor.

F. No measurement will be made for temporary erosion controls required to correct conditions created due to the Contractor's negligence, carelessness, or failure to install controls in accordance with the approved plan and sequence for the performance of such work.

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

H. 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.

G. 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.

H. Utility Locator Service: Notify Miss Utility for utility location services 72 hours prior to site clearing.

I. Construction Access shall be via the existing curb cut on South Irving Street as shown on C-04B. If the existing curb/gutter, or the existing asphalt trail is damaged during construction, Contractor is responsible for replacing the damaged curb/gutter and trail in kind at no additional expense to the owner.

3.02 TREE REMOVAL

A. 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 inside and outside of the Limits of Disturbance (LOD).

B. Do not remove trees, shrubs, and other vegetation indicated to remain.

C. Grind down stumps and remove roots larger than **2 inches**, obstructions, and debris to a depth of **18 inches** below exposed subgrade.

D. Chip removed tree branches, and trunks and legally **dispose of off-site**.

3.03 PROTECTION

A. Locate, identify, disconnect, seal and cap existing utilities. Protect existing utilities to remain in place that are to remain or abandon in place as shown on Construction Drawings. 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.

C. Following Arlington County Specifications/ Guidelines for Tree Protection Fencing, protect trees, plant growth, and features designated to remain as part of final landscaping. Refer to actual bed drawings for tree protection fencing and signage and drawing references as contained by Arlington County Landscape Standards.

D. Trees damaged by construction operations shall be evaluated by the Urban Forester and replaced or pruned and treated as needed by an International Society of Arboriculture (I.S.A.) Certified Arborist.

E. According to Arlington County's Tree Replacement Guidelines, replace trees damaged beyond repair by the construction process with nursery grown stock meeting American Nursery and Landscape Association (ANLA) Standards.

F. Conduct demolition and removal operations with minimum interference to public or private accesses and facilities. Maintain ingress and egress at all times and clean or sweep roadways daily as required by Erosion Control Plan or governing authority. Dust control shall be provided with sprinkling systems or equipment provided by Contractor.

G. Conduct demolition and removal operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from County.

H. Conduct demolition and removal operations to prevent injury to people and damage to facilities to remain. Ensure safe passage of people around demolition area. Protect existing site improvements, appurtenances, and landscaping to remain.

I. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

J. Provide traffic control as required, in accordance with the US Department of Transportation's "Manual of Uniform Traffic Control Devices" and applicable state highway department requirements.

K. Existing field light poles shall be protected and undisturbed.

3.04 DEMOLITION:

A. Bituminous and Portland cement concrete pavement designated for demolition shall be broken into pieces and disposed of at an offsite location selected by the Contractor. The Contractor shall provide saw cut smooth edged for all bituminous and Portland cement concrete pavements

B. The Contractor shall be solely responsible for making the arrangements for the disconnection and abandonment of gas, water, sewer, electricity, cable, telephone, and other public or service utilities.

C. Other existing items marked for removal on the Demolition Plan, including but not limited chain link fencing (and footers), segmental block walls (and footers), asphalt paving (and subbase), long jump sand, etc., shall be demolished and removed according to the notes on C-04.

3.05 CLEARING AND GRUBBING

A. Clear areas required for access to Project Site and execution of work.

B. Unless otherwise indicated on Construction Drawings, remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with installation of new construction. Removal includes digging out stumps and roots. Depressions caused by clearing and grubbing operations are to be filled to subgrade elevation to avoid ponding water.

C. The area of grubbing shall be maintained within the clearing limits shown on the plans. Remove stumps and root matter to a depth of 24 inches below existing ground surface. Refill excavations made by removal of stumps or roots with materials specified for structural backfill in Section 31000.

D. Remove grass, trees, plant life, stumps, and other construction debris from Project Site to a legal dump site that is suitable for handling such material according to state laws and regulations.

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

F. Invasive/non-native removal shown on sheet C-04 shall be performed by third party and is not scope for General Contractor. Invasive/non-native removal shall occur prior to tree planting in the forest.

3.06 TOPSOIL EXCAVATION

A. Remove sod and grass before stripping topsoil.

B. Topsoil shall consist of organic surficial soil found in depth of not more than 6-inches. Satisfactory topsoil shall be reasonably free of subsoil, clay lumps, stones and other objects over 1 inch in diameter, weeds, roots, and other objectionable material.

C. Cut heavy growths of grass from areas before stripping and remove cuttings with remainder of cleared vegetative material.

D. Strip topsoil from areas that are to be filled, excavated, landscaped, or re-graded to such depth that it prevents intermingling with underlying subsoil or questionable material.

E. Stockpile topsoil in storage piles in areas shown on Construction Drawings or where directed by Project Officer. Construct storage piles to freely drain surface water. Cover storage piles as required to prevent windblown dust. Dispose of unsuitable topsoil as specified by waste material, unless otherwise specified by Project Officer. Excess topsoil shall be removed from Project Site by Contractor unless specifically noted otherwise on Construction Drawings or as acceptable to Project Officer.

3.07 DISPOSAL

A. Dispose of trees and shrubs in accordance with the Garbage, Refuse and Weeds Ordinance of the Arlington County Code. When approved by the Project Officer, material to be dumped within the Contract area where directed.

B. Do not burn materials on the Project Site.

C. Remove material from the Project Site as it accumulates. Do not allow waste material to accumulate for more than 72 hours and should be removed before non-work days.

D. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris. Transport these items and legally dispose of them off Owner's property.

PART 4 - MEASUREMENT

4.01 The unit price for SITE CLEARING, DEMOLITION AND REMOVALS shall be LUMP SUM and shall include storage and re-installation of relocated items the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

4.02 The unit price for REMOVE TREE & GRIND STUMP shall be per EACH and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

END OF SECTION 311000

SECTION 311300

TREE PROTECTION AND ROOT PRUNING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Protection and stress reduction of existing trees to remain that interfere with, or are affected by, execution of the Contract, whether temporary or permanent:

i. Root Pruning of existing trees roots that are affected by execution of the Work, whether temporary or permanent construction

ii. 6' Chain Link Tree Protection & Construction Fence (around field and around construction access route from South Irving Street)

iii. Temporary Root Protection Matting (Construction Access Route)

iv. Tree Trunk & Limb Protection Wrap

2. Contractor coordination with Project Officer, Arlington County Certified Arborist/Urban Forester, Certified Arborist subcontractor, County Landscape Architect, Consultant Landscape Architect

B. Provide all labor, materials, tool and equipment as required to have tree protection applied on all areas called for on plans.

C. In addition to the specifications contained herein, Work shall be performed in accordance with the Arlington County Department of Parks & Recreation Design Standards for Tree Protection and Trimming as shown on plans and available online at: http://parks.arlingtonva.us/design-standards/

D. Related Sections:

1. 013300 Submittal Procedures

2. 015000 Temporary Erosion and Sediment Control

3. 061300 Heavy Timber Construction

4. 311000 Site Clearing, Preparation, Demolition and Removals

5. 312000 Earth Moving

6. 329100 Planting Preparation

7. 329200 Seeding and Sodding

8. 329300 Exterior Plants

1.02 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.

1.03 SUBMITTALS

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

B. Certification: From Contractor's Certified 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 Contractor's Certified Arborist, for care and protection of trees affected by construction during and after completing the Work.

D. Contract arborist Qualifications: Contractor shall submit a copy of valid ISA certification to the Project Officer for approval with confirmation by Arlington County Certified Arborist/Urban Forester.

E. List products to be used and firms, including qualifications to perform work.

a. Two resumes and detailed qualifications from staff or team individuals assigned to this project.

b. 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.

F. Provide schedules for performance of work.

G. Shop Drawings and Submittals: From General Contractor and their Certified Arborist, for specific protection work within tree critical root zones, including but not limited to:

1. Temporary Root Protection Mat materials, types and construction uses

2. Root Pruning methods

3. Tree Protection Fence and Signs

4. Tree Trunk & Limb Protection Wrap

1.04 QUALITY ASSURANCE

A. Contractor shall ensure that tree and plant protection methods are implemented by an arborist Certified by the International Society of Arboriculture (ISA) to provide for the care of the trees and plants impacted by construction activities. Provide ISA certification verification to Project Officer per section 1.03 “Submittals” prior to beginning work.

B. The Contractor shall identify to the Project Officer at least one authorized on-site Point of Contact(POC) who is, by training or experience, familiar with the policies, regulations and standards applicable to the work being performed. The POC and the certified arborist may be the same individual.

C. Crews shall be directly supervised by an ISA Certified Arborist.

D. All workers, through related training and on the job experience, shall be familiar with the technical aspects of arboricultural work and equipment used in such operations.

E. Trucks and mechanized equipment shall not enter tree protection areas.

F. Stump grinding shall be with small machines specifically designed for that purposes. No stumps shall be excavated except as described herein. Stumps shall be ground not more than 8” below grade and care must be taken to minimize damage to root of the trees to remain.

G. No stump grinding within tree protection areas.

H. All work in or near tree protection areas shall be carefully performed by Contractor in order to avoid damage to tree trunks, branches, root system, and other existing plant materials and soils that are to remain.

I. Silt shall not be allowed to collect in preservation or reforestation areas. Silt accumulating in preservation areas shall constitute damage and will require remedial activity. All silt shall be removed from preservation areas within 24 hours of siltation. The methods and procedures for silt removal within tree preservation and reforested areas shall be approved by the Project Officer with confirmation by the Arlington County Certified Arborist/Urban Forester.

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

1. Pruning shall remove only dead, dying, damaged or broken limbs greater than 1" – 1.5" in diameter.

2. Pruning for clearance shall be reviewed and approved by Project Officer with confirmation by the Arlington County Certified Arborist/Urban Forester.

K. Urban Forester Notification: The Contractor shall notify the Project Officer 72 hours prior to the following events, so that the Arlington County Certified Arborist/Urban Forester can be notified and present at a pre-construction site meeting (refer to Section 3) and to observe work:

1. Tree protection fencing installation

2. Tree or root-pruning operations.

3. Work within tree protection zones.

4. Tree planting.

1.05 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.

PART 2 - PRODUCTS

2.01 MATERIALS

A. 6' Chain Link Tree Protection Fence & Construction Fence: This fence is used around the perimeter of the entire protect site and demarcates the Limits of Work (LOW)/Limits of Disturbance (LOD). Exact placement of fences will be determined at pre-construction meeting. Unless otherwise indicated in approved plans, tree protection fence shall be two-inch wire mesh fabric measuring 72 inches in height mounted on 1.9" O.D. steel pipes driven 24 inches into the ground, placed 120 inches on-center maximum. Refer to Arlington County DPR standard detail on approved plans.

B. Tree Protection Signs: Shall be of heavy-duty sheet aluminum or weatherproof plastic material measuring 12 inches by 18 inches. Signs shall state "NO ENTRY, TREE PROTECTION AREA, CALL 703-228-6525 TO REPORT VIOLATIONS" in both English and Spanish. Signs shall be mounted on fence every 50 feet maximum.

C. 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. Refer to Section 329100. Obtain topsoil from well-drained sites where topsoil is 4 inches deep or more; do not obtain from bogs or marshes.

D. 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.

E. Temporary Root Protection Matting (TRPM): High-density polyethylene, diamond cleat tread surface Alturnamat or approve equal. See plans for locations. The RPM shall be 4' x 8' x ½", heavy duty to support loads up to 120 tons, and be locked together using manufacturers recommended fasteners (at each corner of the mat). The purpose of the RPM is to reduce compaction, rutting, and contamination of soils and root systems along the construction access route shown on C-04B. The TRPM shall be installed throughout the entire the construction route. Within critical root zones, multiple layers of matting may be required by the Arlington County Arborist/Urban Forester. Location of all RPM and construction access is based on the existing maintenance access route to the upper soccer field. The TRPM access route is shown on drawings but shall be coordinated between the Contractor, Arlington County Certified Arborist/Urban Forester and Project Officer. Contractor shall stake out construction access route prior to the Pre-Construction meeting so that Arlington County can review the alignment and require adjustments as needed. Once Construction Access Route is approved, General Contractor shall then install Tree Protection Fencing and TRPM.

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. Shall be maintained and adjusted as needed to ensure continuity of mat panels and minimize impacts to existing turf, soils, and critical root zones, and as required by Erosion & Sediment Control Inspector, Project Officer, or County Arborist.

F. Tree 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.

G. 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.

PART 3 - EXECUTION

3.00 CONSTRUCTION ACCESS

A. As shown on Construction Drawing sheet C-04B.

3.01 GENERAL & PREPARATION

A. Schedule: Contractor's Certified 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 Certified Arborist/Urban Forester, Arlington County Landscape Architect, consultant Landscape Architect, and Arlington County Construction manager. The contractor shall meet on-site with these parties to review trees to remain and protective measures required.

C. Temporary Tree Protection Fencing: Install temporary tree protection fencing and signs around tree protection zones to protect remaining trees and vegetation from construction damage. Maintain temporary fence and remove when construction is complete after approval by Project Officer with confirmation by the Arlington County Certified Arborist/Urban Forester.

D. Labor: Contractor's Arborist will dedicate labor and equipment as necessary to complete the work. It shall be the Contractor's Certified 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 Certified Arborist's responsibility to supervise work and scheduling and see that work progresses in an efficient manner.

E. Notifications: Contractor's Certified Arborist shall notify the DPR Certified Arborist/Urban Forester and DPR Construction Manager of any site condition changes which may affect work progress.

F. 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 Certified Arborist/Urban Forester and Third-Party Certified Arborist.

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

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

I. 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 Certified Arborist/Urban Forester or Third-Party Certified 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 Certified Arborist/Urban Forester or Third-Party Certified Arborist prior to any site work or disturbances occur.

J. 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 Arlington County Certified Arborist/Urban Forester.

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 with confirmation by the Arlington County Certified Arborist/Urban Forester. If a violation is observed, the Contractor will be notified by the Project Officer and shall immediately rectify the situation. Continued and subsequent violations will result in a fine of $500 per day of violation.

M. Special Demolition Procedures:

1. Demolition of walks and hardscape within tree protection areas shall be directly supervised by an ISA Certified Arborist

2. Mechanized equipment shall not enter tree protection areas (TPAs) or reforestation areas.

3. Backfill of voids created by demolition within the TPAs and reforestation areas shall be loosely placed topsoil. Only the amount of topsoil necessary to fill the void without spreading over existing grades shall be allowed.

3.02 TEMPORARY ROOT PROTECTON MATTING

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. TRPM shall be used for access from South Irving Street as shown on C-04B. Install additional Temporary RPM as instructed by Arlington County Certified Arborist/Urban Forester.

C. "AlturnaMATS" or approved equal shall be used to avoid rutting and compaction. These materials may be shifted and re-used as work progresses.

D. When construction activity is complete (as indicated by Construction Manager), remove construction equipment and machinery from atop temporary RPM. Remove temporary RPM when approved by Project Offcer or Arlington County Certified Arborist/Urban Forester.

3.03 EXCAVATION

A. Install shoring or other protective support systems to minimize sloping or benching of excavations if indicated in the approved plans.

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

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

D. Where excavation is proposed within the critical root zone of trees to remain, Contractor shall perform root pruning as indicated in approved plans prior to excavation.

E. Where new finish grade is indicated below existing grade around trees, Contractor shall slope grade outside of tree protection zones. Maintain existing grades within tree protection zones.

3.04 ROOT PRUNING:

A. When required, root pruning locations will be indicated on the approved plans. Exact location and depth shall be determined on site with Project Officer and Arlington County Certified Arborist/Urban Forester during the pre-construction meeting.

B. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots with clean, sharp pruning instruments; do not break or chop. All root pruning shall be performed by an ISA certified arborist. Refer to Arlington County Department of Parks & Recreation Design Standards "Tree Protection and Trimming" as shown on plans and available online at: http://parks.arlingtonva.us/design-standards/

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

D. 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.

3.05 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 Certified Arborist/Urban Forester or contract Certified Arborist's written instructions.

B. The Contractor shall be responsible for any damage to trees within the Tree Protection Area caused by the Contractor's personnel, vehicles, or equipment at the site. Any damage to a tree to remain shall result in a payment by the Contractor to the Project Officer for the amount of damage based on the latest edition of the Council of Tree and Landscape Appraisers Guide for Plant Appraisal published by the International Society of Arboriculture (ISA). All trees are to be valued as landscape trees.

3.06 DISPOSAL OF WASTE MATERIALS

A. Burning is not permitted.

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

3.07 FIELD QUALITY CONTROL AND MONITORING

A. Tree Condition Monitoring: The Contractor's ISA Certified Arborist shall perform monitoring once per month year-round to monitor insects, disease, soil moisture levels, weather, and health changes on all trees within the project area. 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 Certified Arborist, Arlington County Certified Arborist/Urban Forester and Arlington County Landscape Architect for documentation.

PART 4 - MEASUREMENT

4.01 The unit price for ROOT PRUNING shall be LINEAR FOOT and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications and to the satisfaction of the Project Officer.

4.02 The unit price for LIMITS OF DISTURBANCE / 6' CHAIN LINK TREE PROTECTION & CONSTRUCTION FENCE (AROUND FIELD) shall be LINEAR FOOT and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications and to the satisfaction of the Project Officer.

4.03 The unit price for LIMITS OF DISTURBANCE / 6' CHAIN LINK TREE PROTECTION & CONSTRUCTION FENCE (CONSTRUCTION ACCESS ROUTE FROM SOUTH IRVING STREET) shall be LINEAR FOOT and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications and to the satisfaction of the Project Officer.

4.04 The unit price for TEMPORARY ROOT PROTECTION MATTING (CONSTRUCTION ACCESS ROUTE) shall be SQUARE FOOT and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications and to the satisfaction of the Project Officer.

4.05 The unit price for TREE TRUNK AND LIMB PROTECTION WRAP shall be EACH and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications and to the satisfaction of the Project Officer.

END OF SECTION 311300

SECTION 312000

EARTH MOVING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Excavating and Preparing subgrades for slabs-on-grades, walks, walls, pavements, lawns and grasses, footings, 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 Documents

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

2. Virginia Erosion and Sedimentation Control Handbook, Latest Edition

3. Underground Utility Protection Ordinance – Chapter 55 Arlington County Code

4. Local Governing Authority and Code Requirements – Chapter 57 Arlington County Code

5. Arlington County DES Construction Standards and Specifications

6. Virginia Department of Transportation Road and Bridge Specifications

7. Tree Protection Standards and Specifications – as indicated in Construction Drawings

D. Related Sections:

1. Section 011500 – Temporary Erosion and Sediment Control

2. Section 033000 – Cast-in-Place Concrete

3. Section 061300 – Heavy Timber Construction

4. Section 116833 – Athletic Equipment

5. Division 26

6. Section 129300 – Site Furnishings

7. Section 311000 – Site Clearing, Preparation, Demolition and Removals

8. Section 311300 – Tree Protection and Root Pruning

9. Section 321123 – Aggregate Base Course and Underdrainage

10. Section 321216 – Asphalt Paving

11. Section 321313 – Concrete Paving

12. Section 321813 – Synthetic Turf Surfacing

13. Section 323113 – Chain Link Fences

14. Section 323233 – Segmental Retaining Walls

15. Section 329100 – Planting Preparation

16. Section 329200 – Seeding and Sodding

17. Section 329300 – Exterior Plants

18. Section 334000 – Storm Drainage

1.02 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 subgrade and surface paving material.

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

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

1.03 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.

1.04 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.

1.05 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

2.01 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. 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.

E. 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.

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

G. 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.

H. 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.

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

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

2.02 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: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less 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: 247 lbf; ASTM D 4632.

3. Sewn Seam Strength: 222 lbf; ASTM D 4632.

4. Tear Strength: 90 lbf; ASTM D 4533.

5. Puncture Strength: 90 lbf; ASTM D 4833.

6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.

7. Permittivity 0.02 per second, minimum; ASTM D 4491.

8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355

2.03 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

3.01 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 011500 Temporary Erosion and Sediment Control; 311000 Site Clearing, Preparation, Demolition and Removals; 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.

3.02 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.

3.03 EXPLOSIVES:

A. Explosives: Use of explosives is prohibited.

3.04 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.

    i. 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:

    i. 24 inches outside of concrete forms other than at footings.

    ii. 12 inches outside of concrete forms at footings.

    iii. 6 inches outside of minimum required dimensions of concrete cast against grade.

    iv. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.

    v. 6 inches beneath bottom of concrete slabs on grade.

    vi. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

3.05 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.

3.06 EXCAVATION FOR WALKS AND PAVEMENTS

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

3.07 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.

3.08 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.

3.09 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 base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place 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 under surface paving.

3. Shape base course to required crown elevations and cross-slope grades.

4. Place base course 6 inches or less in compacted thickness in a single layer.

5. Place 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 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

4.01 The unit price for EARTH MOVING shall be LUMP SUM and shall include the cost of all labor, materials, equipment and incidental expenses necessary for the excavation, disposal, delivery, placing and compaction of select fill, dewatering, sheeting and shoring, grading, stockpiling, haul-off, and other incidental work and expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 312000

DIVISION 32

EXTERIOR IMPROVEMENTS

SECTION 321216

ASPHALT PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes hot-mix asphalt paving.

1.02 RELATED SECTIONS

A. Section 013300 – Submittal Requirements

B. Section 061300 – Heavy Timber Construction

C. Section 312000 – Earth Moving

D. Section 321123 – Aggregate Base Course and Underdrainage

E. Section 321816.13 – Playground Protective Surfacing (Long Jump Sand)

1.03 REFERENCES

A. Virginia Department of Transportation Construction Standards and Specifications (VDOT)

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

C. Material certificates.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall be registered with and approved by authorities having jurisdiction or the DOT of the state in which Project is located.

B. Regulatory Requirements: Comply with the Arlington County DPW Construction Standards and Specifications for asphalt paving work.

C. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp or if the following conditions are not met:

1. Tack Coat: Minimum surface temperature of 60 deg F.

2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.

3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

PART 2 - PRODUCTS

2.01 AGGREGATES

A. Subbase: VDOT 208, gradation 21-A.

2.02 ASPHALT MATERIALS

A. Base Course: Bituminous concrete consisting of coarse and fine aggregate combined with asphalt cement, resulting in a mixture of type BM-2 in conformance with VDOT 211.

B. Tack Coat: Asphalt cement of viscosity grade CMS-2 or CRS-2 in conformance with VDOT 310.

C. Surface Course: Bituminous concrete consisting of crushed stone, crushed slag, or crushed gravel in fine aggregate, slag or stone screenings, or combination thereof, combined with asphalt cement, resulting in a mixture of type SM-2A in conformance with VDOT 211.

2.03 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.

PART 3 - EXECUTION

3.01 PATCHING

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd..

C. Patching: Fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.

3.02 SURFACE PREPARATION

A. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.

B. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

C. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

3.03 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Spread mix at minimum temperature of 250 deg F.

2. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in a strip of the full width of the walkway being constructed, or in strips of not less than 10 feet for larger areas.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.04 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

F. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.05 INSTALLATION TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch.

2. Surface Course: Plus 1/4 inch, no minus.

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch.

2. Surface Course: 1/8 inch.

3. Cross Slope: Ensure cross slope of 1.5% perpendicular to the direction of travel, in the direction of site drainage.

3.06 FIELD QUALITY CONTROL

A. Testing Agency: If deemed necessary by the Project Officer, Owner may engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.

B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

C. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.07 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

PART 4 - MEASUREMENT

4.01 The unit price for PEDESTRIAN ASPHALT PAVEMENT @ LONG JUMP, INCLUDING AGGREGATE BASE shall be SQUARE FOOT, including the cost of furnishing all labor, materials, equipment and incidental expenses necessary to complete the work, including expansion material, sealant, curing compound, aggregate subbase, all in accordance with the plans, specifications and approval of the Project Officer. Does not include excavation.

END OF SECTION 321216

SECTION 321313

CONCRETE PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes exterior cement concrete pavement for the following horizontal surfaces:

1. Concrete Walkways & ADA Accessible Ramp

2. Concrete Pads for Trash/Recycling Receptacles

3. Concrete Slab beneath Shade Structure and Spectator Seating

B. All paved surfaces must be compliant with the most current Americans with Disabilities Act Standards for Accessible Design. Refer to grading plan for specific notes.

1.02 RELATED DOCUMENTS

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

B. Virginia Erosion and Sedimentation Control Handbook, Latest Edition

C. Virginia Department of Transportation Roadway Specifications

D. Virginia Department of Transportation Road and Bridge Standards

E. Arlington County DES Construction Standards and Specifications – 02611 Concrete Walks

F. Section 013300 – Submittal Procedures

G. Section 033000 – Cast-in-Place Concrete

H. Section 116800 – Site Furnishings

I. Section 133416 – Spectator Seating

J. Section 133419 – Fabricated Engineered Shade Structures

K. Section 311000 – Site Clearing, Preparation, Demolition and Removals

L. Section 312000 – Earth Moving

M. Section 321123 – Aggregate Base Course and Underdrainage

N. Section 323113 – Chain Link Fences

O. Section 323233 – Segmental Retaining Walls

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.04 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Expansion Joint Sealant Samples: Provide full range of Manufacture's colors for review and approval by Project Officer with confirmation by Landscape Architect

D. Qualification Data: For testing agency.

E. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

F. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials.

2. Steel reinforcement and reinforcement accessories.

3. Fiber reinforcement.

4. Curing compounds.

5. Applied finish materials.

6. Bonding agent or epoxy adhesive.

7. Joint fillers.

8. Waterstops

G. Field quality-control test reports.

H. Minutes of pre-installation conference.

I. 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.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

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

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.

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

E. Concrete Testing Service: County may engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

F. Preinstallation Conference: Conduct conference at Project Site to comply with requirements in Division 1 Section "Coordination, Field Engineering, Cutting and Patching, and Regulatory Requirements."

1. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:

i. Contractor's superintendent.

ii. Independent testing agency responsible for concrete design mixtures.

iii. Ready-mix concrete producer.

iv. Concrete pavement subcontractor.

G. Mockups for Color Concrete: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of color concrete mockups where directed by Project Officer with confirmation by Landscape Architect and not less than 60 inches by 60 inches.

1.06 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Deliver, store, and handle steel reinforcement to prevent bending and damage.

C. Environmental Requirements:

1. In cold weather, concrete shall not be placed when temperature is, or is predicted to be, within the following 48 hours, below 40 degrees F unless proper provisions have been made for heating and protecting concrete in accordance with ACI 306R.

2. In hot weather, to prevent the development of high temperatures in fresh concrete, concrete shall be manufactured and cast in accordance with the recommendations of ACI 305R.

PART 2 - PRODUCTS

2.01 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves with a radius of 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.02 STEEL REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

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

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

D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed, or as denoted in the construction drawings.

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

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".

2.03 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.

B. Portland Cement is air-entrained, ASTM C 150, Class A3 General Use per VDOT 217.

1. Provide 3,000 PSI concrete for walkways, ramps and pads

2. Provide 3,500 PSI concrete for concrete slab beneath shade structure

C. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:

1. Portland Cement: AASHTO M85 with exceptions as listed in the Road and Bridge Specifications of the Virginia Department of Transportation. Fly Ash: ASTM C 618, Class C or F.

2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

3. Blended Hydraulic Cement: ASTM C 595, Type IS, portland blast-furnace slag or IP, portland-pozzolan cement.

B. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate, uniformly graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.

2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

2. Retarding Admixture: ASTM C 494/C 494M, Type B.

3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.04 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

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.

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

2.06 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.40 by weight.

3. Slump Limit: 2 to 3 inches prior to the addition of high-range water reducing admixture, if it is added at the Project Site. 5 to 8 inches at the point of placement. In no case shall water be added exceeding the specified water/cement ratio.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 6 percent plus or minus 2 percent for 1-1/2-inch nominal maximum aggregate size.

2. Air Content: 6 percent plus or minus 2 percent for 1-inch nominal maximum aggregate size.

3. Air Content: 6 percent plus or minus 2 percent for 3/4-inch nominal maximum aggregate size

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

1. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
Use water-reducing admixture in concrete, as required, for placement and workability.

2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.

1. Fly Ash or Pozzolan: 25 percent.

2. Ground Granulated Blast-Furnace Slag: 50 percent.

3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.

F. Color Pigment: If specified in the Bid Drawings, add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.08 JOINT FILLER

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

2.09 EXPANSION JOINT SEALANT

A. Expansion Joint Sealant: Sealant shall be one-component polyurethane-based 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 selected by Landscape Architect to match one of the pavement colors.

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

1. SikaFlex-1a or approved equivalent, manufactured by Sika Corporation.

2. Sonoclastic NP-1or approved equivalent, manufactured by Sonneborn and Chem Rex Inc.

3. The sealing materials shall be delivered to the Project Site in unbroken original packages bearing the manufacturer’s name.

C. Joint-sealant backer materials

1. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

2. Project Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type-batch-machine-mixer.

3. For concrete mixes of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.

4. For concrete mixes larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..

5. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances with Project Officer present for compliance with requirements for installation tolerances and other conditions which might affect the performance of concrete. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one 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. Subbase with soft spots and areas of pumping or rutting exceeding depth of ½ inch require correction according to requirements in Division 2 Section "Earthwork."

C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.02 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.03 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 required, 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.

3.04 STEEL REINFORCEMENT

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

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Zinc-Coated Reinforcement: Use galvanized steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.

G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace

units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.05 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.

2. Provide tie bars at sides of pavement strips where indicated.

3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.

5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet, unless otherwise indicated.

2. Extend joint fillers full width and depth of joint.

3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.

4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.

5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.

6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated on the construction drawings. Construct contraction joints for a depth equal to at least one-third of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.06 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation place steel reinforcement, and items to be embedded or cast in. Check tops of forms for grade before placing concrete. Notify other trades to permit installation of their work.

B. Obtain approval by the Project Officer with confirmation of the Landscape Architect before placing concrete.

C. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

D. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

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

F. Do not add water to concrete during delivery or at Project Site.

G. Do not add water to fresh concrete after testing.

H. 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.

I. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

J. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer or use bonding agent if approved by Project Officer with confirmation by Landscape Architect.

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

L. 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.

M. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact sub-base and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

N. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.

2. Do not use frozen materials or materials containing ice or snow.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

O. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.07 FINISH

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

1. 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.

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.

3.08 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.

D. 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, screeding, 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 Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

i. Water.

ii. Continuous water-fog spray.

iii. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.09 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.

2. Thickness: Plus 3/8 inch, minus 1/4 inch.

3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch.

4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.

5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.

6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.

7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.

8. Joint Spacing: 3 inches.

9. Contraction Joint Depth: Plus 1/4 inch, no minus.

10. Joint Width: Plus 1/8 inch, no minus.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

2. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.

i. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.

4. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.

5. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.

6. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of five standard cylinder specimens for each composite sample.

7. Compressive-Strength Tests: ASTM C 39/C 39M; test 2 specimens at 7 days and 2 specimens at 28 days.

8. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Project Officer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Project Officer but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Project Officer.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.11 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. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

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 and Final Completion inspections.

PART 4 - MEASUREMENT

4.01 The unit price for REINFORCED CONCRETE PAVEMENT INCLUDING TURN-DOWN EDGE (WHERE PRESENT) AND AGGREGATE BASE shall be SQUARE FOOT and shall include the cost of furnishing all labor, materials, equipment and incidental expenses necessary to complete the work, including expansion material, sealant, stain, steel reinforcement, curing compound, concrete, aggregate subbase, all in accordance with the plans, specifications and approval of the Project Officer. Does not include excavation.

END OF SECTION 321313

SECTION 321813

SYNTHETIC TURF SURFACING

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. Section 013300 – Submittal Procedures

B. Section 033000 – Cast-in-Place Concrete

C. Section 116833 – Athletic Equipment

D. Section 312000 - Earth Moving

E. Section 321123 – Aggregate Base Course and Underdrainage

F. Section 321313 - Concrete Paving

G. Section 323113 – Chain Link Fences

H. Section 323233 – Segmental Retaining Walls

I. Section 334000 – Storm Drainage

1.02 WORK INCLUDED

A. Furnish all labor, materials, tools and equipment necessary to install all synthetic turf and line packages (full-size and youth) as indicated on the plans and as specified herein and other related specifications. The installation of all new materials shall be performed in strict accordance with the manufacturer's installation instructions and in accordance with all approved shop drawings.

B. Turf Manufacturer/ Contractor shall be responsible for all work inside the limits of disturbance.

1.03 REFERENCES

A. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition

B. ASTM – American Society for Testing and Materials.

1. D1577 - Standard Test Method for Linear Density of Textile Fiber

2. D5848 - Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Covering

3. D1338 - Standard Test Method for Tuft Bind of Pile Yarn Floor Covering

4. D1682 - Standard Method of Test for Breaking Load and Elongation of Textile

Fabrics

5. D5034 - Standard Test Method of Breaking Strength and Elongation of Textile Fabrics (Grab Test)

6. F1015 - Standard Test Method for Relative Abrasiveness of Synthetic Turf Playing Surfaces

7. D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity

8. D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials

9. F355 - Standard Test Method for Shock-Absorbing Properties of Playing Surfaces.

10. F2117 – Standard Test Method for Vertical Rebound Characteristics of Sports Surface Systems: Acoustical Measurements (Soccer)

11. BS7044, Section 2.2 Methods for Determination of Person/Surface Interaction Method 1: Determination of Traction (Rotational Resistance)

12. F1551-03 Suffix: DIN 18-035, Part 6: Water Permeability of Synthetic Turf Systems

13. ASTM F355-10, Procedure A: Testing Services Inc. test number TSI 1202

1.04 SUBMITTALS

A. Submittals shall be provided to Project Officer for approval as outlined in Spec Section 013300.

B. Shop Drawings:

1. Field layout including all line packages and logos.

2. Roll/ Seaming Marking Plan

3. Show installation methods and construction indicating field-verified conditions, clearances, measurements, terminations, drainage including any details of construction that deviate from the plans and specifications.

C. Product Data:

1. Submit manufacturer's catalog cuts, material safety data sheets (MSDS), brochures, specifications; preparation and installation instructions and recommendations; storage, handling requirements and recommendations.

2. Submit fiber manufacturer's name, type of fiber and composition of fiber.

3. Submit data in sufficient detail to indicate compliance with the contract documents.

4. Submit manufacturer's instructions for installation.

5. Submit manufacturer's instructions for maintenance for the proper care and preventative maintenance of the synthetic turf system, including painting and markings.

D. Samples:

1. Submit one 12x12 inch (minimum) loose carpet sample without infill. Loose sample should demonstrate seaming and include an inlaid line.

2. Submit a sample of sand infill and a sample of selected infill and a sample of the final sand/selected infill mixture, including ratio by volume and by weight equivalent per square foot and method of installation. Sample of each shall represent the exact quantity per square foot. Particle size gradation charts must also be included.

3. Underlayment: One 12x12 inch (minimum) piece of permeable resilient polypropylene drainage layer.

E. Product Certification:

1. Submit manufacturer’s certification that products and materials comply with requirements of the specifications.

2. Submit test results indicating compliance with Reference Standards.

F. Project Record Documents: Record actual locations of seams, drains and other pertinent information in accordance with Division 1 Specifications Series, General Requirements.

G. List of existing installations: Submit list including respective owner’s representative and telephone number.

H. Warranties: Per section 1.7, Submit warranty and ensure that forms have been completed in Owner's name and registered with approved manufacturer.

I. Submit a written “Certification of Acceptance of the Base Construction” from the manufacturer of the infill turf system prior to installation of the synthetic turf system.

J. Testing Certification: Submit certified copies of independent (third-party) laboratory reports on ASTM testing:

1. Pile Height, Face Weight & Total Fabric Weight, ASTM D5848.

2. Primary & Secondary Backing Weights, ASTM D5848.

3. Tuft Bind, ASTM D1335.

4. Grab Tear Strength, ASTM D1682 or D5034.

5. Shock Attenuation, ASTM F1936

6. Water Permeability, ASTM D4491

7. Lead Content, ASTM F2765

K. Prior to Final Acceptance, the Contractor shall submit to the Owner:

1. Three (3) copies of Maintenance Manuals, which will include all necessary instructions for the proper care and preventive maintenance of the turf system, including painting and markings.

2. Project Record Documents: Record actual locations of seams, drains or other pertinent information.

3. Warranty: Submit Manufacturer Warranty and ensure that forms have been completed in Owner's name and registered with Manufacturer and Insurance Carrier. Submit information confirming that 3rd Party Insurance Policy, non-cancelable and pre-paid, is in effect covering this installation, and underwritten by a Best "A" Rated Insurance Carrier. Insurance carrier must confirm that the policy is in force and premiums paid.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section. The Turf Contractor and/or the Turf Manufacturer:

1. Must be experienced in the manufacture and installation of this type of tall pile synthetic infill turf systems as outlined below:

i. A minimum of ten (10) multi-purpose fields installed by the same manufacturer of 50,000 square feet or more in the United States, using the specified fiber.

B. Turf Contractor/ Installer Qualifications: Company specializing in performing the work of this section.

1. The Turf Contractor must provide competent workers skilled in this specific type of synthetic turf installation. Technicians must have installed this type of system, with sewn seams on at least 10 installations in the past 3 years.

2. The designated Supervisory Personnel on the project must be certified, in writing by the Turf Manufacturer, as competent in the installation of this material, including sewing seams and proper installation of the infill mixture with a minimum of 5 years of experience in turf installations.

3. Installer shall be certified by the manufacturer and licensed.

4. The Manufacturer shall have a representative visit the site to certify, in writing, the installation and Warranty compliance.

C. Prior to the beginning of installation, the installer of the synthetic turf shall inspect the sub-base. The installer will accept the sub-base in writing when the base contractor

provides test results for compaction, planarity and permeability that are in compliance with the synthetic turf manufacturer's recommendations.

D. Pre-Installation Conference: Conduct conference at project site at time to be determined by Architect. Review methods and procedures related to installation including, but not limited to, the following:

1. Inspect and discuss existing conditions and preparatory work performed under other contracts.

2. In addition to the Contractor and the installer, arrange for the attendance of installers affected by the Work, The Owner's representative, and the Architect.

E. The Turf Contractor shall provide the necessary testing data to the owner that the finished field meets the required initial shock attenuation, as per ASTM F1936.

F. Shall provide third party certification confirming minimum requirement of 9 lbs. tuft bind.

G. The Owner reserves the right to reject and/ or refuse acceptance of any or all aspects of the synthetic turf installation if it fails to meet the requirements of this specification section.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Deliver products to project site in wrapped condition.

B. Store materials/ products in a safe and secure place, under cover and elevated above grade.

C. Deliver and store components with labels intact and legible.

D. Protect from damage during delivery, storage, handling and installation. Protect from damage by other trades.

E. Inspect all delivered materials and products to ensure they are undamaged and in good condition.

F. Comply with manufacturer's recommendations.

1.07 SEQUENCING AND SCHEDULING

Coordinate the Work with installation of work of related trades as the Work proceeds.

Sequence the Work in order to prevent deterioration of installed system.

1.08 WARRANTIES

A. The Contractor shall provide a warranty to the Owner that covers defects in materials and workmanship of the turf for a minimum period of eight (8) years from the date of substantial completion. The turf manufacturer must verify that their representative has inspected the installation and that the work conforms to the manufacturer's

requirements. The manufacturer's warranty shall include general wear and damage caused from UV degradation. The warranty shall specifically exclude vandalism, and acts of nature beyond the control of the Owner or the manufacturer. The warranty shall be fully third party insured; pre-paid for the entire 8-year term and be non-prorated. The Contractor shall provide a warranty to the Owner that covers defects in the installation workmanship, and further warrant that the installation was done in accordance with both the manufacturer's recommendations and any written directives of the manufacturer's representative. Prior to final payment for the synthetic turf, the Contractor shall submit to owner notification in writing that the field is officially added to the annual policy coverage, guaranteeing the warranty to the Owner. The insurance policy must be underwritten by an "AM Best" A rated carrier and must reflect the following values:

1. Pre-Paid 8-year insured warranty.

2. Insured Warranty Coverage must be provided in the form of one single policy

3. No maximum per claim coverage amount.

4. Minimum of five-million dollar ($5,0000,000) annual aggregate

5. Must cover full 100% replacement value of total square footage installed, minimum of $7.00 per sq. ft. (in case of complete product failure, which will include removal and disposal of the existing surface) The warranty shall include all necessary materials, labor, transportation costs, dumping fees, etc to complete any repairs under such warranty.

6. Policies that include self insurance or self retention clauses shall not be considered.

7. Policy cannot include any form of deductible amount.

8. Sample policy must be provided at time of bid to prove that policy is in force. A letter from an agent or a sample Certificate of Insurance will not be acceptable.

B. The warranty coverage shall not place limits on the amount of the field's usage.

C. The synthetic turf system must maintain a G-max of less than 120 for the life of the Warranty as per ASTM F1936. The manufacturer's warranty shall include annual G-Max Testing and given to DPR.

D. Permeable Resilient Polypropylene Drainage Base

1. Sports field underlayment panels shall be warranted by the manufacturer against warping, cracking, shattering, splitting or deteriorating. They shall not displace turf, deform, buckle from heat or moisture, or form gaps in cold or dry conditions that can be seen through the turf, under normal and proper use. They shall be free from defects in material and workmanship for a period of twenty (20) years after date of installation.

2. The Panels shall not compress by more than ten percent (10%) during the Warranty Period unless they are subjected to stress loads in excess of those that ordinarily occur during use for athletic performance [35 pounds per square inch].

1.09 MAINTENANCE SERVICE

A. Contractor shall train the Owner's facility maintenance staff in the use of the turf manufacturer's recommended maintenance equipment.

B. Manufacturer must provide maintenance guidelines and a maintenance video to the facility maintenance staff.

1.10 TESTING

A. Turf Manufacturer shall be responsible to provide independent laboratory G-max testing (ASTM 355, 1936 method) at substantial completion, to verify that the shock attenuation properties of the field meet the requirements set forth in this specification.

1. The field must maintain an ASTM F1936 G-max of less than 120 for the life of the Warranty.

2. In addition to testing at time of completion, the Turf Manufacturer shall be responsible for annual Gmax testing as described above at its own cost. If at anytime the G-max ranges reach unacceptable levels, it is the responsibility of the Turf Manufacturer (or its 3rd party warranty) to bring the field back into the required ranges at no cost to the Owner.

B. Turf Manufacturer shall be responsible to provide independent laboratory Lead Content testing prior to substantial completion and final acceptance by Owner.

1. Two representative samples of fiber(s) and locations on the field shall be tested by the test methods below. The total lead content measured shall be less than 300 mg/ kg (ppm). Sample locations shall be chosen by the Owner.

i. The testing shall be conducted by an independent environmental laboratory accredited for heavy metal testing in solid and hazardous waste.

ii. Prepare samples as outlined in EPA Method 3052 with the temperature modified from 180 +/- 5 deg C to 210 +/- 10 deg C.

iii. Analyze prepared samples for lead using inductively coupled plasma-atomic emission spectrometry (AAS) as outlined in Test Method E 1613.

iv. Report total lead content as mg/kg (ppm).

C. Turf Manufacturer shall be responsible to provide independent drainage testing of <u>installed</u> field gravel base and turf carpet with infill prior to substantial completion and final acceptance by Owner. The combined tests shall prove installed artificial turf system's drainage capability shall allow water flow through the system at a rate of not less than 30 inches per hour.

1. ASTM test WK22081- Test Methods for Vertical Permeability of Synthetic Turf Sports Field Base Stone and System by Bucket Flood Test Method. This test does not require special equipment and can be done in the field to test the vertical permeability before the synthetic turf is installed and after installation of the base is complete. This method does not require the application of a head and more accurately mimics rainwater conditions. It provides an opportunity to actually see the surface drain.

2. ASTM F1551 -Water Permeability of Synthetic Turf Systems and Permeable Bases. Test will provide permeability of synthetic turf carpet with infill.

3. Provide written report of permeability of base, and carpet with infill over base. Report shall include inches per hour rate.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Synthetic Turf

1. Shaw Sports Turf
2. FieldTurf
3. AstroTurf
4. Sports Field Engineering
5. Sprinturf
6. A-Turf
7. **Or approved equivalent** as specified in the invitation to bid.

2.02 MATERIALS

A. The component materials of the synthetic turf system consist of:

1. A carpet made of dual filament polyethylene fibers (spinneret, extruded) tufted into a backing. All backing must meet the drainage requirements below.

2. All proposed synthetic turf systems shall be a 50/50 blend of arched monofilament yarn, having a 230 to 300 micron thickness and a nominal filament width of 1.5mm inter-tufted with a 100 micron parallel fibrillated slit film yarn. Turf carpet shall have a minimum stitch (tufting) gauge of 1/4" and a maximum stitch gauge of 1/2". All fibers shall be polyethylene or co-polymer fiber tufted into a permeable backing system, and coated with a secondary backing of high-grade polyurethane.

3. All components and their installation method shall be designed and manufactured for use on outdoor athletic fields. The materials as hereinafter specified should be able to withstand full climatic exposure in all climates, be

resistant to insect infestation, rot, fungus, mildew, ultraviolet light and heat degradation, and shall have the basic characteristics of flow-through drainage, allowing free movement of surface runoff through the synthetic turf fabric where such water may flow to the existing base and into the field drainage system.

4. The finished playing surface shall appear as mowed grass with no irregularities and shall afford excellent traction for conventional athletic shoes of all types. The finished surface shall resist abrasion and cutting from normal use.

5. Glue, thread, paint, seaming fabric and other materials may be used to install and mark the artificial turf. Turf panels, including sideline panels, must be sewn. Glued panel seams are not acceptable. All adhesives used in bonding the system together shall be resistant to moisture, bacterial and fungus attacks, and resistant to ultraviolet rays at any location upon installation.

6. Field shall consist of one (1) full-size* soccer line package in the east-west direction (color = white). *See C-13B for striping dimensions.

7. Field shall consist of two (2) youth-size* soccer line packages in the north-south direction (color = yellow). * See C-13B for striping dimensions.

    1. Lines colors shall be verified during the submittal stage.

8. Field shall have one shade of green.

B. The installed artificial grass fabric system shall have the following specified properties:

Standard	Property	Specification
ASTM D1577	Fiber Denier	>10000 nominal
ASTM D3218	Yarn Thickness microns	>100 microns (slit); >230 (mono)
ASTM D2256	Yarn Breaking Strength	>8 lbs. (slit); >25lbs (mono)
ASTM D5793	Stitch Gauge	min. 1/4”- max 1/2”
ASTM D418/D5848	Pile Height	1 5/8” – 2”
ASTM D5848	Pile Weight	min. 44 oz. / square yard
ASTM D5848	Primary Backing	min. 6 oz. / square yard
ASTM D5848	Secondary Backing	min. 20 oz. / square yard
ASTM D5848	Total Weight	min. 70 oz. / square yard
ASTM D1335	Tuft Bind (without infill)	min. 9 lbs.
ASTM D1682/D5034	Grab Tear (width)	200 lbs. force

ASTM D1682/D5034	Grab Tear (length)	200 lbs. force
ASTM F1015	Relative Abrasiveness Index	<25
ASTM D4491	Carpet Permeability	>30 inches / hour
ASTM F355/F1936	Impact Attenuation, Gmax	90 min. – 120 max. at installation; 90 min. – 120 max. over field life (including pad beneath)

C. The Carpet shall consist of fibers tufted into a primary backing with a secondary coating.

1. The Carpet shall be furnished in 15' wide rolls. Rolls shall be long enough to run from sideline to sideline without splicing. The soccer center line and perimeter white lines or borders shall be tufted into the individual rolls. Head seams, other than at sidelines, will not be acceptable.

. Porous Backing:

i. Primary backing shall be double-layered polypropylene fabric treated with UV inhibitors.

ii. The secondary backing shall consist of an application of porous, heat-activated urethane to permanently lock the fiber tufts in place.

Perforated Backing:

i. The primary backing shall consist of two layers of woven fabric and one layer of non-woven fabric.

ii. The secondary backing of high-grade polyurethane shall be applied to the primary backing at a minimum of 20 oz./yd. Secondary backing adds resistance to water degradation and strengthens grip on fibers.

iii. The entire backing shall be coated with holes perforated throughout the backing at a minimum 3" interval to allow for drainage. Partially coated materials shall not be acceptable.

iv. Hole spacing must allow for water drainage of a minimum of 30" an hour. The 30" per hour must account for infill blockage. Turf manufacturer must submit product data for hole spacing and hole size for rate of permeability.

D. The Infill materials shall be as approved by the Manufacturer and as per the following specifications: The Infill shall consist of a resilient granular system, comprised of selected/graded dust-free silica sand or mineral aggregate and rubber granules. The infill may be a homogeneous mixture of sand and rubber or installed as a layered system per the manufacturer. The silica sand component of the infill shall represent

50% of the total infill, by weight. Total infill amount shall be approx. 7.0 lbs. per square foot but not be less than 6.0 lbs. per square foot (depending on manufacturer stitch gauge) to achieve a +/-1.375 inch infill depth.

1. Rubber: The rubber shall be dust and contaminant free. No recycled tire rubber content will be accepted as part of this installation. The clean, uniformly sized particles shall be consistent in shape and particle size distribution. Rubber shall meet California's prop 65 regulation. Approved rubber manufacturer/products:

    i. EPDM Rubber: Target Technologies International, Inc./Play Safe 65 EPDM Infill, or approved equal. Virgin EPDM shall be odorless and not oily.

    ii. EPDM Rubber: Ultimate RB Inc./RTH Processing Inc., Sof-touch EPDM Infill, or approved equal. Virgin EPDM shall be odorless and not oily.

    iii. EPDM Rubber: Ecore International, EPDM Crumb Rubber Infill, or approved equal. Virgin EPDM shall be odorless and not oily.

    iv. Recycled Rubber: Nike Grind synthetic turf infill, or approved equal.

    v. All other infill alternatives/manufacturers shall be approved by the County for review and pre-approval during the bidding process (refer to ITB instructions for submittal deadline).

2. Sand: Silica Sand shall be whole and not conglomerated or grounded. The shape of the sand particles shall be rounded or sub-angular so as to minimize abrasion to field users and synthetic turf fibers. Size of sand shall be per manufacturer based on selected infill and based on performance of sports specified herein.

    i. Mineral Aggregate: If a mineral aggregate is selected in lieu of silica sand, product shall be 12/20 mesh Zeofill sourced from the southwest region of the United States and shall be 100% organic and quartz-free.

3. The particles shall resist abrasion in high traffic and excessive wear applications and provide stability to artificial sports turf applications.

4. The particles shall be structurally pure and consistently uniform in size distribution for predictable performance.

E. Permeable Polypropylene Drainage Base:

1. Athletic field synthetic underlayment, a molded polypropylene base composite material designed specifically for use with synthetic infill turf.

2. Underlayment shall ensure safety of the playing surface (impact attenuation/shoe traction) and high capacity subsurface drainage of the installed playing field.

3. Shall be composed of expanded Polypropylene edge interlocking panels with molded Impact-absorbing pistons and bi-directional channel drainage system

4. Description: The specified material must have both impact absorption and drainage properties that meet the following performance requirements.

5. Model: PowerBase YSR by Brock USA or approved equal.

Standard	Property	Specification
FIFA 1 and 2 Star		Meets requirements with approved synthetic infilled turf
	Density	3.63 lbs. / cubic ft. (58.2 grams / liter)
EN12616	Vertical drainage	200" per hour
	Surface contact	50% minimum with synthetic turf backing
ISO 8295	Friction coefficient	movement of artificial turf over 50mm distance 8.92N maximum force
ASTM D4716	Lateral drainage	0.00583 m2/sec @ 0.5% slope
ISO 4897	Thermal stability	not to exceed 3mm per 30 degree C change
ISO 8301, EN 12664/7	Thermal resistance (R Value)	minimum 0.6
ISO 1798	Tensile strength	min 700 Kpa or 110 psi
ASTM F355	G-Max; system test under infill turf	120G maximum average
EN 14809	Shock Absorption	60-70%
EN14809	Vertical Deformation	<4mm
ISO 1856C	Compression set - 25% strain, 22hrs, 23°C after 24 hrs.	9% (0.083 ")
	Repeated impact compression resistance	7.45kg/cm2 or 106psi, repeated load, 10,000 cycles system test with infill turf; not to exceed 3%
ASTM G22-76/G21-96	Bacteria and Fungi resistance	Pass
ESSM 105d/1997	Environmental testing- ground water protection	Pass
ASTM F925	Chemical Resistance to the following: Gasoline, Brake Fluid, Chlorine, Underbody coating, Transmission Fluid, Motor Oil, Zinc Chloride, Tar and Oil Solvents, Windshield Washer Fluid, Kerosene, Ethylene and Propylene Glycols	no change to material

6. Material shall be 100% recyclable; recycling for energy not acceptable.

7. Material shall be manufactured in an ISO-9000 certified facility.

2.03 ADDITIONAL MATERIAL

A. The Contractor shall provide the Owner the following materials:

1. Turf fabric two hundred square feet (200) to be used for emergency repairs of turf. Owner to set forth min size requirements during submittal phase.

2. All usable remnants of new material shall become the property of the Owner and may satisfy the 200 square feet requirement.

3. In-fill material as required to fill two hundred square feet (200). This material may not be used by the Contractor as top dressing as required to maintain depth and Gmax values during the warranty period.

2.04 FIELD SWEEPER AND FIELD GROOMER

A. The following field maintenance equipment shall be provided to the Owner, in a fully operational and assembled state, with proper manuals, instruction to the Owner's maintenance staff prior to final acceptance of the project.

1. An all-in-one field grooming device and field sweeper device for use on an infill synthetic turf system and provide proper care and maintain manufacturer's warranty.

2. Model: TurfCare TCA 1400 by SMG Equipment, 2002 West Valley Hwy #200, Auburn, WA 98001, 253-350-8803, **or approved equal**.

PART 3 - EXECUTION

3.01 GENERAL

A. The installation shall be performed in full compliance with approved shop drawings.

. Only trained technicians, skilled in the installation of athletic caliber synthetic turf systems working under the direct supervision of the approved installer/manufacturer supervisors, shall undertake any cutting, sewing, gluing, shearing, topdressing or brushing operations.

C. The designated Supervisory personnel on the project must be certified, in writing by the turf Manufacturer, as competent in the installation of this material, including sewing seams and proper installation of the Infill mixture.

D. Manufacturer of Pad shall provide supervision for pad installation. Pad Manufacturer must approve pad installation prior to installation of synthetic turf carpet.

3.02 EXAMINATION

A. Verify that all sub-base, drainage and leveling is complete prior to installation.

B. The surface to receive the synthetic turf must be inspected by the Installer, and prior to the beginning of installation, the Installer must accept the sub-base in writing. The acceptance will depend on the base contractor providing the installer with test results indicating that compaction, planarity and permeability are in compliance with the synthetic turf manufacturer's specifications. The surface must be perfectly clean as installation commences and shall be maintained in that condition throughout the process. Acceptance shall be for tolerance to grade (1/4 inch in 10 feet in all directions).

C. The compaction of the aggregate base shall be 95%, according to the Modified Proctor procedure (ASTM D1557), and the surface tolerance shall not exceed 0-1/4 inch over 10 feet and 1/4" from design grade. All must be verified by means of ASTM testing and surveys to the satisfaction of the turf contractor and Owner.

3.03 INSTALLATION OF TURF SYSTEM

A. Install in accordance with Manufacturer's instructions. The Turf Contractor shall strictly adhere to the installation procedures outlined under this section. Any variance from these requirements must be accepted, in writing, by the onsite representative of the Manufacturer/Installer, and submitted to the Project Officer, verifying that the changes do not in any way affect the warranty or performance of the system. Infill materials shall be approved by the Manufacturer and installed in accordance with the Manufacturer's standard procedures.

B. The carpet rolls are to be installed directly over the properly prepared aggregate base. Extreme care should be taken to avoid disturbing the aggregate base, both in regard to compaction and planarity. It is suggested that a 2-5 ton static roller be placed on site and made available to repair and properly compact any disturbed areas of the aggregate base.

C. The rolls of turf shall be rolled out a minimum of six hours (4 hours if mostly sunny) prior to starting seaming procedures to allow for carpet to expand and relax.

1. All visible wrinkles shall be stretch out before seaming. If wrinkles cannot be stretched properly, material shall either be removed or allowed to sit long enough to be stretched.

2. Seams shall be flat, tight and permanent with no separation or fraying.

D. The full width rolls shall be laid out across the field. Turf shall be of sufficient length to permit full cross-field installation (from end to end or side to side). No "head" or cross seams will be allowed. Utilizing standard state of the art sewing procedures, each roll shall be attached to the next.

E. This is basically a <u>sewn</u> installation. Gluing of fabric rolls shall not be acceptable. Minimal gluing will be permitted and only to repair problem areas, corner completions, and install logos as required by the specifications. All seams shall be sewn using double bagger stitches and polyester thread. Seams shall be flat, tight, and permanent with no separation or fraying.

F. Infill materials shall be applied in thin lifts. The turf shall be brushed as the mixture is applied. The mix shall be uniform and even in thickness to assure proper playing characteristics. The Infill materials shall be installed to fill the voids between the fibers and allow the fibers to remain vertical and non-directional.

G. The Infill installation consists of the manufacturer recommended mixture of sand and rubber per the volumes listed within this specification. (See item A-2 of Section 2.02 for general specifications on the infill). The Infill shall be installed to the depths specified in Section 2.2.D.

H. Synthetic turf shall be attached to the perimeter edge, both glued and nailed, in accordance with the Manufacturer's standard procedures and construction details provided in the Bid Documents.

I. SYNTHETIC BASE

1. Job Conditions:

   i. Base Acceptance: The Owner and Contractor must jointly approve the base before synthetic drainage underlayment can begin.

   ii. Do not install surface in temperatures above 90 degrees Fahrenheit.

2. Product Requirements:

   i. Obtain and install the product in accordance with written installation instructions from the manufacturer.

   ii. Use only new materials manufactured and shipped for the specific installation. No used, recycled or refurbished materials are to be installed.

   iii. Product to be shipped as flat panels on prepackaged pallets. Pallets to be wrapped with heavy-duty barrier for protection from moisture and UV exposure. Do not stack pallets.

3. Installation:

   i. Place surface directly onto geotextiles.

   ii. Install panels perpendicular to the sidelines, in accordance with manufacturer's instructions. When trimming for the edges of the field, panels must be within 3mm (1/8 inch) of the curb in height and distance.

   iii. Panels shall be fitted together as tightly as possible. Panels are to be overlapped and fit together against the four soft protrusions molded along the overlapping edge of the panels. Panels may have gaps not greater than 3mm (0.125 inch) maximum.

   iv. Seams should be mechanically fastened by hand without use of additional materials, glue, fasteners or secondary processes and equipment.

4. Turf carpet installation shall begin within 7 days after underlayment installation to avoid prolonged exposure to sun.

3.04 CLEAN UP AND PROTECTION OF THE SITE

A. Protect installed turf from subsequent construction operations.

B. Contractor shall provide the labor, supplies, and equipment as necessary for final cleaning of surfaces and installed items.

C. All usable remnants of new material shall become the property of the Owner.

D. The Contractor shall keep the area clean throughout the project and clear of debris.

E. Surfaces, recesses, enclosures, etc., shall be cleaned as necessary to leave the work area in a clean, immaculate condition ready for immediate occupancy and use by the Owner.

F. Contractor shall be fully responsible for any damages outside the Limits of Disturbance.

PART 4 - MEASUREMENT

4.01 The unit price for SYNTHETIC TURF, INCLUDING INFILL & ALL INCIDENTALS (Includes provision of new turf, leveling base, all as necessary to complete work) shall be SQUARE FOOT and shall include the cost of all labor, materials, and incidental expenses necessary to complete the work, in accordance with the plans and specifications, to the satisfaction of the Project Officer.

4.02 The unit price for LINE PACKAGE (FULL SIZE) shall be EACH and shall include the cost of all labor, materials, and incidental expenses necessary to complete the work, in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

4.03 The unit price for LINE PACKAGE (YOUTH SIZE) shall be EACH and shall include the cost of all labor, materials, and incidental expenses necessary to complete the work, in accordance with the plans and specifications, to the satisfaction of the Project Officer.

4.04 The unit price for FIELD GROOMER shall be EACH and shall include the cost of all labor, materials, delivery, assembly and incidental expenses necessary to complete the work, in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

4.05 The unit price for GMAX AND INFILTRATION TESTING shall be LUMP SUM and shall include the cost of all labor, materials, testing, and incidental expenses necessary to complete the work, in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

END OF SECTION 321813

SECTION 321816.13

PLAYGROUND PROTECTIVE SURFACING (LONG JUMP SAND)

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Non-Toxic Playground Sand for Use in Long Jump Landing Pit.

1.02 RELATED SECTIONS

A. 0133000 – Submittal Procedures

B. 061300 – Heavy Timber Construction

C. 312000 – Earth Moving

D. 321216 – Asphalt Paving

E. Sieved in accordance with ASTM C136.

F. ASTM F1292 – Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment

G. Division 26 – Electrical

H. 321123 – Aggregate Base Course and Underdrainage

I. 334000 – Storm Drainage

1.03 INFORMATIONAL SUBMITTALS

A. Material certificates.

B. Product certificates.

C. Product data.

PART 2 - PRODUCTS

2.01 Playground/Play Sand for Use in Long Jump Landing Pit. See Site/Materials Plan C-09 and Construction Detail 2/L-04.

A. Containing no impurities or any other foreign, hazardous or toxic materials that can cause injuries.

B. Rounded particle profile, rounded naturally or by mechanical means.

C. Clean, washed, and hydrosized to remove fines, silts, dirt and clay particles. Free of friable or agglomerated grains.

D. 0.15mm - .75mm grain, uniformly graded

E. Main use = indoor/outdoor children's play areas.

F. Low airborne dust

G. Masonry, angular, or construction sand is not acceptable.

2.02 ACCESSORIES

A. Edging: Pressure-Treated Timbers, per Specification Section 061300. Anchored-in-place, weather-resistant containment barrier designed to minimize sharp edges, protrusions, and tripping hazards.

1. Anchor Stakes: Per 2/L-04 and Specification 061300.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prepare substrates to receive timber edging. Excavate as needed to meet proposed grades shown on grading plan.

1. Pay special attention to the existing electrical conduit (for the existing field lights) that the proposed long jump is atop. Soft dig (by hand) to excavate down to properly install backfill, timbers and landing pit to proposed grades as shown in the drawings.

2. Repair: Fill holes and depressions to smooth out subgrade. Do not compact subgrade so that water can infiltrate.

3.02 INSTALLATION OF LOOSE-FILL SURFACING

A. Apply playground sand to produce a uniform surface and consistent depth, 18" minimum depth, as indicated on drawings.

B. Timber Edging: Place and permanently secure edging in place and attach units to each other.

C. Initial Grading: Hand rake or use a screed to a uniformly smooth finished surface.

D. Saturation: After initial grading, saturate sand with water and allow water to percolate and sand to self settle. Add additional sand as needed to meet finished elevations shown on detail. Repeat the Initial Grading and Saturation process at least twice.

E. Final Grading:

1. At takeoff, sand must be flush with top of timbers and top of asphalt.

2. At edges, raked sand finish elevation is 1” less than surrounding timbers

3. The middle of the sand pit shall be raked to be slightly higher than the sand at the edges of the pit.

PART 4 - MEASUREMENT

4.01 The unit price for PLAYGROUND SAND (LONG JUMP) shall be CUBIC YARD furnished and installed, and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work, in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

END OF SECTION 321816.13

SECTION 323113

CHAIN LINK FENCES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Furnish all labor, materials, and equipment required to install the chain link fencing system as indicated on the drawings and/or specified herein. Said work shall include any incidentals required to provide a finished job.

1.02 RELATED SECTIONS

A. Section 013300 – Submittal Procedures

B. Section 033000 – Cast-In-Place Concrete

C. Section 055213 – Pipe and Tube Railings

C. Section 101400 – Signage

D. Section 321313 – Concrete Paving

E. Section 323233 – Segmental Retaining Walls

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

1.03 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):

1.04 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

1.05 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.

1.06 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, gate, fabric, materials, hardware assemblies, and all proposed fence alignment sections, footing systems, and their adjacencies to the segmental block retaining wall and perimeter curb.

1. For fence shop drawings behind a segmental block retaining wall, shop drawings shall be signed and sealed by a professional civil engineer licensed in Virginia.

C. In the preparation of Shop Drawings, use terminology conforming to ASTM F552

1.07 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

2.01 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:

D. ASTM F1043, Group IC, Electrical Resistance Welded Round Steel Pipe, heavy industrial weight.

E. M181, Type I, Grade 2, Electrical Resistance Welded Steel Pipe

F. RR-F-191/3, Class 1, Grade B, Electrical Resistance Welded Steel Pipe

G. The exterior surface of the electrical resistance weld shall be recoated with the same type of material and thickness as the basic zinc coating.

H. 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.

I. 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.

J. The color of all framework shall be black in accordance with ASTM F934.

K. 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
3"	2.875	73.03	0.16	4.06	4.64	6.9	0.8778	x	50,000	=	43,890	1,463	914	610
4"	4	101.6	0.16	4.06	6.56	9.76	1.7819	x	50,000	=	89,095	2,970	1,856	1,237

2.02 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).

1. Selvage: Top edge knuckled and bottom edge knuckled.

C. Color: The coating color for the fence fabric shall be black. Reference ASTM F668 and ASTM F934.

D. 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 8 gauge (See Table 2).

E. 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#
8	.162 (4.11 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#
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#

2.03 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)

H. Concrete Compressive Strength: 3,000 psi, minimum at 28 days, unless otherwise indicated on Construction Drawings.

I. Diagonal Truss shall be of one-piece lengths equal to full height of fabric with a minimum cross section as shown on the drawings

J. Top Protector Protective Cap: Safety Top Cap by Pexco or approved equal.

a. Heavy-weight, durable and flexible plastic in an open 'P" shape profile.

b. Materials: HDPE plastic with UV stabilizers, designed to endure high impact, to resist the harmful effects of the sun, and to withstand severe weather conditions.

c. Security: Resists vandalism by using steel hog-rings to permanently attach the Cap to the fence.

d. Installation: "snap" over the top of a fence and fasten to the wire mesh with steel hog-rings (included with each package) through the (3) three pre-drilled holes on each piece.

e. Warranty: 15 Year Limited Warranty

f. Color: Yellow, confirm with Arlington County Landscape Architect

2.04 SLEEVE-IT POST FOOTING (OR APPROVED EQUAL)

Product: Sleeve-It 1224R (12"dia. x 24" deep) by Strata Systems, Inc., or approved equal.
Phone: 1 (800) 680-7750
Email: strata@geogrid.com

PART 3 - EXECUTION

3.00 EXAMINATION

A. Do not begin installation before final grading is completed unless otherwise permitted by Project Officer.

3.01 PREPARATION

A. Stake locations of fence lines and terminal posts. Do not exceed intervals of 300 feet or line of sight between stakes. Indicate locations of utilities, underground structures, retaining walls, railings, and other nearby elements as shown on the construction documents.

3.02 INSTALLATION

A. General

1. Install work in accordance with ASTM F 567, the manufacturer's recommendations, Sleeve-It manufacturer's recommendations, fence shop drawings, and segmental block wall manufacturer's specifications.

2. Install posts at a maximum spacing of 8 feet on center. See plans for exact spacing.

3. Install corner or slope posts where changes in line or grade exceed a 30-degree deflection angle.

4. Provide continuous top 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.

8. Provide intermediate rails on 12’ fence.

B. Posts

1. Center and align posts in hand dug or augured holes, or Sleeve-It (or approved equal) when behind retaining walls. Posts shall be spaced as indicated on Layout Drawings. Footing size shall be per Construction Documents and Shop Drawings.

2. Verify that posts are set plumb, aligned and at correct height and spacing, and hold in position during setting with concrete.

3. Concrete Fill: Place concrete around posts in continuous pour to dimensions and spacing indicated on the drawings (footings). Concrete shall be poured to top curb elevation shown on grading plan. Vibrate or tamp for consolidation, taking special precautions not to disturb the retaining wall. Slope top to drain away from post when applicable. Protect fence posts, retaining walls, and all other adjacent materials from concrete splatter or overspray.

    i. Posts Set into Sleeve-It (or approved equal) (adjacent to Segmental Block Wall): When fencing is specified behind either an existing or proposed retaining wall, Sleeve-It footings are required.

        1. Install Sleeve-It in accordance with manufacturer’s specifications and coordinate installation with Retaining Wall installation. When the segmental retaining wall has been constructed to two feet from the top (not including the capstone), prepare a level area approximately 24” x 36” deep behind the wall face. The prepared area should be 24” below the proposed top of wall (not including the capstone).

        2. Set the tapered Sleeve-It on a level surface in an upright position so that the front of the Sleeve-It is flush against the back of the battered retaining wall. Do not remove perforated Sleeve-It lid. Do not step on perforated lid as this could cause serious bodily injury.

        3. Encapsulate and stabilize the unit by placing and compact sufficient backfill materials to a minimum 95% of the material’s maximum dry density as determined by ASTM D-698 (Standard Proctor) and as required by wall manufacturer. Backfill and compaction within three feet of the wall face shall be performed with hand operated equipment as recommended by the National Concrete Masonry Association (NCMA) SRW guidelines.

4. Integrate the Sleeve-It with wall's geogrid by slitting the geogrid perpendicular to the wall face just enough to fit around the base of the Sleeve-It unit while ensuring that the geogrid remains properly attached to the wall. Continue backfilling process until the material reaches the top of the tower. See Specification 323223 for more geogrid information. Do not remove perforated lid until ready to place post.

5. Punch the perforated lid using a mallet or hammer to expose the inside of the Sleeve-It unit. Detached lids can be left inside the unit or discarded prior to pouring the infill material.

6. Place post through the exposed area and rest on the flat ground surface area inside the Sleeve-It cavity. Posts shall extend a minimum of 18" into the sleeve to ensure proper engagement. Ensure that the post is upright, plumb and level and hold in place while carefully pouring infill material (VDOT Class A3 Concrete) through the exposed cavity. Follow guidelines by Concrete provider and 033000 Cast-in-Place Concrete specification.

7. Set EPDM liner atop/around the Sleeve-It as shown in construction drawings. See Specification 323223 for more EPDM information.

8. Pour remaining flush curb atop the EPDM until the final finish grade elevation (shown on construction documents) is reached.

9. Coordinate entire installation with synthetic turf installation.

ii. Posts Set without Sleeve-It on flush curb (not adjacent to Segmental Block Wall): Set posts into augured holes to depths and diameters specified in construction drawings. Fill the post footing with concrete as shown on drawings. After the fence posts and their footings are set, pour the remaining flush curb. Coordinate entire installation with synthetic turf installation.

iii. Posts Set without Sleeve-It in turf areas (no flush curb): Tops of all footings to be 6" from finish grade. Trowel tops of footings, and slope or dome to direct water away from posts.

4. Allow concrete to attain at least 75 percent of its minimum 28-day strength before installation of rails, tension wires, and fabric.

5. Do not install such times less than 7 days after placement of concrete.

6. 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 Upper Soccer Field 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. Anchor fabric to framework so fabric remains under tension after pulling force is released.

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 where shown 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. Install tension wires according to ASTM F567, maintaining plumb position and alignment of fence posts.

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.

3.03 TESTS

A. Upon completion of this portion of the work, conduct fabric tension (deflection) tests.

3.04 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

4.01 The unit price for the 12' EXTENDED CHAIN LINK FENCE & FOOTINGS (ON FLUSH CURB AROUND SOCCER FIELD) shall be LINEAR FOOT and shall include the cost of all labor, materials, equipment and incidental expenses (including but not limited to concrete footings) necessary to complete the work, in accordance with the drawings and specifications, and to the approval of the Project Officer.

4.02 The unit price for the 4' CHAIN LINK FENCE & FOOTINGS (ON THE SOUTH SIDE OF RAMP) shall be LINEAR FOOT and shall include the cost of all labor, materials, equipment and incidental expenses (including but not limited to concrete footings) necessary to complete the work, in accordance with the drawings and specifications, and to the approval of the Project Officer.

4.03 The unit price for the 4' CHAIN LINK FENCE & FOOTINGS (AT EXISTING SOUTHERN RETAINING WALL) shall be LINEAR FOOT and shall include the cost of all labor, materials, equipment and incidental expenses (including but not limited to concrete footings) necessary to complete the work, in accordance with the drawings and specifications, and to the approval of the Project Officer.

4.04 The unit price for the 4' CHAIN LINK FENCE & FOOTINGS (ON FLUSH CURB AROUND SOCCER FIELD) shall be LINEAR FOOT and shall include the cost of all labor, materials, equipment and incidental expenses (including but not limited to concrete footings) necessary to complete the work, in accordance with the drawings and specifications, and to the approval of the Project Officer.

END OF SECTION 323113

SECTION 323223

SEGMENTAL RETAINING WALLS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes multiple-depth segmental retaining walls with soil reinforcement.

B. Related Requirements:

1. Section 0133000 – Submittal Procedures
2. Section 033000 – Cast-in-Place Concrete
3. Section 312000 – Earth Moving
4. Section 321123 – Aggregate Base Course and Underdrainage
5. Section 321313 – Concrete Paving
6. Section 321813 – Synthetic Turf Surfacing
7. Section 323113 – Chain Link Fences
8. Section 334000 – Storm Drainage

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each color and texture of concrete unit specified.

C. Delegated-Design Submittal: For segmental retaining walls.

1.03 INFORMATIONAL SUBMITTALS

A. Research/Evaluation Reports: For segmental retaining wall units and soil reinforcement, from ICC-ES.

B. Preconstruction test reports.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

1.05 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform the following preconstruction testing:

1. Test soil reinforcement and backfill materials for pullout resistance according to ASTM D6706.

2. Test soil reinforcement and backfill materials for coefficient of friction according to ASTM D5321.

1.06 SHOP DRAWINGS

A. Segmental Block Retaining Wall – sections, elevations, plans, including all incidentals, including, but not limited to, chain link fence, Sleeve-It (or approved equal), footings, geogrid, curbing and synthetic turf, and EPDM liner, signed and sealed by a civil engineer licensed in Virginia.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Basis of Design: Design of segmental retaining walls is based on products indicated. If comparable products of another manufacturer are proposed, engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design segmental retaining walls.

B. Compliance Review: Qualified professional engineer responsible for segmental retaining wall design shall review and approve submittals and source and field quality-control reports for compliance of materials and construction with design.

2.02 SEGMENTAL RETAINING WALL UNITS

A. Concrete Units: ASTM C1372, Normal Weight, except that maximum water absorption shall not exceed 7 percent by weight and units shall not differ in height more than plus or minus 1/16 inch from specified dimension.

1. Segmental Block Retaining Wall shall be Keystone Compac III (Near Vertical Setback), by York Building Products, or approved equal. 4126 Buckeystown Pike, Frederick, MD 21704.

2. Provide units that comply with requirements in ASTM C1372 for freeze-thaw durability.

3. Provide units that interlock with courses above and below by means of hollow cores filled with drainage fill.

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

C. Shape and Texture: Provide units with machine-split textured to match the texture at the existing wall at the Lower Field at Thomas Jefferson Park.

D. Shape and Texture: Provide units matching basic shape, dimensions, and face texture of basis-of-design product, as well as the general shape, dimensions and face texture at the existing wall at the Lower Field at Thomas Jefferson Park.

2.03 INSTALLATION MATERIALS

B. Pins and Clips: Product supplied by segmental retaining wall unit manufacturer for use with units provided, made from nondegrading polymer reinforced with glass fibers.

C. Cap Adhesive: Product supplied or recommended by segmental retaining wall unit manufacturer for adhering cap units to units below.

D. Leveling Base: Comply with requirements in Section 312000 "Earth Moving" and Section 321123 “Aggregate Base Course and Underdrainage.”

E. Drainage Fill: Comply with requirements in Section 312000 "Earth Moving" and Section 321123 “Aggregate Base Course and Underdrainage.”

F. Soil Fill: Comply with requirements in Section 312000 "Earth Moving" for satisfactory soils.

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

H. Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent.

1. Apparent Opening Size: No. 70 to 100 sieve, maximum; ASTM D4751.

2. Minimum Grab Tensile Strength: 110 lb.; ASTM D4632.

I. Geogrid Soil Reinforcement: Product specifically manufactured for use as soil reinforcement and as follows:

Mirafi 3XT by TenCate Geosynthetics, or approved equal.

1. SG200 by Strata Global GeoSolutions or approved equal.

J. Fence Post Footing: Product specifically manufactured for use as fence post reinforcement behind segmental block retaining wall.

1. Sleeve-It 1224R (12” diameter x 24” deep) by Strata Systems Inc. or approved equal.

i. Install in accordance with manufacturer’s specifications. See Specification 323113 (Chain Link Fences) for additional information.

K. Ethylene Propylene Diene Terpolymer (EPDM) Unreinforced EPDM manufactured in accordance with and conforming to GM21, 1.12 mm 45 mils thick.

1. Seaming materials per the Manufacturer’s recommendations

PART 3 - EXECUTION

3.01 RETAINING WALL INSTALLATION

A. General: Place units according to NCMA's "Segmental Retaining Wall Installation Guide" and segmental retaining wall unit manufacturer's written instructions.

1. Lay units in running bond.

2. Form corners and ends by per manufacturer’s standards.

B. Leveling Base: Place and compact base material to thickness indicated and with not less than 95 percent maximum dry unit weight according to ASTM D698.

C. First Course: Place first course of segmental retaining wall units for full length of wall. Place units in firm contact with each other, properly aligned and level.

1. Tamp units into leveling base as necessary to bring tops of units into a level plane.

D. Subsequent Courses: Remove excess fill and debris from tops of units in course below. Place units in firm contact, properly aligned, and directly on course below.

E. Cap Units: Place cap units and secure with cap adhesive.

3.02 FENCE INSTALLATION BEHIND RETAINING WALL

A. Install in accordance with Specification 323113, construction drawings and approved shop drawings.

3.03 FILL PLACEMENT

A. General: Comply with requirements in Section 312000 "Earth Moving," with NCMA's "Segmental Retaining Wall Installation Guide," and with segmental retaining wall unit manufacturer's written instructions.

B. Fill voids between and within units with drainage fill. Place fill as each course of units is laid.

C. Place, spread, and compact drainage fill and soil fill in uniform lifts for full width and length of embankment as wall is laid. Place and compact fills without disturbing alignment of units. Where both sides of wall are indicated to be filled, place fills on both sides at same time. Begin at wall, and place and spread fills toward embankment.

1. Compact reinforced-soil fill to not less than 95 percent maximum dry unit weight according to ASTM D698.

2. In areas where only hand-operated compaction equipment is allowed, compact fills to not less than 90 percent maximum dry unit weight according to ASTM D698.

3. Compact nonreinforced-soil fill to comply with Section 312000 "Earth Moving."

D. Place a layer of drainage fill at least 24 inches wide behind wall to bottom of synthetic turf typical section. Place a layer of drainage geotextile between drainage fill and soil fill.

E. Wrap subdrainage pipe with filter fabric and place in drainage fill as indicated, sloped not less than 0.5 percent to drain.

F. Place impervious fill over top edge of drainage fill layer.

G. Place soil reinforcement in horizontal joints of retaining wall where indicated and according to soil-reinforcement manufacturer's written instructions. Embed reinforcement a minimum of 8 inches into retaining wall and stretch tight over compacted backfill. Anchor soil reinforcement before placing fill.

1. Place additional soil reinforcement at corners and curved walls to provide continuous reinforcement.

2. Place geosynthetics with seams, if any, oriented perpendicular to segmental retaining walls.

3. Do not dump fill material directly from trucks onto geosynthetics.

4. Place at least 6 inches of fill over reinforcement before compacting with tracked vehicles or 4 inches before compacting with rubber-tired vehicles.

5. Do not turn vehicles on fill until first layer of fill is compacted and second layer is placed over each soil-reinforcement layer.

3.04 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Comply with requirements in Section 312000 "Earth Moving" for field quality control.

1. In each compacted backfill layer, perform at least one field in-place compaction test for each 150 feet or less of segmental retaining wall length.

2. In each compacted backfill layer, perform at least one field in-place compaction test for each 24 inches of fill depth and each 50 feet or less of segmental retaining wall length.

3.05 ANTI-GRAFFITI COATING

A. By Sherwin-Williams or approved equal.

B. Apply to all parts of the wall that are exposed to the public.

C. Clear, one-component, non-sacrificial, ready-to-use siloxane coating intended for use over base concrete or previously panted concrete or steel surfaces. It cures with atmospheric moisture and offers excellent graffiti resistance and cleanability with waterpower-washing.

D. Additional Required Characteristics: weatherability, single component, elastomeric, low VOC, service life 10-years minimum, surface tolerant, one-coat application,

E. Contractor shall both clean all wall surfaces and apply the coating per the manufacturer's written directions.

PART 4 - MEASUREMENT

4.01 The unit price for NEAR VERTICAL SEGMENTAL BLOCK RETAINING WALL, INCLUDING EPDM LINER AND ALL INCIDENTALS, shall be LUMP SUM, and shall include the cost of furnishing all labor, materials, equipment, and incidental expenses necessary to complete the work, including expansion material, sealant, color, steel reinforcement, curing material, concrete, aggregate subbase, all in accordance with the plans and specifications and to the approval of the Project Officer.

Does not include excavation.

4.02 The unit price for REUSE EXISTING BLOCK FROM DEMOLISHED WALL TO HEIGHTEN EXISTNG SOUTHERN WALL, shall be LUMP SUM, and shall include the cost of furnishing all labor, materials, equipment, and incidental expenses necessary to complete the work, including expansion material, sealant, color, steel reinforcement, curing material, concrete, aggregate subbase, all in accordance with the plans and specifications and to the approval of the Project Officer.

Does not include excavation.

4.03 The unit price for REUSE EXISTING BLOCK FROM DEMOLISHED WALL FOR SBW ON NORTH SIDE OF RAMP, shall be LUMP SUM, and shall include the cost of furnishing all labor, materials, equipment, and incidental expenses necessary to complete the work, including expansion material, sealant, color, steel reinforcement, curing material, concrete, aggregate subbase, all in accordance with the plans and specifications and to the approval of the Project Officer.

Does not include excavation.

END OF SECTION 323223

SECTION 329100

PLANTING PREPARATION

PART 1 - GENERAL

1.01 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 013300 – Submittal Procedures
2. Section 015000 Temporary Erosion and Sediment Control
3. Section 311000 Site Clearing, Preparation, Demolition and Removals
4. Section 311300 Tree Protection and Root Pruning
5. Section 312000 Earth Moving
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 (especially planting plans) 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/

1.02 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.

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.

1.03 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.

   i. Fertility: pH, nitrate nitrogen, ammonia nitrogen, phosphate phosphorous, potassium, calcium, magnesium, zinc, iron, manganese.

   ii. Suitability: total salinity, boron, sodium, potassium, calcium, magnesium, chloride, sulfate.

   iii. 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. Mulches and Organic Matter/Compost: Sample of mulch and organic matter/compost may be requested in lieu of inspection.

5. Product certificates: Contractor shall submit for each type of manufactured product, to be approved by the Project Officer in coordination with Landscape Architect or Urban Forester and complying with the following:

   i. Manufacturer's certified analysis for standard products.

E. Geotextile/Soil Stabilization/Erosion Control Fabric: Sample

1.04 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

2.01 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.

2.02 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.

B. 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:

1. 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.

2. All fertilizers shall be uniform in composition, free flowing, and suitable for application with approved equipment.

3. Fertilizers shall be delivered to the site fully labeled according to applicable state fertilizer laws and shall bear the name, trade name, or trademark and warranty of the product.

C. Delay mixing fertilizer with planting soil if planting will not proceed within 2 days.

D. Spread fertilizer and lime with approved equipment.

2.03 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.

2.04 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 (leaf compost) as described in the Arlington County DPR Standard planting details, unless otherwise indicated by the Project Officer with confirmation by the Landscape Architect or Urban Forester.

2.05 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.

2.06 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.

2.07 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 steep slope (steeper than 3:1) areas. Install atop amended soils.

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.

4. Secure to ground with biodegradable stakes on a 3'x3' grid.

PART 3 - EXECUTION

3.01 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.

   i. Protect adjacent and adjoining areas from hydro-seeding and hydro-mulching overspray.

   ii. 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 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. Contractor shall avoid unnecessary compaction of the soil during grading.

F. Contractor shall ensure appropriate slopes of the swales, berms and final grades.

G. Immediately following each day's work, contractor shall clean all dirt, excess soil, debris and trash from the site. Contractor shall protect and store additional soils in stockpiles protected from saturation, erosion, weed growth and contamination with plastic sheeting or tarps.

H. 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.

I. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

J. Prepared lawns and planting areas shall be inspected and approved by Project Officer in coordination with Landscape Architect prior to seeding, sodding or planting.

K. If the graded areas develop volunteer weed growth, the growth shall be eliminated at the expense of the Contractor.

3.02 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.

3.03 ADDITIONAL PLANTING PREPARATION REQUIREMENTS FOR TREE PLANTING IN FORESTED AREAS

A. Establish erosion control and tree protection measures in accordance with E&S Plans, Tree Protection Plans and project specifications.

B. Do not disturb existing trees or their critical root zones.

C. Amend existing soils with leaf compost, imported topsoil and water soil thoroughly.

D. See 3.01 to 3.02 for additional planting preparation requirements.

PART 4 - MEASUREMENT

Not used.

END OF SECTION 329100

SECTION 329200

TURF AND GRASSES

PART 1 - GENERAL

1.01 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:

1. Seeding
2. Sodding
3. Hydro-seeding
4. Plugging

B. Related Sections:

1. Section 013300 – Submittal Procedures
2. Section 015000 – Temporary Erosion and Sediment Control
3. Section 310000 – Site Clearing, Preparation, Demolition and Removals
4. Section 311300 – Tree Protection and Root Pruning
5. Section 312000 – Earth Moving
6. Section 329100 – Planting Preparation
7. Section 329300 – Exterior Plants

C. In addition to the specifications contained herein, Work shall be performed in accordance with the:

1. Drawings (especially planting plans and reforestation plan) 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 (DPR) Design Standards as shown on the plans and available online at:

   http://parks.arlingtonva.us/design-standards/

1.02 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.

1.03 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 1.04 “Quality Assurance” to Project Officer for approval.

C. Samples:

1. 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.

2. Sod: Sod grower's name, together with substantiating information as to field location from which sod is to be cut and species, percent purity and mixture of grass sod to be applied. Samples or photos of sod mix may be requested in lieu of inspection.

3. Special Seed Mixes: Contractor shall submit product data per section 2.03.

1.04 QUALITY ASSURANCE

A. Contractor qualifications:

1. Evidence of completion of at least three (3) projects of similar nature and scope to this project completed within the last five (5) years that have resulted in successful turf and meadow establishment

2. Contractor shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.

3. Experience: Three to Five years’ experience in turf installation.

B. Installer's Feld Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

C. Contractor shall maintain an experienced full-time supervisor on Project site when work is in progress.

D. Topsoil Analysis: Furnish sol analysis by a qualified soil-testing laboratory

PART 2 - PRODUCTS

2.01 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.

D. Sod must be acquired from a Virginia State Certified grower/propagator.

E. Sod shall be fresh and clean and comply with purity and germination requirements.

2.02 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.

2.03 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.

1. Sod shall be free of disease and soil borne insects.

2. Sod shall be free of clover, broadleaf weeds and noxious weeds. Sod considered free of such weeds if less than 2 such plants are found per 100 square feet of area.

3. Sod shall be of uniform color and density and contain:

Kind of Seed	% by Weight
Turf Type Tall Fescue	90
Kentucky Bluegrass	10

4. All cultivars must be on the current approved list of the Virginia Turfgrass Variety Recommendations and the sod shall be certified by the Virginia Sod Certification Program. Provide appropriate certifications at the time of installation.

5. 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.

6. Sod shall have been mowed prior to stripping and shall have been maintained for a minimum of three months.

7. Sod shall be relatively free of thatch. Thatch build up that significantly detracts from the appearance of the sod may be sufficient cause for rejection.

8. Sod shall be machine stripped at a uniform soil thickness of approximately ¾-inch. Measurement for thickness to exclude tip growth and thatch.

9. Individual pieces of sod shall be cut to supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be 5%. Broken pads, torn or uneven ends shall not be permitted.

10. Root development shall be such that standard size pieces will support their own weight and retain their size and shape when suspended vertically from a firm grasp on uppermost 10% of the area.

11. Under moderate moisture conditions, weight shall not exceed 7 pounds per square foot. Minimum weight shall not be less than 4 lbs. per square foot.

B. Sod Staples: by manufacturer recommended by Sod manufacturer or approved equal. 4-6" length; made from 100% natural byproducts that biodegrade within 8-24 months; rigid, durable design; barbed ears and ribbing for strong connection of sod to subgrade; complies with ASM D6400.

2.04 SPECIALTY SEED (STEEP SLOPE AREAS)

A. When specialty seed is explicitly specified in approved plans, and unless otherwise indicated, the specialty seed mix shall be as follows:

1. Ernst Seed Mix ERNMX-140 "Partially Shaded Area Roadside Mix," or approved equal. The mix composition is specified on the planting plans.

2. 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:

1. 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.

2. Brush seed into top 1/8 inch of soil, roll lightly and water with light spray.

3. 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.

4. Water newly planted areas and keep moist until established.

2.05 SOILS & SOIL AMENDMENTS

A. Refer to Section 329100 "Plant Preparation" soils and soil amendment specifications.

2.06 MULCHES/ ORGANIC MATTER

A. Refer to Section 329100 "Planting Preparation" for mulch specifications.

2.07 SOIL STABILIZATION/EROSION CONTROL FABRIC

A. Refer to Section 329100 "Planting Preparation" for specifications.

2.08 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, Class T or O, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.

2.09 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8.

B. Peat: Sphagnum peat moss, partially decomposed, finely divided or granular texture, with pH range of 3.4 to 4.8.

C. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.

2.10 FERTILIZER

A. 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:

1. Composition: 10 percent nitrogen, 20 percent phosphorous, and 10 percent potassium, by weight.

2.11 MULCHES (FOR SEEDED AREAS)

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

2.12 TURF 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.

PART 3 - EXECUTION

3.01 PREPARATION

A. Refer to Section 329100 “Planting Preparation” for specifications.

3.02 SEEDING - GRASS

A. 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. After instruction from Project Officer and county inspectors, General Contractor shall remove the construction fencing and temporary root protection matting (TRPM) along the construction access route, and deep plug aerate (3 passes) the compacted earth beneath the TRPM and within the LOW. This area shall then be seeded according to the requirements of this specification.

C. 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.

D. Use 4” of prepared topsoil as base for areas to be seeded.

E. 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.

F. Seed shall be uniformly distributed by hydro-seeding methods as specified:

1. 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.

G. 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.

H. Sow seed at the rate of 5 to 8 lb/1000 sq. ft.

I. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray. 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.

J. 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.

3.03 SODDING

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. 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 shall be submitted for Landscape Architect's approval prior to delivery. 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 truck load. All grass sod shall meet the following basic requirements.

1. Sod shall be free of disease and soil borne insects

2. Sod shall be free of clover, broadleaf weeds and noxious weeds. Sod considered free of such weeds if less than 2 such plants are found per 100 square feet of area.

3. Sod shall be of uniform color and density

B. 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.

C. Sod sample shall be submitted to and approved by 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.

D. Sod shall have been mowed prior to stripping and shall have been maintained for a minimum of three months.

E. 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.

F. Sod shall be machine stripped at a uniform soil thickness of approximately ¾-inch. Measurement for thickness to exclude tip growth and thatch.

G. 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.

H. 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.

I. 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.

J. 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.

K. 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.

L. 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.

M. 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.

N. Use 4” of prepared topsoil as base for areas to be sodded.

O. 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.

P. 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.

Q. 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. Successive strips to be neatly matched and all joints staggered. Sod will be laid in all areas indicated on landscape plans.

1. To prevent sod slippage in areas of stormwater conveyance and steep slopes (1:6 or greater), anchor sod to subgrade with biodegradable staples as described in 2.03(B):

a. Sod placed in swales or ditches shall be staked as recommended by sod manufacturer but not less than two anchors per roll of sod.

b. Sod placed on slopes 1:6 or steeper shall be staked as recommended by sod manufacturer but not less than two anchors per roll.

3.04 STEEP SLOPE SEEDING AREAS

A. Prepare planting area per the specifications.

B. Native Seeding process:

1. 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.

2. 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.

3. Moisten prepared planting area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

4. 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.

D. Allow biodegradable soil stabilization matting to biodegrade.

3.05 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.

3.06 MAINTENANCE

A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

1. Sodded Lawns: 60 days from date of Substantial Completion

B. Maintain surfaces and supply additional topsoil where necessary, including areas affected by erosion.

C. Water to ensure uniform seed germination and to keep surface of soil damp:

1. Each watering shall consist of 1 gallon per 3 sq. yd. of seed or sod

2. Apply water slowly so that surface of soil will not puddle and crust

D. 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. Mower blades should be sharp so that the lawn is cut cleanly. Leave grass clippings well distributed throughout lawn.

E. After first mowing of lawn, water grass sufficiently to moisten soil from 3" to 5" deep.

F. Reseed damaged grass areas showing root growth failure, deterioration, bare or thin spots and erosion.

3.07 GUARANTEE

A. The Contractor shall be responsible for maintaining all sodded and seeded areas in a healthy, vigorous condition in accordance with Section 3.05 "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.

3.08 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 3.02 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

4.01 The unit price for AERATE & OVERSEED DAMAGED AREAS IN CONSTRUCTION ACCESS ROUTE FROM SOUTH IRVING STREET shall be SQUARE FOOT and shall include the cost of furnishing all labor, materials, equipment and incidental expenses (including Section 329100 Planting Preparation) necessary to complete the work, all in accordance with the plans, specifications and approval of the Project Officer. Does not include excavation.

4.02 The unit price for NATIVE SEED MIX FOR STEEP SLOPES shall be POUND and shall include the cost of all labor, materials, and incidental expenses (including Section 329100 Planting Preparation) necessary to complete the work, in accordance with the plans and specifications, to the satisfaction of the Project Officer.

4.03 The unit price for SODDING AND TOPSOIL shall be SQUARE FOOT and shall include the cost of furnishing all labor, materials, equipment and incidental expenses necessary (including Section 329100 Planting Preparation) to complete the work, all in accordance with the plans, specifications and approval of the Project Officer. Does not include excavation.

END OF SECTION 329200

SECTION 329300

EXTERIOR PLANTING

PART 1 - GENERAL

1.01 SUMMARY

A. Provide all labor, materials, tools and equipment as required to have plants, topsoil, amendments, mulch and seed and/or sod applied on all areas called for on the approved plans.

B. Related Sections:

1. 013300 Submittal Procedures
2. 015000 Temporary Erosion and Sediment Control
3. 312000 Earth Moving
4. 311000 Site Clearing, Preparation, Demolition and Removals
5. 311300 Tree Protection and Root Pruning
6. 329100 Planting Preparation
7. 329200 Seeding and Sodding

C. In addition to the specifications contained herein, Work shall be performed in accordance with the:

1. Drawings (especially planting plans and reforestation plan) 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:

   http://parks.arlingtonva.us/design-standards/

1.02 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.

1.03 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 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.

C. Refer to Section 329100, "Planting Preparation" for soil test requirements.

D. Contractor shall submit State Nursery inspection certificates to the Project Officer.

E. Contractor shall submit to Project Officer the verification of Landscape Industry Certified Technician and Landscape Industry Certified Officer certificates for those responsible for plant installation.

F. Planting Schedule: Contractor shall submit the planting schedule to the Project Officer for approval with confirmation by the Landscape Architect or Urban Forester. 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 before 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.

G. Substitutions:

1. The Contractor shall submit a written request for a substitute plant a minimum of forty-five (45) 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 Project Officer in coordination with 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 Project Officer in coordination with the Landscape Architect or Urban Forester.

H. Maintenance Instructions: Contractor shall submit to the Project Officer recommended procedures for maintenance of exterior plants during a calendar year. Submit before end of required maintenance periods.

1.04 QUALITY ASSURANCE

A. Installer Qualifications:

1. Contractor shall designate a project crew leader who possesses one or more of the following certifications:

i. Certified by the Professional Landcare Network (PLANET) as a "Landscape Industry Certified Technician"

ii. Certified by the Professional Landcare Network (PLANET) as a "Landscape Industry Certified Officer"

iii. The Contractor shall identify to the Project Officer at least one full-time on-site supervisor who is the Contractor's competent, qualified, and authorized person on the worksite and who is, by training or experience, familiar with the policies, regulations and standards applicable to the work being performed, and capable of sufficiently communicating with the Project Officer.

iv. Crew leader and supervisor may be the same individual.

B. Installer Qualifications for Tree Planting Projects:

1. ISA Certified Arborist shall be on the worksite during tree planting.

2. The County will, throughout the contract term, have the right of reasonable rejection and approval of staff or subcontractors assigned to the project by the Contractor. If the County reasonably rejects staff or subcontractors, the Contractor shall provide replacement staff or subcontractors satisfactory to the County in a timely manner and at no additional cost to the County. The day-to-day supervision and control of the Contractor's employees, and any employees of any of it subcontractors, shall be solely the responsibility of the Contractor.

C. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory. Comply with requirements in Section 329100, “Planting Preparation.”

D. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in the most current version of ANSI Z60.1, "American Standard for Nursery Stock." 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 Project Officer with confirmation by the Landscape Architect or Urban Forester may reject any non-conforming stock and has the option to field-select plant materials prior to purchasing.

E. Collected material may be used only when approved by Project Officer with confirmation by Arlington County Urban Forester and/or DPR PNR Natural Resource Manager

F. Nomenclature shall be in accordance with *Hortus III*, by L.H. Bailey. All trees and shrubs shall be labeled with a securely attached, waterproof tag bearing legible designation of botanical and common name.

G. Pre-installation Conference: Conduct conference at Project site with Project Officer, Arlington County Urban Forester and/or Department of Parks and Recreation (DPR) representative or County Landscape Architect.

H. 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 observe the work.

I. 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).

J. 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.

K. Inspections:

1. Urban Forester may perform periodic inspections to check on tree plantings.

2. Contractor shall arrange a meeting on site with the Project Officer in coordination with the Urban Forester and/or Landscape Architect to perform final inspection of plantings. Refer to section 1.07 “Final Inspection.”

1.05 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 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 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 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 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, 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 Project Officer with confirmation by 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 Project Officer shall approve the layout with confirmation by the Landscape Architect prior to plant installation. Plants installed without layout approval from the Project Officer with confirmation by Landscape Architect are subject to removal and replanting by the Contractor at no additional cost to Arlington County.

1.06 WATER REQUIREMENTS

A. Initial Waterings: The Contractor shall supply water for all plantings and shall water all plants at time of installation and 48 hours after installation, even if it is raining. Contractor shall then water plantings at least twice per week at amounts specified below until final acceptance of work.

B. Each watering shall consist of:

1. 20 gallons per individual tree

2. 1 gallon per 3 sq. yd. of seed or sod

1.07 DELIVERY, STORAGE AND HANDLING

A. Do not prune trees 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 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.

1.08 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 substantial 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 acceptance no less than three months after installation. Contractor is responsible for maintenance and watering of replacement material per Section 1.06 and Section 1.08 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.

1.09 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: One year from date of Final Completion.

1.10 MAINTENANCE

A. Tree: Contractor shall maintain plantings at his/her own expense until final acceptance of the plantings as specified herein section 1.07.

B. Maintenance shall include pruning, mulching, cultivating, watering, weeding, fertilizing, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, 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 acceptance if the time between planting and final acceptance 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.

F. Weeding: Contractor shall perform weeding until final acceptance to keep the planting area as free of weeds as possible. A minimum of one weeding per month from April through October is required if time between planting and final acceptance extends through any months of the growing season.

G. Stakes and Guy Supports: If installed, Contractor shall monitor and adjust all stakes and guy supports until final acceptance.

PART 2 - PRODUCTS

2.01 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 Material: Furnish nursery-grown trees complying with the most current version of 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, bare root or container-grown trees, 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 3/4” 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 4’-6”. Trees over 2” in caliper shall be free and clear of branches or splits in the trunk up to 6’-6”. If the original leader has been headed, a new leader of at least one-half of the diameter of the original leader shall be present. 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 free of injury from biotic and abiotic agents, shall be well developed and well distributed throughout the container.

7. All container-grown trees that have circling and matted roots shall be rejected.

C. Field grown trees shall be grown in soils of the Piedmont region, or west of that region in the above approved states and zones.

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. Bare root plant materials: Bare root plants will be dug with adequate fibrous roots. Do not root prune. Roots shall be protected during handling and planting to guard against drying out and damage.

F. 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.

1. Plant stock shall originate from a location within 150 miles of Arlington County.

2.02 OTHER MATERIALS

A. Refer to Section 329200 "Seeding and Sodding" for specifications for seeding, specialty seeding, sodding, and soil stabilization/erosion control fabric.

B. Refer to Section 329100 "Planting Preparation" for specifications for soils, mulch, soil amendments and other items related to planting preparation.

PART 3 - EXECUTION

3.01 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.

1. 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.

2. Planting operations shall be performed during periods within the planting season when weather and soil conditions are suitable and in accordance with accepted local practice. Plants shall not be installed in top soil that is in muddy or frozen condition. **Lawns and trees shall be installed between 03/15 and 06/15 or between 09/15 and 12/01.** If a project completion is outside of this planting

period, contact the Arlington County Urban Forester to obtain a deferral or approval for planting out of season.

C. 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.

D. Landscape Plantings (Trees)

1. 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.

2. 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. Tree Pruning: **Contractor shall conform to the most current version of ANSI A-300 Tree Pruning Standards. Do not cut tree leaders; remove only injured or dead branches from trees, or those that pose a hazard to pedestrians.** Make all cuts back to a lateral branch or bud. Cuts should be perpendicular above branch collar. Final pruning shall be done after the tree is in place. Do not prune into old wood on evergreens.

F. Plant Protection: Contractor shall protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged exterior planting. Injured roots shall be pruned to clean ends before planting with clean, sharp tools per most current ANSI 300 specifications.

G. Contractor shall remove all tags, labels, strings and wire from the plants, unless otherwise directed.

H. Contractor shall remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off of Arlington County property.

I. Refer to Section 1.06 'Water Requirements.'

3.02 STAKING & GUYING TREES

A. Contractor shall stake and guy trees only if required by Urban Forester.

B. If staking and guying is required, the Contractor shall provide and install stakes and guying in accordance with DPR standard staking details for deciduous and evergreen trees.

PART 4 - MEASUREMENT

4.01 The unit price for DECIDUOUS AND EVERGREEN (CANOPY) TREES shall be EACH and shall include the cost of all labor, materials, and incidental expenses (including Section 329100 Planting Preparation) necessary to complete the work, in accordance with the plans and specifications, to the satisfaction of the Project Officer.

4.02 The unit price for ORNAMENTAL (UNDERSTORY) TREES shall be EACH and shall include the cost of all labor, materials, and incidental expenses (including Section 329100 Planting Preparation) necessary to complete the work, in accordance with the plans and specifications, to the satisfaction of the Project Officer.

END OF SECTION 329300

DIVISION 33

UTILITIES

SECTION 334000

STORM DRAINAGE

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Pipes and Fittings
2. Area Drain and Drain Basins
3. Stormwater Inlets
4. Pipe Connectors
5. Turf Covered Access Hatches

B. Provide all labor, materials, tools and equipment necessary to install storm drain pipes, fittings, hatches, inlets and basins.

C. Related Sections:

1. Section 013300 – Submittal Procedures
2. Section 312000 – Earth Moving
3. Section 321123 – Aggregate Base Course and Underdrainage
4. Section 321813 – Synthetic Turf Surfacing

D. 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. Erosion & Sedimentation Control – Chapter 57 Arlington County Code
4. Arlington County Department of Environmental Services (DES) Construction Standards and Specifications
5. Construction Drawings

1.02 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

1.03 SUBMITTALS

A. Product Data: Provide data on all pipe materials, pipefittings, and accessories.

B. Shop Drawings:

1. Provide shop drawings for each area drain and drain basin installation. Include plans, elevations, sections, details, frames, covers and grates.

2. Provide shop drawings for stormwater inlets. Include plans, elevations, sections, details, frames, covers, design calculations and concrete design-mix reports.

1.04 PROJECT CONDITIONS

A. Accurately record actual locations of pipe runs, connections, inlets, cleanouts, and invert elevations.

1. Notify Project Officer no fewer than two days in advance of proposed interruption of service.

2. Do not proceed with interruption of service without Project Officer's written permission.

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 Arlington County or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

3. Notify Project Officer no fewer than two days in advance of proposed interruption of service.

4. Do not proceed with interruption of service without Project Officer's written permission.

D. Coordinate work with replacement of storm sewer inlets and connection to existing storm sewer system.

1.05 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

2.01 PVC PIPE AND FITTINGS

A. PVC Gravity sewer piping shall be in accordance with Arlington County Department of Environmental Services (DES) Standards and Specifications 02500 – Gravity Sewer and Appurtenances.

2.02 AREA DRAINS AND DRAIN BASINS

A. Lid and frame:

1. Manufactured or supplied by the inlet manufacturer or equivalent per details shown on Construction Drawings.

2. Shall be made specifically for each drain basin so as to provide a round bottom flange that closely matches the diameter of the surface drainage inlet.

3. Shall be capable of supporting H-10 loading for pedestrian traffic.

4. Iron used manufacture of the castings shall conform to ASTM A 536 grade 70-50-05 for ductile iron and shall be provided painted black.

B. Drain Basins:

1. Shall be manufactured from PVC pipe stock, utilizing a thermo-molding process to reform the pipe stock to the specified configuration, to be ADS or equivalent manufactured to dimensions specified on Construction Drawings.

C. Structure construction in accordance with manufacturer's instructions and details shown on Construction Drawings.

1. The drainage pipe connection stubs shall be manufactured from PVC stock and formed to provide a watertight connection with the specified pipe system.

2. The joint tightness shall conform to ASTM D3212 for joints for drain and sewer plastic pipe using flexible electrometric seals.

3. The pipe spigot shall be joined to the main body of the drain basin. This pipe stock used to manufacture the main body and pipe stubs of the surface drainage inlets shall meet the mechanical property requirements for fabricated fittings as described by ASTM D3034, Standard for Sewer PVC Pipe and Fittings: ASTM F1336 Standard for PVC Gasketed Sewer Fittings.

2.03 STORMWATER INLETS

A. CONCRETE

1. Concrete shall be in accordance with DES Standards and Specifications Section 02500 – Gravity Sewer and Appurtenances.

B. Standard Precast Concrete Inlet:

1. Description: ASTM C478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.

2. Base Section: thickness for floor slab and thickness for walls and base riser section, and separate base slab or base section with integral floor as indicated on drawings.

3. Riser Sections: minimum thickness as indicated on drawings, and lengths to provide depth indicated

4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.

5. Joint Sealant: ASTM C990, bitumen or butyl rubber

6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.

7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and grate.

8. Steps: In accordance with DES Standards and Specifications – Section 02500 Gravity Sewers and Appurtenances, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches.

9. Pipe Connectors: ASTM C923, resilient, of size required, for each pipe connecting to base section.

C. Frames and Grates: As indicated on drawings.

2.04 PIPE CONNECTORS

A. Resilient Pipe Connectors: ASTM C1478

1. Hub Adaptor: ASTM D3034, SDR 26 HWS, PVC Type PSM

2. Rubber Gasket: ASTM 477, Elastomeric Seals

3. Securing Clamp

i. Band SS #301

ii. Screw SS #305

iii. Housing SS #301

iv. Rubber Sleeve: ASTM 477, Elastomeric Seals

2.05 TURF COVERED ACCESS HATCHES

A. BASE: TCITQCV - TurfCool® Quick Coupler or Gate Valve Box (or approved equal) for Synthetic Infill Turf as Manufactured and Supplied by:

Sportsfield Specialties, Inc.

P.O. Box 231

41155 State Highway 10

Delhi, NY 13753

p. 888-975-3343

www.sportsfieldspecialties.com

B. Components:

1. TCITQCV - TurfCool® Quick Coupler or Gate Valve Box (or approved equal) for Synthetic Infill Turf

   i. Dimensions: As noted on the construction documents.

   ii. Box: 3/16" (0.1875”) Aluminum Construction, Welded Frame with Open Bottom Having the Following Attributes:

      a. 1/8" (0.125”) Aluminum Cover Ledge

      b. Integrated Synthetic Infill Turf Attachment Ledge

      c. Infill Retainer System with 1-1/4” (1.25”) Flexible Gasket Seals Specifically Designed for Synthetic Infill Turf Applications

      d. 6” PVC Drain Stub for Drainage Connection

      e. Leveling Bolts

   iii. Solid Cover: 1/8" (0.125”) Aluminum Construction with the Following Attributes:

      a. Infill Retainer System with 1-1/4” (1.25”) Flexible Gasket Seals Specifically Designed for Synthetic Infill Turf Applications

      b. Designed to Allow Synthetic Turf Material to be Adhered Directly to the Aluminum Surface with Appropriate Adhesive and/or Mechanical Fasteners as Determined by Others

   iv. Assembly Hardware

PART 3 - EXECUTION

3.01 EARTHWORK

A. Excavation, trenching, and backfilling are specified on construction drawings in Section 312000 - Earth Moving.

3.02 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. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

D. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow.

2. Install piping-NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.

3. Install piping with 24 inch minimum cover.

4. Install piping according to ASTM D 2321.

3.03 AREA DRAIN AND 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.

3.04 3.03 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, non-pressure drainage piping according to manufacturer's instructions.

3.05 STORMWATER INLET INSTALLATION

A. Form bottom of excavation clean and smooth to correct elevation.

B. Refer to Construction Drawings and manufacturer's instructions and requirements.

3.06 CONNECTIONS

A. Make connections to existing piping per pipe connector manufacturer's instructions.

3.07 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.08 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 Substantial Completion of Project.

1. Submit separate reports 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. Damage: Crushed, broken, cracked, or otherwise damage 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. Reinspect 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. Contractor shall notify Project Officer of all Storm Drain testing so that Project Officer may be present during time of testing.

4. Submit separate report for each test.

5. Gravity-Flow Storm Drainage Piping: Test 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

4.01 The unit price for DRAIN BASIN shall be EACH for each size and for each cover type installed and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

4.02 The unit price for TURF COVERED ACCESS HATCH shall be EACH for each size installed and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

4.03 The unit price for 8" TRENCH DRAIN shall be LINEAR FOOT and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

4.04 The unit price for CONCRETE RISER RING shall be LINEAR FOOT for each size installed and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

4.05 The unit price for PERFORATED SCHEDULE 40 PVC PIPE shall be LINEAR FOOT for each diameter and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

4.06 The unit price for SOLID SCHEDULE 40 PVC PIPE shall be LINEAR FOOT for each diameter and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

4.07 The unit price for HDPE shall be LINEAR FOOT for each diameter and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

4.08 The unit price for COUPLING shall be EACH for each size installed and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

4.09 The unit price for STORMWATER INLET (VDOT T-DI-7) shall be EACH installed and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

4.10 The unit price for FIELD CONNECTION TO EXISTING STORM DRAIN shall be for EACH installed and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

4.11 The unit price for CONNECT NEW STORM DRAIN TO EXISTING INLET shall be for EACH installed and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

4.12 The unit price for END CAP shall be EACH for each size installed and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

4.13 The unit price for ELBOW shall be EACH for each size installed and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

4.14 The unit price for TEE shall be EACH for each size installed and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications, and to the satisfaction of the Project Officer.

END OF SECTION 334000