



**A R L I N G T O N**  
VIRGINIA

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

**21-DPR-ITB-646  
Project Manual**

**Department of Parks and Recreation**

**Marcey Road Park Improvements  
(By Right)**

**2722 Marcey Road  
Arlington, Virginia 22207**

Project includes, but is not limited to: demolition; tree protection and erosion and sediment control; storm drainage and stormwater management; athletic courts, court lighting and sports equipment; site improvements such as picnic shelter, retaining walls, walkways, fencing, site furnishings, signage and drinking fountain; and reforestation and general landscaping.



**Marcey Road Park  
Improvements  
(By Right)  
21-DPR-ITB-646**

**Exhibit B "Project Technical Specifications"**

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# **DIVISION 01**

## **SUMMARY AND GENERAL REQUIREMENTS**

## SECTION 011000

### 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: Marcey Road Park Improvements
- B. Project Location: 2722 Marcey Road, Arlington, VA 22207
- 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 and Stormwater Management
  - 7. Earthwork & Grading
  - 8. Construction Stakeout

9. Segmental Block Walls & Concrete Curbing
10. Tennis and Basketball Equipment and Athletic Multi-Use Court Surfacing
11. Concrete Pavement
12. Shade/Picnic Structure
13. Chain Link Fencing (various heights)
14. Planting (Soil Preparation, Sodding, Tree Planting, Reforestation)
15. Site Furnishings, Drinking Fountain, and On-Site Water Service
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) to the Contractor.
  - 4. The County shall submit Building Permit documents (for the shade structure and the retaining wall) to the County ISD and pay any needed fees. The Contractor shall finalize the process and obtain the actual permit(s).
  - 5. 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).
  - 6. 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.
  - 7. Permits: Contractor shall be required to obtain any necessary permits except the following that will be provided by the County:
    - i. Land Disturbance Activity (LDA) Permit
    - ii. Virginia Stormwater Management Permit (VSMP)
      - \* 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. Submittals Register (also known as a Submittals Log): Contractor shall submit a log of all items prior to commencing work. Nomenclature shall include item number, item name, item description, manufacturer/supplier, specification section reference, construction drawing reference, and contractor remarks (as needed), at minimum. The Submittals Register shall also include the following: To:, From:, Contract Number, Project Title and Location.
- a. When submitting the Submittals Register, also provide a sample RFI template, to include at minimum the project number, project name, RFI subject, date, RFI number, to/from contact information, drawing reference, specification reference, or [other] reference, and ultimately the specific RFI question/clarification.
- E. 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.
- F. Identification: Each submittal shall be submitted with the Standard Arlington County DPR Transmittal Form (see *Transmittal of Shop Drawings, Equipment Data, Material Samples, or Manufacturer's Certificates of Compliance*, included at the end of this Specification Section 013300). This standard cover sheet includes, but is not limited to, the following information:
1. Name and signature of contractor, firm or entity that prepared each submittal.
  2. Project title and location (address).
  3. Date.
  4. Project Contract Number (ITB) and Purchase Order Number (PO)
  5. Name, address, phone number, email address of Arlington County Project Officer
  6. Name, address, phone number, email address of Contractor.
  7. Name, address, phone number, email address of subcontractor, supplier, or manufacturer (include as needed in the *Remarks* section.
  8. Applicable specification section and Construction Drawing sheet number.
  9. A description of the submittal item (type, size, model number, etc.).

10. A unique identifier, such as the *Transmittal Number* and Item Number. See *Instructions*, included at the end of this Specification Section 013300, for a description of how the standard form shall be completed, included submittal formatting, numbering and nomenclature.
- G. Variations (Deviations): Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using the standard transmittal form, included at the end of this Specification Section 013000. Project Officer will discard submittals received from sources other than Contractor.
- I. 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.”
- J. Use for Construction: Use only final submittals with mark indicating “approved” or “approved as noted” by Landscape Architect / Project Manager.

## **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 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. Submittal Format: Submit a digital PDF binder of Product Data, unless otherwise indicated. Project Officer will return with their own cover sheet after reviewing. See Section 2.01(D) below for when physical samples are required, in addition to the digital PDF submittal.
- 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. CONTRACTOR shall stamp approval on SHOP DRAWINGS prior to submission, as an indication that dimensions and coordination with interrelated items have been checked and verified. Stamp shall read: “(CONTRACTOR’s Name) represents that we have determined and verified all field dimensions and measurements, field construction criteria, materials, catalog numbers and similar data, and that we have checked with the requirements of the DRAWINGS and SPECIFICATIONS, the CONTRACT DOCUMENTS, and GENERAL CONDITIONS.”
    - 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. Submittal may be digital or hard copy.
- D. Samples: When required by other specification sections, submit physical 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. If requested by Landscape Architect, contractor shall submit a physical sample(s).
  - 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.





## INSTRUCTIONS

1. Section I will be initiated by the Contractor in the required number of copies.
2. Each Transmittal shall be numbered consecutively. The Transmittal Number typically includes two parts separated by a dash (-). The first part is the specification section number. The second part is a sequential number for the submittals under that spec section. If the Transmittal is a resubmittal, then add a decimal point to the end of the original Transmittal Number and begin numbering the resubmittal packages sequentially after the decimal.
3. The "Item No." for each entry on this form will be the same "Item No." as indicated in the Submittal Register
4. Submittals requiring expeditious handling will be submitted on a separate Form.
5. Items transmitted on each transmittal form will be from the same specification section. Do not combine submittal information from different specification sections in a single transmittal.
6. If the data submitted are intentionally in variance with the contract requirements, indicate a variation in column h, and enter a statement in the Remarks block describing the detailed reason for the variation.
7. When submittal items are transmitted, indicate the "Submittal Type" (*SD-01 through SD-11*) in column c of Section I.  
Submittal types are the following:

SD-01 - Preconstruction	SD-02 - Shop Drawings	SD-03 - Product Data	SD-04 - Samples	SD-05 - Design Data	SD-06 - Test Reports
SD-07 - Certificates	SD-08 - Manufacturer's Instructions	SD-09 - Manufacturer's Field Reports	SD-10 - O&M Data	SD-11 - Closeout	
8. For each submittal item, the Contractor will assign Submittal Action Codes in column g of Section I. The County approving authority will assign Submittal Action Codes in column i of Section I. The Submittal Action Codes are:

A -- Approved as submitted.	F -- Receipt acknowledged.
B -- Approved, except as noted on drawings. Resubmission not required.	X -- Receipt acknowledged, does not comply with contract requirements, as noted.
C -- Approved, except as noted on drawings. Refer to attached comments. Resubmission required.	G -- Other action required ( <i>Specify</i> )
D -- Will be returned by separate correspondence.	K -- Government concurs with intermediate design. ( <i>For D-B contracts</i> )
E -- Disapproved. Refer to attached comments.	R -- Design submittal is acceptable for release for construction. ( <i>For D-B contracts</i> )
9. Approval of items does not relieve the contractor from complying with all the requirements of the contract.

**END OF SECTION 013300**

**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 Final Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Project Officer. The copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  4. 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. Contractor 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.
    - i. Stormwater Management Facility as-built drawings shall be signed and sealed by a surveyor or engineer with a DPOR professional Virginia license.
  - 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, including but not limited to, the following:
  - 1. Concrete Footings for (including but limited to): Chain Link Fences, Reforestation Fence, Shade Structure, Trash Receptacles, Recycling Receptacles, Signage, Segmental Block Wall, Precast Benches at Basketball Court, Tennis Court Practice Wall, Tennis Netting and Basketball Poles
  - 2. Concrete Curbing in Parking Lot and Tennis Court
- B. Related Sections:
  - 1. Section 013300 – Submittal Procedures
  - 2. Section 0345000 – Precast Architectural Concrete
  - 3. Section 061063 – Exterior Rough Carpentry
  - 4. Section 101400 – Signage
  - 5. Section 129300 – Site Furnishings
  - 6. Section 133419 – Pre-Engineered Structures
  - 7. Section 221113 – Facility Water Distribution
  - 8. Section 312000 – Earth Moving
  - 9. Section 312500 – Temporary Erosion and Sediment Control
  - 10. Section 321123 – Aggregate Base Course and Underdrainage
  - 11. Section 321313 – Concrete Paving
  - 12. Section 323113 – Chain Link Fences
  - 13. Section 323223 – 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 deter-



mine 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, testing, 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 and exposed concrete 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; non-staining; 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 and Footings (exposed and 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.
- B. 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.
- C. 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 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."

## **2.04 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 312000 – Earth Moving. 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 deflection or any temporary or permanent damage to the structure. Prevent the breaking of edges and corners of concrete in the stripping of forms. Upon removal of formwork, immediately patch honeycombed areas and other voids to the satisfaction of the 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 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 defective 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 measurement for CAST-IN-PLACE CONCRETE to be paid for shall be for cast-in-place concrete pavement constructed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**END OF SECTION 033000**

## **SECTION 034500**

### **PRECAST ARCHITECTURAL CONCRETE**

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

##### **1.01 SUMMARY**

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work as required to make a complete Precast Architectural Concrete installation, as shown on the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
  - 1. Pre-Cast Concrete Seat Wall (Bid Alternate)
  - 2. Pre-Cast Concrete Steppers

##### **1.02 DEFINITIONS AND APPLICABLE STANDARDS**

- A. References:
  - 1. ACI – American Concrete Institute.
  - 2. ANSI – American National Standards Institute.
  - 3. APA – Architectural Precast Association.
  - 4. ASTM – American Society for Testing and Materials.
  - 5. AWS – American Welding Society.
  - 6. PCI – Precast/Pre-stressed Concrete Institute.

##### **1.03 SUBMITTALS**

- A. General:
  - 1. Collect information into a single Submittal for each element of construction and type of product or equipment identified under this Section for review.
  - 2. To expedite review, Submittal shall be organized and presented into specific sections or headings. Furnish neat, concise, legible, and clearly identifiable information, and sufficiently explicit detail, to enable proper evaluation for Contract compliance. Highlight catalog, product data, or brochures containing various products, sizes, and materials to show particular item submitted.
  - 3. Submittal Format: As applicable, furnish Submittal as a single electronic digital PDF (Portable Document Format) file.
- B. Digital Submittal Information:



1. Product/Material Data: Submit available product/material literature supplied by manufacturer's, indicating that their products comply with specified requirements. Provide manufacturing source (name, address, and telephone number), and distributor source (name, address, and telephone number) for each type of product/material.
    - a. Precast Architectural Concrete.
  2. Certificates: Submit certified copies of Precast Architectural Concrete mix design for each batch used.
  3. Scaled Shop Drawings: Provide enlarged scaled plans, elevations, sections, as required, for review by the Landscape Architect and Structural Engineer, indicating dimensioned fabrication and erection of Precast Architectural Concrete. Show construction including structural materials and components, joining materials, embedments, or other items attached to or concealed in the Work.
  4. Maintenance Program: Submit Manufacturer-recommended program for maintenance of each type of Precast Architectural Concrete indicated herein.
  5. Qualification Data: Submit names for firms and persons specified in the "Quality Assurance and Control" Article to demonstrate their capabilities and experience on similar Precast Architectural Concrete Unit installations.
- C. Material Samples: Submit four (4) sets of physical Material Samples for review of kind, color, pattern, size, 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. Include the full range of exposed color and texture expected in the completed Work. Provide Material Samples bound and individually wrapped in re-sealable labeled 1-gallon plastic bags (as applicable):
- D. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- E. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Project Officer with confirmation by the Landscape Architect, in writing.

#### **1.04 QUALITY ASSURANCE AND CONTROL**

- A. Manufacturer Qualifications:
1. Manufacturer with experience in successfully demonstrating the manufacturing of Precast Architectural Concrete Work similar in material, design, and extent to that indicated for this Project, with a record of successful performance, and with sufficient production capacity to produce required units without causing delay in the Work.
  2. Manufacturer shall be an APA - Certified Production Plant.
- B. Installer Qualifications: Engage an experienced Installer with experience in successfully demonstrating the installation of Precast Architectural Concrete Work similar in material, design, and extent to that indicated for this Project, with a record of successful

performance, and with sufficient production capacity to produce required units without causing delay in the Work.

- C. Comply with requirements of PCI MNL 117 for manufacturing, testing, and dimensional tolerances for fabrication and erection.
- D. Design Precast Architectural Concrete mixes in compliance with ACI 318.
- E. Welders, welding operators, and tackers shall be qualified in accordance with AWS D1.1. Re-qualify welders who have not performed welding for three (3) or more years.
- F. Shop welding, as required, shall be in accordance with AWS D1.1.
- G. Field-Constructed Mock-ups:
  - 1. Provide a complete fabricated seat-wall unit for all respective materials receiving Precast Architectural Concrete specified herein this Section which is to be used as the basis for judging quality of workmanship throughout the project, as follows:
    - a. Pre-Cast Concrete Seat-wall unit, complete.
  - 2. Prior to the installation of Work in this Section, erect Field-Constructed Mock-up to verify selections made under the Submittals Article to demonstrate aesthetic effects as well as qualities of materials and execution. Build Field-Constructed Mock-ups to comply with the following requirements, using materials indicated for final Unit of Work, including same base construction, joints, and contiguous Work as indicated.
  - 3. Locate Field-Constructed Mock-ups in the location and of the size indicated or, if not indicated, as directed by the Project Officer with confirmation by the Landscape Architect.
  - 4. Notify the Project Officer and Landscape Architect at least two (2) weeks in advance of the dates and times when the Field-Constructed Mock-up will be erected and ready for review.
  - 5. Demonstrate the proposed range of aesthetic effects and workmanship in the Field-Constructed Mock-up that will be produced in final unit of Work.
  - 6. When the Project Officer and Landscape Architect determines that a Field-Constructed Mock-up does not meet requirements, retain it for reference and construct another Field-Constructed Mock-up until it is accepted. Modify or correct Work as directed by Project Officer with confirmation by the Landscape Architect.
  - 7. Obtain the Project Officer's and the Landscape Architect's acceptance of the Field-Constructed Mock-up, in writing, prior to the start of the final Unit of Work. An accepted Mock-up is a prerequisite to commencing Work under this Section.
  - 8. Retain and maintain Field-Constructed Mock-ups during construction in an undisturbed condition. Accepted Field-Constructed Mock-ups shall be the standard for judging the completed Work under this Section.
  - 9. Demolish and remove the Field-Constructed Mock-ups when directed by the Project Officer.
  - 10. Accepted Field-Constructed Mock-ups may become part of the completed Work, if directed by the Project Officer and Landscape Architect.

## **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Provide new, unused materials indicated under this Section. Store and secure properly to prevent theft or damage.
- B. Delivery: Transport and deliver Precast Architectural Concrete (Units) on pallets, packaged in such a manner so that no damage occurs to the material. Catalog items shall be delivered in their original containers, with seals unbroken and labels intact until their installation. Wrapped or bundled materials shall clearly show their manufacturer's name and trademark.
- C. Storage: Cover with non-staining, waterproof paper when necessary to protect them from weather.
- D. Damaged Materials: Be responsible for all damage or disfiguration of pre-cast work until Final Completion. Remove off Project Site and replace at no additional cost to Arlington County all damaged or rejected pre-cast materials.
- E. Deliver and install materials so as to not delay work and install only after preparations for installation have been completed.

## **1.06 COORDINATION, SCHEDULING, AND OBSERVATIONS**

- A. Notify Contractors performing Work related to installation of Work under this Section in ample time so as to allow sufficient time for them to perform their portion of Work and that progress of Work is not delayed. Verify conditions at the Project Site for Work that affects installation under this Section. Coordinate items of other trades to be furnished and set in place.
- B. Field Measurements: Perform accordingly per requirements under Section 042000 – Concrete Unit Masonry.
- C. Perform installation operations only when weather is suitable in accordance with locally accepted practices.
- D. Grades and Levels: Perform accordingly per requirements under Section 042000 – Concrete Unit Masonry.
- E. Construction Site Observations: Periodic site observations shall be made by the Project Officer and Landscape Architect during the installation of Work under this Section for compliance with requirements for type, size, and quality. The Project Officer and Landscape Architect retains right to observe Work for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected materials immediately from Project Site. The Contractor shall request, in writing, at least one (1) week in advance of the time when mandatory site observation(s) by the Project Officer and Landscape Architect are required.

## **1.07 SUBSTITUTIONS**

- A. Consideration: Materials to be considered equal to the Materials indicated herein this Section shall be reviewed by the Project Officer with confirmation by the Landscape Architect. Materials with equal performance characteristics produced by other

Manufacturer's and/or Distributors may be considered, providing deviations in dimensional size, color, composition, operation, and/or other characteristics do not change the design concept, aesthetic appearance, nor intended performance, as solely judged by the Landscape Architect. The burden of proof on product equality is on the Contractor.

- B. Specific reference to Manufacturer's names and products specified herein are used as standards of quality. This implies no right to the Contractor to substitute other materials without prior written approval by the Project Officer for Work under this Section.
- C. Materials substituted and installed by the Contractor, without prior written approval by the Project Officer with confirmation by the Landscape Architect, may be rejected. Contractor shall not be entitled to be compensated by the County where the Contractor has installed rejected substitutions without receiving prior written approval.
- D. Contract Price: Substituted Materials under this Section shall not increase the Contract price.

## **PART 2 - PRODUCTS**

### **2.01 SUGGESTED MANUFACTURERS**

- A. Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
  - 1. Slab Bench, 18"x60", by QCP
  - 2. Concrete Backless Bench, 24"x17", by Belson Outdoors
  - 3. Socrates Bench 24"x18", by Landscape Forms
  - 4. TF5113 (72"x18") or TF5117 (48"x18") by Wausau Made
  - 5. Rectangular Campus Bench 72" or 96" x 24" by Doty & Sons Concrete
  - 6. Or equal, as approved by the Landscape Architect.
  - 7. The Precast Concrete Steppers shall be custom made by the same manufacturer as the Precast Concrete Bench.

### **2.02 FINISHES**

- A. Color: Davis Color or approved equal; as selected from the full range of standard manufacturer's colors
- B. Finish: Smooth Acid Etched.

### **2.03 MATERIALS FOR PRECAST ARCHITECTURAL CONCRETE ASSEMBLIES**

- A. Portland Cement:
  - 1. Type: Meet ASTM C150, Type I or III. Use only one brand and type for entire job. White cement may be required for selected colors.
  - 2. Minimum Compressive Strength at 28 Days: 5,000 PSI.
  - 3. Maximum Absorption Rate:
    - a. Regular Weight Concrete: Five-percent (5%).

- b. Lightweight Concrete: Twelve-percent (12%).
  - 4. Sacks of cement per cubic yard of concrete: 6.5 minimum.
  - 5. Slump: Three-inches (3") maximum.
  - 6. No other admixtures are allowed without Project Officer's approval.
- B. Aggregates:
  - 1. Regular Weight Concrete: Meet ASTM C33, with maximum 3/4 in. size or to maximum 1/5 width of minimum precast section.
  - 2. Light-weight Concrete: Meet ASTM C330, with maximum 5/8 in. size or to maximum 1/5 width of minimum precast section.
- C. Supplementary Cementitious Materials (fly ash, blast furnace slag, etc.) shall not be used.

## **2.04 ACCESSORIES FOR PRECAST ARCHITECTURAL CONCRETE ASSEMBLIES**

- A. Reinforcement:
  - 1. Reinforcing Bars: Meet ASTM A615, Grade 40 deformed billet-steel bars, clean and free from rust, scale, or coating that will reduce bond.
  - 2. Welded Wire Fabric: Meet ASTM A185. Leave tags designating wire size and spacing on each roll until ready for use.
- B. Water: Clean, potable, free from injurious amounts of oils, alkalis, organic materials and other deleterious materials.
- C. Admixtures:
  - 1. Air-Entraining Admixture:
    - a. Meet ASTM C260.
    - b. Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
      - 1) *Daravair 1000, W.R, Grace Construction Products, 800-433-0020.*
      - 2) *Micro-Air, Master Builders, Inc., 800-628-9990.*
      - 3) *Or equal, as approved by the Landscape Architect.*
    - c. Application Rate: Per selected Manufacturer's latest printed instructions.
  - 2. Integral Concrete Coloring Admixture:
    - a. Pure mineral oxide, lime-proof and non-fading, designed for use in architectural concrete, from a single source, and shall be like in color and visual appearance. Meet ASTM C979.
    - b. Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
      - 1) *Davis Color, White.*
      - 2) *Or equal, as approved by the Landscape Architect.*
    - c. Application Rate: Per selected Manufacturer's latest printed instructions.
    - d. Percentage: Maximum ten-percent (10%) of the cement content by weight.
- D. Inserts/Miscellaneous Installation Mounting Hardware (Dowels): AISI stainless steel, Type 304, in length as indicated in Contract Drawings.

- E. Epoxy Adhesive: 100% solids, two-component, high-modulus, high bond-strength epoxy adhesive, resistive to chemicals, moisture, salts, alkalis, acids, or solvents, specifically formulated for the purpose of bonding concrete to concrete or masonry.
  - 1. Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
    - a. Sikadur 31 Hi-Mod Gel, Sika Corporation.
    - b. Epobond™, L&M Construction Chemicals.
    - c. Or equal as approved by the Project Officer with confirmation by the Landscape Architect.

## **2.05 SETTING MORTAR AND GROUT**

- A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C91/C91M.
- E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.
  - 1. Color: As selected by Landscape Architect from full range of manufacturer's standard colors
- F. Aggregate for Mortar: ASTM C144.
  - 1. White-Mortar Aggregates: Natural white sand or crushed white stone.
  - 2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- G. Aggregate for Grout: ASTM C404.
- H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- I. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
- J. Water: Potable.

## **2.06 DESIGN MIXES**

- A. Design Mixes by Manufacturer appropriate to type and strength of Precast Architectural Concrete that will produce Precast Architectural Concrete of specified strengths and approved finishes. Mix designs shall indicate:
  - 1. Water-cement ratio.
  - 2. Water content.
  - 3. Admixture content.
  - 4. Cement content.
  - 5. Aggregate content.
  - 6. Aggregate gradations.
  - 7. Slump.
  - 8. Air content.
  - 9. Strength.
- B. More than one (1) Mix Design may be required to produce Precast Architectural Concrete Units indicated. Designate mixes A, B, C, etc. if more than one (1) mix is required.

## **2.07 FABRICATION**

- A. Conform to applicable requirements of ACI and PCI.
- B. Manufacture Precast Architectural Concrete items to ensure uniformity of dimensions and finishes.
- C. Provide special corner and medallion shapes as indicated.
- D. Place concrete in molds to prevent cold joints within units. Do not use supports for reinforcing steel from the exposed face. Provide  $\frac{3}{4}$  inch minimum cover for all reinforcing.
- E. Locate embedded items accurately.
- F. Block out openings for embedded items.
- G. Perform welds to comply with AWS provisions.
- H. Cure Precast Architectural Concrete to comply with ACI 533-3R.
- I. Deposit and vibrate concrete to ensure proper consolidation, elimination of unintentional cold joints, and to minimize entrapped air on exposed surfaces.
- J. Fabricate Precast Architectural Concrete items straight, smooth, and true to size and shape, with exposed edges and corners precise and square to profiles indicated. Items that are warped, cracked, broken, spalled, stained or otherwise defective will not be acceptable.
- K. Clearly mark each Precast Architectural Concrete Unit, and other pieces as necessary on a surface to be concealed, identifying it for location and for date of casting.
- L. Tolerances:

1. Overall dimension under 10-feet (height or width): Plus or minus (+/-) 1/8-inch.
2. Overall dimension under 20-feet (height or width): Plus (+) 1/8-inch, minus (-) 3/16-inch.
3. Overall dimension under 30-feet (height or width): Plus (+) 1/8-inch, minus (-) 1/4-inch.
4. Thickness: Plus or minus (+/-) 1/8-inch.
5. Insert location: Plus or minus (+/-) 1/8-inch.
6. Bowing or Warping: 1/700 of precast unit dimension.

## **2.08 SOURCE QUALITY CONTROL**

- A. Testing Laboratory employed by Arlington County will perform the following:
  1. Sample and test concrete ingredients.
  2. Review the Contractor's proposed mix design.
  3. Inspect plant and equipment for measuring, mixing and transporting concrete.
  4. Inspect batching and mixing operations.
  5. Inspect concrete mixes, performing aggregate and cement analyses.
  6. Review mill test reports for steel and inspect reinforcement and embedded items.
  7. Perform visual inspection of welds.
  8. Perform slump tests.
  9. Make cylinders for laboratory testing of compressive strength and perform tests in accordance with ASTM C39.
  
- B. If there is evidence that strength of unit does not meet specification requirements, upon direction of the Project Officer with confirmation by the Landscape Architect, the Testing Laboratory will make core samples drilled from hardened Precast Architectural Concrete at locations designated by the Project Officer to perform non-destructive tests to determine compressive strength.
  1. Testing Laboratory will determine compressive strength of drilled cores in accordance with ASTM C42 by the following:
    - a. Taking at least three representative cores from Precast Architectural Concrete Units of suspect strength.
    - b. Testing cores in saturated-surface-dry condition in accordance with ACI 318 if Precast Architectural Concrete will be wet during use of completed structure.
    - c. Testing cores in air-dry condition in accordance with ACI 318 if Precast Architectural Concrete will be dry at all times during use of completed structure.
  2. Strength of Precast Architectural Concrete for each series of cores will be considered satisfactory if their average compressive strength is at least eighty-five-percent (85%) of twenty-eight (28)-day compressive strength.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Existing Conditions: Examine surfaces to receive Precast Architectural Concrete Work. Report to Project Officer conditions found to be in conflict or detrimental to installation of Precast Architectural Concrete Work.



### **3.02 PREPARATION**

- A. Field Measurement: Verify field measurements prior to installation Precast Architectural Concrete Work. Do not install Precast Architectural Concrete Work where conditions differ from those shown on the Contract Drawings and in the Contract Specifications.
- B. Cleaning: Remove dirt and setting materials on finish surfaces prior to application of mortar or Precast Architectural Concrete materials.

### **3.03 INSTALLATION**

- A. Install Precast Architectural Concrete Units level, plumb, in line and true within the non-cumulative and individual tolerances.
- B. Mortar Bed: Provide even, level mortar bed throughout. Set all Units in mortar bed, plumb and true to grade with adjacent pieces flush.
- C. Conform to applicable requirements of referenced standards. Erect Units without damage to shape or finish.
- D. Securely fasten items in place at locations indicated. Method of attachment shall be proposed by manufacturer and installer and indicated on Shop Drawings.
- E. Grout joints: Brace Units until grout has reached sufficient strength to support units and until final connections can be made.
- F. Maintain Units clean and free of grout or other construction materials during and after installation.
- G. Joints:
  - 1. Expansion: Provide expansion joints as shown on the Contract Drawings.
  - 2. Joint Tolerances: 1/16 in. or less. Form uniform joints throughout the Work.

### **3.04 CLEANING**

- A. After completion of Precast Architectural Concrete installation, clean surfaces of excess or spilled mortar or concrete materials.
- B. Use mild soap, fiber brushes and clean water. Avoid contamination of adjacent Work.
- C. Patching is not allowed.
- D. Replace badly damaged Precast Architectural Concrete Units. Project Officer with confirmation by Landscape Architect will be sole judge of degree of damage or mismatch of finish that will require replacement.
- E. Protect Precast Architectural Concrete Units throughout construction and repair damage as specified.
- F. Upon completion of Work, remove materials, tools, rubbish and debris resulting from the Work.

**PART 4 – MEASUREMENT**

**4.01** The measurement for PRECAST ARCHITECTURAL CONCRETE STEPPERS to be paid for shall be for Precast Architectural Concrete Steppers furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.02** The measurement for PRECAST ARCHITECTURAL CONCRETE SEATWALLS (BID ADD ALTERNATE 1A) to be paid for shall be for Precast Architectural Concrete Seatwalls furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**END OF SECTION 034500**

# **DIVISION 04**

## **MASONRY**

## SECTION 040105

### MASONRY RESTORATION AND CLEANING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Cleaning of existing stone wall surfaces; re-anchoring loose tennis court stone in situ; salvaging and cleaning stone from demolished basketball court wall and anchoring to tennis court wall as needed; replacement of damaged stone with salvaged recovered stone; repointing existing mortar joints; re-anchoring stone.
2. Cleaning, replacing, repointing and re-anchoring loose/damaged stone shall occur on the tennis court stone wall. Refer to drawing sheet ALT-01 for wall location.
3. Pointing and repointing shall occur to the following extent:
  - a. Loose or disintegrated mortar
  - b. Holes and missing mortar
  - c. Cracks that can be penetrated ¼” or more by a knife black .027inch thick
  - d. Cracks 1/16” or more in width and of any depth
  - e. Hollow sounding joints when tapped by a metal object
  - f. Eroded surfaces ¼” or more deep
  - g. Deterioration to the point that mortar can be easily removed by hand, without tools.
  - h. Joints filled with substances other than mortar.
  - i. Any other problem areas as directed by the Project Officer.
4. Replacing and re-anchoring stone shall occur to the following extent:
  - a. Loose, spalled, deteriorated, unsound, or damaged stone
  - b. Any other problem areas as directed by the Project Officer.
5. Cleaning shall occur to the following extent:
  - a. Efflorescence, water stains, stains, splashed/splattered materials
  - b. New or existing mortar/grout stains
  - c. Vandalized, tagged, discolored, painted, marked or any unnatural appearance
  - d. Any other problem areas as directed by the Project Officer.

##### 1.2 PREINSTALLATION MEETING

- A. Preinstallation Conference: Conduct conference on Work within this Section at Project Site. Coordinate meeting date/time/attendees with Project Officer.
- B. Review methods and procedures including, but not limited to:

1. Masonry personnel, equipment, materials, application, sequencing, tolerances and quality control program.

### **1.3 ACTION SUBMITTALS**

#### **A. Product Data:**

1. Submit data on cleaning compounds and cleaning solutions
2. Submit data on mortar for each type, color, and texture.
3. Accessories: each type of anchor, accessory and miscellaneous support.
4. Submit manufacturer's technical data for each product indicated, including recommendations for their application and use; include test reports and certifications substantiating that products comply with requirements.

#### **B. Samples:**

1. For each color of mortar required.

#### **C. Representative of the restoration subcontractor shall submit a written restoration plan and restorer's step-by-step written instruction tailored specifically for this project.**

1. Submit written plan of procedures and materials to be used in complying with this Section, including written description of cleaning methods, spray working pressures, materials, pre-soaking durations and equipment proposed for use in cleaning stone.
2. Elaborate on methods to be used, including: disposal plan including location of approved disposal site; and detailed description of methods to be employed to control pollution.
3. Written plan shall also include methods and procedures listed in 1.2(B)1 above.
4. Quality Control Plan

#### **D. Submit letters to authenticate installer's required experience.**

### **1.4 FIELD CONDITIONS**

#### **A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.**

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried.

#### **B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.**

#### **C. Do not apply cleaning materials under windy conditions, which would cause cleaning products or protective treatments to be blown onto adjacent unprotected surfaces.**

#### **D. Do not apply cleaning materials to frozen substrate; allow adequate time for substrate to thaw, if freezing conditions exist before application.**

- E. Do not apply consolidation or protective treatments earlier than 24 hours after rain or if rain is predicted for a period of 6 hours after application, unless otherwise indicated by manufacturer's written instructions.
- F. Protection of Work: During construction cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work.

## **1.5 QUALITY ASSURANCE**

### **A. Performance Requirements**

- 1. Perform work in accordance with Masonry Standards Joint Committee (MSJC) Code and MSJC Specifications.
- 2. Maintain one copy of each document on site.

### **B. Qualifications**

- 1. Manufacturer:
  - a. Company specializing in manufacturing products specified in this Section with minimum five years' experience.
- 2. Installer:
  - a. Company specializing in performing Work of this Section with minimum five years' documented experience.

### **C. Mockup**

- 1. Rake out, clean, restore and repoint an inconspicuous and discreet section of the existing wall, approximately 4' long x 4' high. Final location shall be as directed by Arlington County Project Officer. Allow waiting period of not less than seven calendar days after completion of each sample cleaning to permit study of sample areas for negative reactions.
- 2. Mockup shall be reviewed and approved by Arlington County's Project Officer and Landscape Architect prior to commencing the remaining Work and proceeding with general cleaning operations.
  - a. Repeat mockups on up to three separate panels, until accepted in writing.
  - b. Acceptable panels illustrating results of restoration and cleaning will become standard for the Work of this Section and may become part of the complete Work if undisturbed at time of Substantial Completion.

## **1.6 DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials neatly stacked and tied on pallets; store clear of ground with adequate waterproof covering.
- B. Store restoration cleaner materials in manufacturer's packaging; keep containers tightly closed and away from open flames

- C. Store mortar ingredients in manufacturer's packaging, or when delivered loose, with adequate weatherproof covering.
- D. Comply with manufacturer's recommendations for minimum and maximum temperature requirements for storage.

## **1.7 SEQUENCING**

- A. Provide masonry restoration and cleaning materials and other construction in ample time to complete Work in a timely manner
- B. Perform repointing before cleaning masonry surfaces.

## **PART 2 - PRODUCTS**

### **2.1 RECOVERED, CLEANED AND REUSED STONE (FROM DEMOLISHED BASKETBALL COURT WALL)**

- A. When replacing damaged or missing stone on the tennis court wall, salvage the natural stone from the demolished basketball court wall. Clean stone and remove any mortar, foreign materials or markings without damaging the stone. Reuse the salvaged basketball court stone as needed to replace missing or damaged stones on the tennis court wall.
- B. Fabrication: Select, cut and split salvaged stone to produce pieces of thickness, size, and shape matching the existing wall to remain.

### **2.2 MASONRY RESTORATION AND CLEANING OF EXISTING STONES ON WALLS TO REMAIN**

- A. Verify acceptability of cleaner for cleaning new masonry with pigmented mortar joints and for stone variety used. For example, do not use acidic cleaners on limestone.
- B. Cleaner Manufacturers:
  - 1. PROSOCO, Inc.
  - 2. Diedrich Chemicals Restoration Technology
  - 3. EaCo Chem, Inc.
  - 4. Hydrochemical Techniques, Inc.
  - 5. Dominion Restoration Products
  - 6. Or approved equal, as recommended by subcontractor based on successful past performance and as reviewed and approved during the process described in Part I above.
- C. Components – Exterior Restoration and Cleaning
  - 1. Restoration Cleaner clear liquid; 1.050 – 1.12 specific gravity; no flash point; 1.5 – 3.0 pH
    - a. Basis of Design: Sure Klean Light Duty Restoration Cleaner or Sure Klean Heavy Duty Restoration Cleaner by PROSOCO, Inc., or approved equal.

- b. Or approved equal, as recommended by subcontractor based on successful past performance and as reviewed and approved during the process described in Part I above.
- 2. Water for Cleaning: Clean, potable, free of oils, acids, alkalis, salts and organic matter.
- 3. Brushes: Fiber bristle only
- 4. Mortar

## 2.3 MORTAR MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or Type II, except Type III may be used for cold-weather construction; natural color or white cement may be used as required to produce mortar color indicated.
  - 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C114.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Masonry Cement: ASTM C91/C91M.
- D. Mortar Pigments (if needed to match color of existing mortar): Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in stone masonry mortar.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Davis Colors; True Tone Mortar Colors
    - b. Lanxess Corporation; Bayferrox Iron Oxide Pigments
    - c. Solomon Colors; SGS Mortar Colors
    - d. Cathedral Stone Products, Inc.
- E. Colored Portland Cement-Lime Mix OR Colored Masonry Cement Mix (if needed to match color of existing mortar): Packaged blend of Portland cement, hydrated lime, and mortar pigments. Mix produces color indicated or, if not indicated, as selected from manufacturer's standard colors. Pigments do not exceed 10 percent of Portland cement by weight.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Colored Portland Cement-Lime Mix
      - 1) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime
      - 2) Lafarge North American; Eaglebond
      - 3) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement
    - b. Colored Masonry Cement Mix
      - 1) Essroc, Italcementi Group Brixment-in-Color
      - 2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Masonry Cement.
      - 3) Lafarge North America; Magnolia Masonry Cement.
      - 4) Lehigh Cement Company; Lehigh Custom Color Masonry Cement.
- F. Aggregate: ASTM C144 and as follows:
  - 1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 sieve.



2. Provide one of the following, with approval from Arlington County Project Officer, based on which best matches the walls' existing mortar joint color:
  - a. White Aggregates: Natural white sand or ground white stone.
  - b. Colored Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.

G. Water: Potable, ASTM C 270.

## **2.4 MASONRY VENEER REPAIR ANCHORS**

- A. Expansion Type Masonry Repair Anchors: Mechanical fasteners designed for masonry veneer stabilization consisting of 1/4-inch diameter, Type 304 stainless-steel rod with brass expanding shells at each end and water-shedding washer in the middle. Expanding shells shall be designed to provide positive mechanical anchorage to veneer on one end and backup masonry on the other.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. BLOK-LOK Limited, Torq-Lok.
    - b. Hohmann & Barnard, Inc.; #521RA-B Restoration Anchor
    - c. Or approved equal, as recommended by subcontractor based on successful past performance and as reviewed and approved during the process described in Part I above.
- B. Size: Sufficient to extend at least halfway, but not less than 1-1/2 inches, through stone masonry and with at least a 5/8-inch cover on exterior face.
- C. General: Provide anchors that allow vertical adjustment but resist a 100-lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.

## **2.5 MASONRY CLEANERS OF SALVAGED AND NEWLY REPLACED STONE**

- A. Verify acceptability of cleaner for cleaning new masonry with pigmented mortar joints and for stone variety used. For example, do not use acidic cleaners on limestone.
- B. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by cleaner manufacturer and stone producer.

## **2.6 MORTAR MIXES**

- A. General: Do not use admixtures unless otherwise indicated.
  1. Do not use calcium chloride.
  2. Use Portland cement-lime or masonry cement mortar unless otherwise indicated.
  3. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this

dampened condition for one to two hours. Add remaining water in small portions until mortar reaches required consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.

- B. Mortar strength shall not exceed strength in existing masonry construction.
- C. Tuck pointing mortar shall not be denser than original mortar; tuck pointing mortar shall be prehydrated.
- D. Color to match existing mortar.
- E. Mortar for Stone Masonry: Comply with ASTM C270, Proportion Specification. Type S.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- A. Verify surfaces to be cleaned and restored are ready for Work of this Section.
  - 1. Clean substrates of substances that interfere with penetration or performance of surface treatments (i.e. including but not limited to plant growth, paint, foreign debris).
  - 2. Test for moisture content and pH level, according to manufacturer's instructions, to ensure surface is prepared and dry to receive surface treatments.
- B. Protect elements surrounding Work of this Section from damage or disfiguration.
- C. Immediately remove stains, efflorescence, or other excess resulting from Work of this Section.
- D. Protect all adjacent surfaces and materials from damage; lay 1/2-inch plywood or drop cloth over full extent of work area and traffic route
- E. Protection
  - 1. Close off, seal, mask and board up areas, landscaping, materials and surfaces not receiving Work of this Section to protect from damage.
  - 2. Protect persons and objects surrounding wall whose masonry surfaces are being restored and surrounding buildings from injury resulting from masonry restoration Work.
  - 3. Protect all adjacent materials from contact with acidic chemical cleaners by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape; apply masking agent to comply with manufacturer's recommendations; do not apply liquid masking agent to painted or porous surfaces.
  - 4. Protect unpainted metal from contact with alkali chemical cleaners by covering them either with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  - 5. Immediately remove mortar splatters in contact with exposed stone and other surfaces.
- F. Construct dust proof and weatherproof partitions to close off occupied areas

## 3.2 INSTALLATION

### A. Rebuilding:

1. Cut out damaged, spalled and deteriorated masonry with care in manner to prevent damage to adjacent remaining materials; cut off full units from joint to joint and in manner to permit replacement with full size units.
2. Support structure in advance of cutting out units to maintain stability of remaining materials.
3. Cut away loose or unsound adjoining masonry and mortar to provide firm and solid bearing for new Work.
4. Salvage as many whole, undamaged stones as possible.
5. Remove mortar, loose particles and soil from salvaged stone by cleaning with brushes and water; store stone for reuse. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.
6. Ensure anchors, ties, reinforcing, and flashing are correctly located and built in.
  - a. Anchor stone masonry to concrete with corrugated-metal anchors or wire anchors. Fasten using Expansion Type Masonry Repair Anchors.
  - b. Embed veneer anchors in mortar joints of stone masonry at least halfway, but not less than 1-1/2 inches, through stone masonry and with at least a 5/8-inch cover on exterior face.
  - c. Install masonry repair anchors in horizontal mortar joints and according to manufacturer's written instructions. Install at not more than 16" o.c. vertically and 16" o.c. horizontally. Recess anchors at least 5/8" from surface of mortar joint and fill recess with pointing mortar.
  - d. Rake out joints for pointing with mortar to depth of not less than 1/2 inch before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides.
7. Install built in masonry Work to match and align with existing, with joints and coursing true and level, faces plumb and in line.
8. Build in openings, accessories and fittings.
9. Build in new and reclaimed stones.
10. If field cutting and trimming of salvages stones is required, use motor driven saw designed to cut masonry with straight, true, clean, sharp and unchipped edges. Stone sizes shall be variable in length and height to match sizes of existing stones already on wall.
11. Lay replacement stone with completely filled bed, head and collar joints.
12. Butter ends with sufficient mortar to fill head joints and shove into place.
13. Wet stone according to ASTM initial rates of absorption (suction).
14. Use wetting methods, which ensure that units are nearly saturated but surface dry when laid.
15. Arrange stones in random pattern with color and size variations uniformly dispersed for an evenly blended appearance that when viewed from 20' away displays a uniform appearance that matches existing wall pattern.
16. Maintain joint width for replacement units to match existing Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment if any.
17. Tool exposed mortar joints in repaired areas to match joints of surrounding existing stonework.

### 3.3 POINTING AND REPOINTING

- A. Do not rake out and repoint joints where not required.
- B. Rake out depth shall equal to 2-1/2 times their width, but not less than minimum 1/2 inch depth or until sound mortar is reached.
- C. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades.
- D. Notify Project Officer of unforeseen detrimental conditions, including voids in mortar joints, cracks, loose stone, rotted wood, rusted metal and other deteriorated items.
- E. Utilize power tools only after test cuts determine no damage to masonry units results.
- F. Do not damage masonry units, spall edge of masonry unit or widen joints; replace any masonry units which become damaged at the Contractor's expense.
- G. When cutting is complete, remove dust, mortar particles and loose material by brushing with air jet; brush, vacuum or flush joints to remove dirt and loose debris.
- H. Premoisten joint and apply mortar specified herein. Joint surfaces shall be damp but free of standing water.
- I. Apply first layer of pointing mortar to areas where existing mortar was removed to depths greater than surrounding areas; apply in layers not greater than 3/8 inch until a uniform depth is formed; compact each layer thoroughly and allow to become thumb-print-hard before applying next layer.
- J. After joints have been filled to a uniform depth, place remaining pointing material in three layers with each of the first and second layers filling approximately 2/5 of joint depth and third layer the remaining 1/5; fully compact each layer and allow to become thumb-print-hard before applying next layer.
- K. Where existing units have rounded edges, recess final layer slightly from face.
- L. Take care not to spread mortar over edges onto exposed surfaces or to feather edge mortar.
- M. When mortar is thumb-print-hard, tool joints to match the original appearance of joints, unless otherwise indicated. Depending on existing conditions, the joint profile of existing mortar joints may be one of the following:
  - 1. Concave
  - 2. Smooth
  - 3. Flat face slightly below edges of stone
  - 4. Recessed or flush with a half-round raised bead in the middle of the joint.
  - 5. Depth: match existing, 1"-1.5" max.
- N. Tuck pointing mortar shall not be denser than original mortar.
- O. Moist cure for 72 hours.

- P. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Remove mortar and repoint.
- Q. Where repointing Work precedes cleaning of existing masonry and stone, allow mortar to harden not less than 30 days before beginning cleaning Work.

### **3.4 ADJUSTING AND CLEANING**

- A. Restoration Cleaning
  - 1. Clean surfaces and remove large particles with wood scrapers or non-ferrous wire brush.
  - 2. Unless otherwise indicated, dilute chemical cleaning materials with water to produce solutions of concentration indicated but not greater than that recommended by chemical cleaner manufacturer.
  - 3. Brush coat stone masonry with restoration cleaner, mixed into solution identical to solution required for sample area.
  - 4. Provide second application when required by preliminary test of sample area.
  - 5. Allow sufficient time for solution to remain on masonry and agitate with soft fiber brush or sponge.
  - 6. Rinse from bottom up with potable water applied at 400 to 600 psi and at rate of 4 gallons per minute; older, more delicate masonry may require restricting water pressure to avoid damage.
- B. In-Progress Cleaning: Clean stone masonry as work progresses. Remove mortar fins and smears before tooling joints.
- C. Final Cleaning: After mortar is thoroughly set and cured, clean stone masonry as follows:
  - 1. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes. Obtain Landscape Architect's approval of sample cleaning before cleaning stone masonry.
  - 2. As work proceeds and on completion, remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels. Remove excess mortar, smears, droppings, using stiff nylon bristle brushes and clean water, spray applied at low pressure (40 psi maximum); metal scrapers or brushes shall not be used; acid or alkali cleaning agents shall not be used.
  - 3. Remove temporary coverings and protection of adjacent work areas.
  - 4. Clean surrounding surfaces.
  - 5. Repair or replace damaged or deteriorated surfaces.
  - 6. Remove construction debris from project site and legally dispose of debris.
- D. Dispose of run-off from cleaning operations by legal means and in a manner which prevents soil erosion, undermining of paving and foundations and damage to landscaping.

### **3.5 EXCESS MATERIALS AND WASTE**

- A. Excess Stone: Stack excess stone where directed by Project Officer for Owner's use. Haul off site and legally dispose if Project Officer declines keeping excess stones on site.

B. Disposal as Fill Material: Not permitted.

**PART 4 - MEASUREMENT**

**4.1** The unit price for REPAIR AND REPOINT EXISTING STONE CLAD WALLS (BID ADD ALTERNATE 2) shall be LUMP SUMP and shall include the cost of all labor, materials, equipment, and incidental expenses necessary to complete the work, including all Work described in the Section, all in accordance with the plans and specifications, and to the approval of the Project Officer.

**END OF SECTION 040105**

# **SECTION 042200 - CONCRETE UNIT MASONRY**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Concrete masonry units.
  - 2. Steel reinforcing bars.

### **1.2 RELATED SECTIONS**

- A. Section 011000 – Summary and General Requirements
- B. Section 013300 – Submittal Procedures
- C. Section 033000 – Cast-in-Place Concrete
- D. Section 099113 – Exterior Painting
- E. Section 312000 – Earth Moving
- F. Section 321123 – Aggregate Base Course and Underdrainage
- G. Section 321315 – Asphalt Court Pavement
- H. Section 321316 – Asphalt Court Surfacing
- I. Section 323113 – Chain Link Fences
- J. Section 323223 – Segmental Retaining Walls

### **1.3**

#### **DEFINITIONS**

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings: Plan, Section, and Elevation of CMU Practice wall, including but not limited to cap stone, panting, grout, concrete footing and mortar. Include reinforcing steel -detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Shop

drawing shall be signed and sealed by a professional structural engineer, licensed in the state of Virginia.

C. Samples: For each type and color of the following:

1. CMUs.
2. Mortar.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of product. For masonry units, include **material test reports substantiating compliance with requirements.**
- B. Mix Designs: For each type of mortar **and grout.** Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
  2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.

## 1.6 QUALITY ASSURANCE

- A. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
1. Build sample panels for in size approximately **48 inches** long by **48 inches** high by **full thickness.**

## 1.7 FIELD CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

## 1.8 CONTRACTOR AND SUBCONTRACTOR QUALIFICATIONS

- A. An experience block layer who has completed freestanding CMU block walls and possesses at least ten (10) years of experience similar in material, design and extent to that indicated for the Project and whose work has resulted in construction with a record of successful in-service performance. Block-layer shall possess current certification from National Concrete Masonry



Association (NCMA) or Mason Contractors Association of America (MCAA) for this type of work.

- B. Contractor shall provide five (5) representative exterior CMU block wall projects (including pictures and references) for review and approval during submittal process.
- C. Contractor and any subcontractors shall guarantee their respective work against defective materials or workmanship for a period of five (5) years from the date of filing notice of completion and acceptance by Owner. Any defects within this five (5) year window will be repaired and replaced by the Contractor at no additional expense to Arlington County.

## **PART 2 - PRODUCTS**

### **2.1 UNIT MASONRY, GENERAL**

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

### **2.2 CONCRETE MASONRY UNITS**

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
  - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- B. Integral Water Repellent: Provide units made with integral water repellent.
- C. **CMUs: ASTM C90.**
  - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of **3050 psi**.
  - 2. Density Classification: **Normal weight**.

### **2.3 MORTAR AND GROUT MATERIALS**

- A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

- D. Masonry Cement: ASTM C91/C91M.
- E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.
- F. Aggregate for Mortar: ASTM C144.
  - 1. White-Mortar Aggregates: Natural white sand or crushed white stone.
  - 2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- G. Aggregate for Grout: ASTM C404.
- H. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
- I. Water: Potable.

## **2.4 REINFORCEMENT**

- A. Uncoated-Steel Reinforcing Bars: ASTM A615 or ASTM A996, Grade 60.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- C. Masonry-Joint Reinforcement, General: ASTM A951/A951M.
  - 1. Exterior Walls: Hot-dip galvanized carbon steel.
  - 2. Wire Size for Side Rods: 0.187-inch diameter.
  - 3. Wire Size for Cross Rods: 0.187-inch diameter.
  - 4. Spacing of Cross Rods: Not more than 16 inches o.c.
  - 5. Provide in lengths of not less than 10 feet.

## **2.5 TIES AND ANCHORS**

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
  - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.
- B. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
  - 1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.105-inch-thick steel sheet, galvanized after fabrication.
  - 2. Tie Section: Triangular-shaped wire tie made from 0.187-inch-diameter, hot-dip galvanized-steel wire.

3. Corrugated-Metal Ties: Metal strips not less than 7/8-inch-wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 0.105-inch-thick steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete.
- C. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4-inch-thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A153 or Epoxy coating 0.020 inch thick.

## 2.6 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
1. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.016 inch thick.
  2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.

## 2.7 MASONRY-CELL FILL

- A. Lightweight-Aggregate Fill: ASTM C331/C331M.

## 2.8 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
  2. For exterior reinforced masonry, use [**portland cement-lime**] [**or**] [**masonry cement**] mortar.
  3. For masonry below grade or in contact with earth, use [**Type M**] [**Type S**].
  4. For reinforced masonry, use [**Type S**] [**Type N**].
  5. For mortar parge coats, use [**Type S**] [**or**] [**Type N**].
  6. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
- B. Grout for Unit Masonry: Comply with ASTM C476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
  2. Proportion grout in accordance with ASTM C476, Table 1] or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
  3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143.

## **2.9 PRIMING AND PAINTING**

- A. As specified by block manufacturer and Specification 099113 – Exterior Painting.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION, GENERAL**

- A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

### **3.2 TOLERANCES**

- A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.

- B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.

- C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

### **3.3 LAYING MASONRY WALLS**

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

### **3.4 MORTAR BEDDING AND JOINTING**

- A. Lay hollow CMUs as follows:
  - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
  - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
  - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
  - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- C. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

### **3.5 MASONRY-CELL FILL**

- A. Pour lightweight-aggregate fill into cavities to fill void spaces. Maintain inspection ports to show presence of fill at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of fill to one story high, but not more than 20 feet.
- B. Install molded-polystyrene insulation units into masonry unit cells before laying units.

### **3.6 MASONRY-JOINT REINFORCEMENT**

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

### **3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE**

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:

1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

### **3.8 FLASHING**

- A. General: Install embedded flashing at ledges and other obstructions to downward flow of water in wall where indicated.
- B. Install flashing as follows unless otherwise indicated:

### **3.9 REINFORCED UNIT MASONRY**

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
  1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
  1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
  2. Limit height of vertical grout pours to not more than 60 inches.

### **3.10 FIELD QUALITY CONTROL**

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level [B] [C] in TMS 402/ACI 530/ASCE 5.
  1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
  2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.

3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for mortar air content and compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.
- I. Prism Test: For each type of construction provided, according to ASTM C1314 at 28 days.

### **3.11 PARGING**

- A. Parge exterior faces of below-grade masonry walls, where indicated, in two uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat, and scarify first coat to ensure full bond to subsequent coat.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

### **3.12 REPAIRING, POINTING, AND CLEANING**

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
  2. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

### **3.13 PRIMING AND PAINTING**

- A. As specified by block manufacturer and Specification 099113 – Exterior Painting.

### **3.14 MASONRY WASTE DISPOSAL**

- A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
  - 1. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

### **PART 4 - MEASUREMENT**

- 4.1 The measurement for PAINTED TENNIS COURT CMU PRACTICE WALL to be paid for shall be for Painted Tennis Court CMU Practice Wall installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**END OF SECTION 042200**



# **DIVISION 05**

## **METALS**

**SECTION 055000**  
**METAL FABRICATIONS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Custom Stainless-Steel Scupper and L-Angles.
- B. Products furnished, but not installed, under this Section include the following:
  - 1. Custom stainless-steel weld plates and L-Angle for casting into segmental block retaining wall.

**1.2 ACTION SUBMITTALS**

- A. Product Data: For the following:
  - 1. Fasteners.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Shop drawings shall be signed and sealed by a professional structural engineer, licensed in the state of Virginia. The scupper shop drawings shall be included with the segmental block wall shop drawings.

**1.3 RELATED SECTIONS**

- A. Section 0133000 – Submittal Procedures
- B. Section 321315 – Asphalt Court Pavement
- C. Section 321316 – Asphalt Court Surfacing
- D. Section 323223 – Segmental Retaining Walls

**PART 2 - PRODUCTS**

**2.1 METALS**

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

- B. Stainless Steel Bars and Shapes: ASTM A276, Type 316.

## 2.2 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
  - 1. Provide stainless steel fasteners for fastening stainless steel.

## 2.3 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- B. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- C. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

## 2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.

- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

## **2.5 GENERAL FINISH REQUIREMENTS**

- A. Finish metal fabrications after assembly.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION, GENERAL**

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: not permitted.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors as shown in construction drawings and approved shop drawings.

## **PART 4 - MEASUREMENT**

- 4.1 The measurement for CUSTOM STAINLESS STEEL SCUPPER to be paid for shall be for Custom Stainless Steel Scupper furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**END OF SECTION 055000**

## **DIVISION 06**

# **WOODS, PLASTICS, AND COMPOSITES**

**SECTION 061063**  
**EXTERIOR ROUGH CARPENTRY**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Pressure-Treated Direct-Bury Wood Posts & Hardware for Reforestation Fencing.

**1.2 RELATED SECTIONS**

- A. Section 033000 – Cast-in-Place Concrete
- B. Section 311300 – Tree Protection and Root Pruning
- C. Section 321123 – Aggregate Base Course and Underdrainage

**1.3 ACTION SUBMITTALS**

- A. Product Data: For preservative-treated wood products, fasteners/eye-bolts, turnbuckle, and all other associated hardware.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Material Certificates:
  - 1. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained.
- B. Evaluation Reports: For preservative-treated wood products, from ICC-ES.
- C. Samples: Type 316 Stainless Steel vinyl covered rope, ½” diameter, 1’ long

**1.5 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.

## **PART 2 - PRODUCTS**

### **2.1 LUMBER, GENERAL**

- A. Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by ALSC's Board of Review.
  - 1. Factory mark each item with grade stamp of grading agency.
  - 2. For items that are exposed to view in the completed Work, mark grade stamp on end or back of each piece
  - 3. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content: 19 percent.

### **2.2 POSTS**

- A. Dimension Lumber Posts: No. 1 or No. 2 grade and any of the following species:
  - 1. Mixed southern pine; SPIB.

### **2.3 PRESERVATIVE TREATMENT**

- A. Pressure treat boards and dimension lumber with waterborne preservative according to AWWA U1; Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
- B. Pressure treat timber with waterborne preservative according to AWWA U1; Use Category UC4a.
  - 1. Treatment with CCA shall include post-treatment fixation process.
- C. Preservative Chemicals: Acceptable to authorities having jurisdiction.
- D. Mark treated wood with treatment quality mark of an inspection agency approved by ALSC's Board of Review.

### **2.4 FASTENERS**

- A. General: Provide Type 316 stainless-steel fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide eye-bolts, minimum 6" length, but up to 8" length, to penetrate through wood substrate per construction drawings.
- B. Post-installed Anchors: Type 316 stainless-steel anchors with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing according to ASTM E488, conducted by a qualified independent testing and inspecting agency.

1. **Stainless-steel eye bolts, washers and nuts** complying with ASTM F593 and ASTM F594, Alloy Group 1. Bolt diameter = ½”

## **2.5 METAL ACCESSORIES**

- A. Type 316 Stainless Steel Hook and Eye Turnbuckle
  1. Turnbuckle Length: 6” (when screwed taut)
  2. Turnbuckle Diameter: ½”
- B. Type 316 Stainless Steel Wire Rope U-Bolt Clip
  1. Sized to securely hold wire rope
- C. Stainless Steel, Vinyl-Coated Wire Rope
  1. Rope Diameter: ½”

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION, GENERAL**

- A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.
- B. Framing Standard: Comply with AF&PA WCD1 unless otherwise indicated.
- C. Install fasteners to comply with manufacturer's written instructions.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Apply copper naphthenate field treatment to comply with AWWPA M4, to cut surfaces of preservative-treated lumber.
- F. Securely attach exterior rough carpentry work to substrate by anchoring and fastening as indicated, complying with the construction drawings.

## **PART 4 - MEASUREMENT**

- A. The measurement for the WIRE ROPE FENCE @ REFORESTATION AREA to be paid for shall be for Wire Rope Fence furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**END OF SECTION 061063**



## **SECTION 061300**

### **HEAVY TIMBER CONSTRUCTION**

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

##### **1.01 SUMMARY**

- A. Section includes:
  - 1. Timber Retaining Wall (North of Basketball Court)
  - 2. Timber Storm Drain End Wall
- B. Related Requirements:
  - 1. Section 013300 – Submittal Procedures
  - 2. Section 311000 – Site Clearing, Preparation, Demolition and Removals
  - 3. Section 312000 – Earth Moving
  - 4. Section 321216 – Asphalt Paving
  - 5. Section 321315 – Asphalt Court Pavement
  - 6. Section 321316 – Asphalt Court Surfacing
  - 7. Section 323113 – Chain Link Fences
  - 8. Section 334000 – Storm Drainage

##### **1.02 DEFINITIONS**

- A. Timbers: Lumber of 6 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 planing 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 measurement for TIMBER STORM DRAIN END WALL to be paid for shall be for Timber Storm Drain End Wall installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.02** The measurement for TIMBER RETAINING WALL (NORTH OF BASKETBALL COURT) to be paid for shall be for Timber Retaining Wall installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**END OF SECTION 061300**

# **DIVISION 09**

## **FINISHES**

# **SECTION 099113 - EXTERIOR PAINTING**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section includes surface preparation and the application of paint systems on:
  - 1. Concrete masonry units (CMUs).

### **1.2 Related Sections**

- A. Section 013300 – Submittal Procedures
- B. Section 042200 – Concrete Unit Masonry

### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
  - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
- B. Samples: For each type of paint system and each color and gloss of topcoat.

### **1.4 QUALITY ASSURANCE**

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Landscape Architect will select one surface to represent surfaces and conditions for application of each paint system.
    - a. Vertical and Horizontal Surfaces: Provide sample on the CMU block wall mockup.
    - b. Other Items: Landscape Architect will designate items or areas required.
  - 2. Final approval of color selections will be based on mockups.
    - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Landscape Architect at no added cost to Owner.

## **1.5 PAINTER QUALIFICATIONS**

- A. An experience painter who has completed exterior paint work and possesses at least ten (10) years of experience similar in material, design and extent to that indicated for the Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Contractor shall provide five (5) representative exterior painting projects (including pictures and references) for review and approval during submittal process.
- C. Contractor and any subcontractors shall guarantee their respective work against defective materials or workmanship for a period of five (5) years from the date of filing notice of completion and acceptance by Owner. Any defects within this five (5) year window will be repaired and replaced by the Contractor at no additional expense to Arlington County.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Behr Paint Company
- B. Benjamin Moore & Co.
- C. McCormick Paints
- D. PPG Paints
- E. Rust-Oleum Corporation
- F. Sherwin Williams Company
- G. Valspar Corporation
- H. Or approved equal.

### **2.2 PAINT, GENERAL**

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
  - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: Provide Manufacturer's full range of colors for review and selection by DPR Landscape Architect and Project Officer.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Masonry (Clay and CMUs): 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
  - 1. Application of coating indicates acceptance of surfaces and conditions.

### **3.2 PREPARATION**

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

### **3.3 APPLICATION**

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

### **3.4 CLEANING AND PROTECTION**

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Landscape Architect, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.



### 3.5 EXTERIOR PAINTING SCHEDULE

- A. Exterior painting schedule for primer, intermediate coat, and topcoat shall conform to MPI Architectural Painting Decision Tree (MPI Manual).

### **PART 4 - MEASUREMENT**

- 4.1 The priming, painting and all associated work mentioned above, including furnishing all labor, materials, and associated expenses necessary to complete the work, is incidental to the PAINTED TENNIS COURT CMU PRACTICE WALL line item (Specification Section 042200). Work shall be in accordance with the plans and specifications and to the approval of the Project Officer.

**END OF SECTION 099113**

# **DIVISION 10**

# **SPECIALTIES**

## **SECTION 101400**

### **SIGNAGE**

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

##### **1.01 SUMMARY**

- A. This Section includes the following:
  - 1. Entry Sign (Single Sided)
  - 2. Park Rules Sign (Single Sided)
  - 3. Reforestation Sign (Single Sided)
  - 4. Court Rules Sign (Single Sided)
  - 5. Tennis Court Rules Sign (Single Sided)
  - 6. Reserved Parking Sign on Aluminum Post (Single Sided)
  - 7. Aluminum Plate Court Number Sign (Single Sided)

##### **1.02 RELATED SECTIONS**

- A. Section 0133000 – Submittal Procedures
- B. Section 033000 – Cast in Place Concrete
- C. Section 321123 – Aggregate Base Course and Underdrainage
- D. Section 321313 – Concrete Paving
- E. 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 post, footing and fasteners shall be guaranteed for a period of five (5) years against defects in materials and workmanship from the date of Final Completion.
- B. 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
  - ii. Gelberg Signs, 6511 Chillum Place, NW Washington, D.C., 20012 202.882.7733, gelbergsigns.com
  - iii. 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 craftsmanship.

#### 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. POSTS

- 1. General: Fabricate posts to lengths required for mounting method indicated.
  - i. Direct-Burial Method: Provide posts 36 inches longer than height of sign to permit direct embedment in concrete foundations.
  - ii. Size: As indicated on drawings.
  - iii. Colors: As indicated on drawings.

#### D. 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.

E. TEXT

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

F. 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.

G. 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.

H. ACCESSORIES

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

I. CONCRETE FOOTING FOR SIGN POSTS: Per Section 033000 Cast in Place Concrete and detail 3/L-05.

J. MOUNTING SGNS TO CHAIN LINK FENCE: 2" standard chain link fence mounting kit, black powder coated Y4904 by SafetySign.com or approved equal.

**2.02 TEXT**

A. Sign text shall read as shown on the drawings.

1. Nueva Std unless otherwise noted.

**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 CONCRETE FOOTING**

- A. Install concrete footing in accordance with Specification 033000.

### **3.04 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.

### **3.05 INSTALLATION**

- A. Excavation: in firm, undisturbed or compacted soil, drill (or using post-hole digger) hand-excavate holes for posts to diameters and spacing indicated. Excavate hole depths as indicated on the drawings.
- B. Install signs level, plumb, and at height indicated, with surfaces free from distortion and other defects in appearance.
- C. Setting Posts: Center and align posts in holes 3 inches above bottom of excavation, unless otherwise indicated. Place concrete and vibrate or tamp for consolidation. Check for alignment and hold in position until concrete has achieved its initial set.
- D. Comply with requirements in Division 3 Section 033000 'Cast in Place Concrete'.
- E. Install all work in conformance to the "Architectural Woodwork Standards," latest edition.
- F. Use non-removable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.

- G. 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.

### **3.06 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.

### **3.07 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 measurement for ENTRY SIGN (SINGLE SIDED) to be paid for shall be for Entry Sign furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
- 4.02 The measurement for PARK RULES SIGN (SINGLE SIDED) to be paid for shall be for Park Rules Signs furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
- 4.03 The measurement for REFORESTATION SIGN (SINGLE SIDED) to be paid for shall be for Reforestation Signs furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
- 4.04 The measurement for COURT RULES SIGN (SINGLE SIDED) to be paid for shall be for Court Rules Signs furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
- 4.05 The measurement for TENNIS COURT RULES SIGN (SINGLE SIDED) to be paid for shall be for Tennis Court Rules Signs furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
- 4.06 The measurement for RESERVED PARKING SIGN ON ALUMINUM POST (SINGLE SIDED) to be paid for shall be for Reserved Parking Signs furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
- 4.07 The measurement for ALUMINUM PLATE COURT NUMBER SIGN (SINGLE SIDED) to be paid for shall be for Aluminum Plate Court Number Signs furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

## **END OF SECTION 101400**



# **DIVISION 11**

# **EQUIPMENT**

**SECTION 116833**  
**ATHLETIC EQUIPMENT**

**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. Provide all equipment and materials, 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. Basketball Goal, including but not limited to all incidentals, post, net, backboard padding, pole padding, breakaway rim.
  2. Tennis Post Set and Net, including but not limited to all incidentals, posts and net.

**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. Section 0133000 – Submittal Procedures
  2. Section 033000 – Cast in Place Concrete
  3. Section 31200 – Earth Moving
  4. Section 321216 – Asphalt Paving
  5. Section 321315 – Asphalt Court Pavement
  6. Section 321316 – Asphalt Court Surfacing

**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 basketball goal (including post and net), basketball backboard padding, basketball pole padding, and steel basketball goal and foundation requirements prior to actual court installation work, 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. Tennis:
  - a. Sportsfield Specialties, 41155 State Highway 10, PO Box 231, Delhi, NY, 13753, 888-975-3343, or approved equivalent.
- B. Basketball:
  - b. True Bounce Inc. 56 Conduit Street, New Bedord, MA 02745, 866-873-3715, or approved equivalent.

### **2.02 PRODUCTS**

- A. Basketball Post and Goal Assembly: By True Bounce, Inc. (or approved equal) with Manufacturer's Pole Padding and Manufacturer's Backboard Padding.

1. Post support: 6” square pole– black powder coated finish with 40” concrete bury (concrete footing is deeper – see manufacturer’s installation instructions)
  2. 60” safety setback
  3. Backboard: 42” x 72” official size rectangular ½” thick polycarbonate backboard with heavy-duty E-Channel extruded aluminum frame. Model No. XL7042 perforated backboard, with slotted solid aluminum corner blocks, solid aluminum rim support block with safety holes and backboard safety padding. . ½” thick perforated holes.
  4. Pole: PA-665 True Bounce Typical Pole, 6x6 steel pole with 5’ extension.
  5. Hardware: Heavy Duty Stainless for both net and pole extension attachment. If stainless is not available from manufacturer, contractor shall purchase separately.
  6. Warranty: Limited Lifetime
  7. Rim: Breakaway Aluminum Rim Support Block RB1000
  8. Net: super heavy-duty goal heavy duty nylon.
  9. Shot Box Stripe Color: Orange (to be verified during submittal process as selected by Landscape Architect from Manufacturer’s full range).
  10. Perimeter Stripe Color: White (to be verified during submittal process as selected by Landscape Architect from Manufacturer’s full range).
  11. Padding Color: Black (to be verified during submittal process as selected by Landscape Architect from Manufacturer’s full range).
- B. External Wind Round Tennis Post Set (Model TSEB) and Signature Net (Model TN) by Sportsfield Specialties, Inc. (or approved equal).
1. Accessories shall include the following: removable aluminum hand crank, TPGS Post Ground Sleeves, TN Net, TNS Net Strap, TNA Net Anchor
  2. Color: Black. Verify with DPR Landscape Architect during submittal review process.

### **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. Coordinate design and installation of framing and supports with the roof structural system.
- D. Set work accurately as measured from established building lines and levels and from court 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 3.3 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 measurement for BASKETBALL HOOP (INCLUDES POST, NET, PADDING, BREAKAWAY RIM AND ALL OTHER INCIDENTALS) to be paid for shall be for Basketball Hoops furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.02** The measurement for TENNIS NET (INCLUDES POSTS AND ALL OTHER INCIDENTALS) to be paid for shall be for Tennis Nets furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**END OF SECTION 116833**

# **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, benches, bicycle racks, picnic tables and trash/recycling containers as shown on the Drawings and specified herein.

#### **1.02 RELATED SECTIONS**

- A. Section 033000 – Cast in Place Concrete
- B. Section 321123 – Aggregate Base Course and Underdrainage
- C. 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.
- 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.
- E. 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 bicycle parking racks 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.
- C. Moveable chairs shall be free from defects in material and/or workmanship for a period of three years from the date of invoice. The warranty does not apply to damage from accident, alteration, misuse, tampering, negligence or abuse. Manufacturer shall, at its option, repair, replace or refund the purchase price of any items found defective upon inspect by an authorized service representative.

### **PART 2 - PRODUCTS**

#### **1.01 MANUFACTURERS**

- A. Acceptable Bench Manufacturer: Kenneth Lynch & Sons, 114 Willenbrock Road, Oxford, CT 06478, 203-264-2831 (phone)
- B. Acceptable Trash and Recycling Receptacles Manufacturer: Victor Stanley, Inc., P.O. Drawer 330, Dunkirk, MD 20754, 1-800-368-2573
- C. Acceptable Picnic Table Manufacturer: Victor Stanley, Inc., P.O. Drawer 330, Dunkirk, MD 20754, 1-800-368-2573 or approved equivalent.
- D. Acceptable Bike Rack Manufacturers: Victor Stanley, Inc. P.O. Drawer 330, Dunkirk MD 20754, 1-800-368-2573

#### **1.02 BENCHES**

- A. Style: 1964 New York World's Fair Bench, 8' length, with end and intermediate armrests (Model No. 6733) and 1964 New York World's Fair Bench, 6' length, with end armrests (no intermediate armrest), backless

- B. Frame: Cast ductile iron, powder coated. Black Powder Coat Color as verified by DPR Landscape Architect following DPR's selection from manufacturer's full range. General Contractor to provide samples.
- C. Slats: shall be of Ipe of the sizes and dimensions shown on the drawings.
1. Slats shall be milled perfectly smooth to the finished length. Each slat shall be of one continuous piece; no joints will be allowed. Lumber shall be parallel cut without heart center or sap-wood and shall be straight grained, maximum slope of grain to be 1:10. All milled surfaces shall be sanded smooth on all four sides and both ends after being worked to the required dimensions. All edges shall be eased to a radius of one-eighth inch (1/8"). All wood shall be thoroughly seasoned and shall contain no more than fifteen percent (15%) to twenty percent (20%) of moisture by weight.
  2. Lumber shall be in sound condition, free from worm holes, knots, longitudinal heart cracks, firm or soft sap wood, fungus, and deformation (twisting or cupping) which cannot be removed during installation using normal installation methods and tools. Natural drying checks, to a maximum of one-eighth inch (1/8") in width, will be acceptable. Dimensional tolerance (measured at 20% moisture content) shall be plus or minus .08" in both width and thickness.
  3. The County reserves the right to independently identify species of samples of wood taken from the job site. Random samples must be supplied to PRCR for identification, at the request of the Project Officer. Should the wood provided on the job site not be as previously approved, the Contractor shall replace all the incorrect wood at no extra cost to the County.
- D. Hardware: Bolts, nuts, and washers used to secure slats to standards shall be stainless steel. Anchor bolts used to secure the benches to pavements may be either stainless steel or hot-dipped galvanized steel. Type and dimensions of all bolts, nuts, and washers shall be as indicated on the plans. Threads of all bolts shall have the ends upset after installation of nuts so as to render the connection vandal resistant.
- E. Finish: Surfaces of the cast iron bench standards, bars and brace rods shall be powder coated with a polyester thermosetting Powder Coating as manufactured by Tiger Drylac, Sherwin Williams, PPG or Spraylat, or an approved equivalent. Powder coating shall be applied at a film thickness of 3 to 4 mils (.08 mm to .10 mm) by electrostatic spray process and bake finished per the manufacturer's directions. It shall be applied without voids, tears or cuts that reveal the substrate and shall thoroughly adhere to the metal without peeling when scratched with a pick device or knife blade point.
1. PPG Powder primer PCM70140
  2. All surfaces shall first receive hot-iron phosphating treatment.
  3. Finish shall pass the Cross Hatch test per ASTM standard, method B.
  4. Color: Black Powder Coat as verified by DPR Landscape Architect following DPR's selection from manufacturer's full range of colors.

### **1.03 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. Verify with Arlington County Landscape Architect prior to purchase.
  11. Mounting plate: Include optional (3) anchor bolt holes.

#### **1.04 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.
  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#4260-01c and #2712-02d.

#### **1.05 BICYCLE RACKS**

- A. Victor Stanley Bike Rack BRHS-101 (Cycle Sentry Series).
1. Height: 31-7/8"
  2. Width (outside to outside): 35-3/8"
  3. Tube: Schedule 40 Steel Pipe, 2-3/8" O.D.
  4. Surface Mount Anchoring: secured to concrete pavement with (4) 1/2" diameter anchor bolts, in accordance with manufacturer's recommendations and per construction drawings.
  5. Finish and Color: VS Powdercoated Black. Verify with Arlington County Landscape Architect prior to purchase.

#### **1.06 PICNIC TABLE**

- A. Victor Stanley Model Number F-565 (surface mount) 6' Table; and custom 6' ADA table with extension on each end
  - 1. Overall Height: 30¾"
  - 2. Seat Height: 18¼"
  - 3. Table Length (Standard 6'): 69¾ "
  - 4. Table Length (Custom ADA): 7'-10¼"
  - 5. Table Width: 27¼"
  - 6. The picnic tables shall be high-tensile tubular steel legs and Ipe slats.
  - 7. Color: VS Powdercoat Black – contractor shall provide manufacturer's full range to Landscape Architect. Verify with Arlington County Landscape Architect prior to purchase.
  - 8. Mounting: Surface Mounted

**1.07 MANUFACTURER FINISH REQUIREMENTS FOR BICYCLE RACKS, 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.

**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. Surface mounting. Location and drilling of holes for inserts included. Stainless Anchor bolts and inserts to be provided by Contractor.
- C. Concrete Footings. Shall comply with requirements in Division 3 Section, Cast in Place Concrete.
- D. 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.
- E. Provide grout specifically recommended by manufacturer for exterior applications, nonshrink, nonmetallic grout complying with ASTM C 1107.
- F. 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.
- G. Threads of all bolts shall have the ends upset after installation of nuts so as to render the connection vandal resistant.
- H. 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.
- I. Nuts, washers and ends of all bolts shall be painted with touch-up paint.

### **3.04 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 measurement for TRASH RECEPTACLES to be paid for shall be for Trash Receptacles furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
- 4.02** The measurement for RECYCLING RECEPTACLES to be paid for shall be for Recycling Receptacles furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
- 4.03** The measurement for BIKE RACK to be paid for shall be for Bike Racks furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
- 4.04** The measurement for BENCH - BACKED to be paid for shall be for Benches - Backed furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
- 4.05** The measurement for BENCH – BACKLESS to be paid for shall be for Benches - Backless furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
- 4.06** The measurement for PICNIC TABLE to be paid for shall be for Picnic Tables furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
- 4.07** The measurement for ADA PICNIC TABLE to be paid for shall be for ADA Picnic Tables furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
- 4.08** The measurement for REMOVE (4) BACKLESS 1964 BENCHES AND (2) BACKED 1964 BENCHES FROM BID (BID DEDUCT ALTERNATE 1B) to be deducted shall be for benches furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**END OF SECTION 129300**

# **DIVISION 13**

## **SPECIAL CONSTRUCTION**

# **SECTION 133419**

## **PRE-ENGINEERED STRUCTURES**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. This section includes prefabricated pre-engineered shade structures.

#### **1.02 RELATED SECTIONS**

- A. Section 011000, "Summary and General Requirements"
- B. Section 013300, "Submittal Procedures"
- C. Section 033000, "Cast-In-Place Concrete"
- D. Division 26, "Electrical"
- E. Section 311000, "Site Clearing, Preparation, Demolition and Removals"
- F. Section 312000, "Earth Moving"
- G. Section 321123, "Aggregate Base Course and Underdrainage"
- H. 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.



- C. 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 and footing designs, 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 requested by the Contractor, 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: Coverworx Recreational Architecture (A Division of Ross & Barr, Inc.), available from MTS Recreations, <https://www.mtsrecreations.com/contact/>, 1-800-337-3963.
- B. Style: Shelter shall be Custom Monoslope Shelter, 16'-0" x 30'-0", Model #MO-1630-SW-C, by Coverworx or approved equal.

Manufacturer's Representative: Howard Smith, MTS Recreations

Contact Information: 804-441-0520, [smith.howard@verizon.net](mailto:smith.howard@verizon.net), mtsrecreations.com

- C. Frame Color: Color selection shall be Gray, as selected from manufacturer's full range and verified/approved by Landscape Architect.
- D. Roof Color: Color selection shall be Blue, as selected from manufacturer's full range and verified/approved by Landscape Architect.
- D. See Drawings A-01 through A-02.

### **2.02 MATERIALS**

- A. Steel columns:
  - 1. As shown on Drawings A-01 through A-02 and per Approved Shop Drawings.
  - 2. Anchors Bolts, Washers, Hex Nuts, and Bracing Template shall be provided by general contractor and as shown on Drawings A-01 through A-02 and per Approved Shop Drawings.
- 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-02 and per Approved Shop Drawings.
- C. Roofing: 24-gauge ribbed galvanized steel in a standing seam pattern. As shown on Drawings A-01 through A-02 and per Approved Shop Drawings.
- D. Fasteners:
  - 1. Anchor bolts shall be as noted on Drawings A-01 through A-02 and per Approved Shop Drawings.
  - 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-02 and per Approved Shop Drawings.
  - 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-02 and per Approved Shop Drawings.

### **2.03 ACCESSORIES**

- A. As shown on Drawings A-01 through A-02 and per Approved Shop Drawings.

### **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-02 for footing layout spacing and instruction. Footing design shall be per approved shop drawings.
- 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 measurement for PRE-ENGINEERED SHADE STRUCTURE to be paid for shall be for Pre-Engineered Shade Structure furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**END OF SECTION 133419**

# **DIVISION 22**

## **PLUMBING**

## SECTION 221113

### FACILITY WATER DISTRIBUTION PIPING

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. This Section includes:
  - 1. Potable water servicing piping and related components.
  - 2. Drinking Fountain and related components
  - 3. Non-freeze drinking foundation components such as freeze-resistant sanitary valve
  - 4. Underground utility vault for housing valves and backflow preventer
- B. Provide all labor, materials, tools and equipment to install waterline, drinking fountain, underground vault, drain pipes, and associated components.
- C. Related Sections:
  - 1. Section 011000 – Summary and General Requirements
  - 2. Section 013300 – Submittal Procedures
  - 3. Section 311000 – Site Clearing, Preparation, Demolition, and Removals
  - 4. Section 312000 – Earth Moving
- D. In addition to the specifications contained herein, Work shall be performed in accordance with the following:
  - 1. Underground Utility Protection Ordinance – Chapter 55 Arlington County Code
  - 2. Arlington County Department of Environmental Services (DES) Construction Standards and Specifications, latest edition
  - 3. Arlington County Plumbing Code (Chapter 18 of the Arlington County Code).

##### 1.02 SUBMITTALS

- A. Project Data: For each type of product indicated.
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation qualification and methods.
- B. Shop Drawings:
  - 1. Complete details of layout and assembly, showing member sizes and part identification, fasteners, anchors and fittings.
  - 2. Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.
  - 3. Shop Drawings shall be signed and sealed by a Professional Engineer, licensed in the State of Virginia.

- C. Field quality-control test reports.
- D. Operation and maintenance data.
- E. Manufacturers warranties:
  - 1. Drinking Fountain and components
  - 2. Underground Vault
- F. Product Samples
  - 1. Drinking fountain physical color sample on the same metal as the fountain

### **1.03 QUALITY ASSURANCE**

- A. Regulatory Requirements:
  - 1. Obtain Plumbing Trade permit for the installation of water system service.
  - 2. Comply with requirements of Arlington County DES. Including tapping of water mains and backflow prevention.
  - 3. Comply with standards of Arlington County DES for potable-water-service piping, including materials, installation, testing, and disinfection.
  - 4. Comply with governing EPA notification regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

## **PART 2 - PRODUCTS**

### **2.01 PIPE AND FITTINGS**

- A. Provide seamless water tube AWWA type K copper pipe conforming to ASTM designation B88 requirements in accordance with Arlington County Department of Environmental Services (DES) Construction Standards and Specification, Section 2550 Water Mains and Appurtenances.
- B. Fittings shall be underground copper service flared type.
- C. National Science Foundation (NSF) Compliance:
  - 1. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

### **2.02 CONCRETE VAULTS**

- A. Description: concrete vault. Vault Model #444-CUS by Smith-Midland PCC or equal.
  - 1. Vault Access
    - a. Gasket Seal Cover #1480 by East Jordan Iron Works or approved equal.
    - b. Watertite Base Flange #1480 by East Jordan Iron Works or approved equal.

## 2.03 VALVES

- A. Provide in accordance with Arlington County Construction Standards and Specification, Section 2550 Water Mains and Appurtenances.

## 2.04 DRINKING FOUNTAIN

- A. Acceptable Manufacturers:
  - 1. Acceptable Drinking Fountain Manufacturer: Most Dependable Fountains, Inc. 5705 Commander Drive, Arlington, TN 38002. Phone: (800) 552-6331, or approved equivalent.
  - 2. Acceptable Freeze Resistant Kit: Hoeptner Products, 7996 Oak Springs Circle, Gilroy, CA 95020, or approved equivalent. Must be approved for use by drinking fountain manufacturer.
  - 3. Acceptable Backflow Prevention Assembly: Zurn Wilkins Model 975XL2, 1747 Commerce Way, Paso Robles, CA 93446. Phone: (855) 663-9876, or approved equivalent.
    - a. Standard: ASSE 1013
    - b. Operation: Continuous pressure applications
    - c. Pressure Loss: 12 psig maximum, through middle third of flow range
    - d. Size: ¾"
    - e. Body: Bronze
    - f. End Connections: Threaded
    - g. Configuration: Designed for straight-through
    - h. Accessories:
      - i. Ball Type with Threaded Ends on Inlet and Outlet
      - ii. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.
  - 4. Acceptable Pressure Reducing Valve: Zurn Wilkins Model TP11000A, 1747 Commerce Way, Paso Robles, CA 93446. Phone: (855) 663-9876, or approved equivalent.
  - 5. Acceptable Vault and Manhole: Smith Midland PCC, 5119 Catlett Road PO Box 300, Midland, VA 22728. Phone: (540) 439-3266, or approved equal.
- B. Most Dependable model 10145SMSS FR SAN (Freeze Flow Sanitary Drinking Fountain), front approach with lock door, or an approved equal.
  - 1. Type: Vandal Resistant and Freeze Resistant
  - 2. Standard Round Pedestal: One-piece weld construction with MDF standard 3/16" wall thickness.
  - 3. Receptor Bowl: 18-gauge electro-polished stainless-steel bowl. Bowl overlaps pedestal, preventing buildup of residue in visual drinking area.
  - 4. Bubbler Head: Stainless-steel anti-squirt head (weighing a pound and a half) mounted with a lock nut and washer to prevent tampering. Lock nut pin holds bubbler in locked position to prevent twisting or turning.
  - 5. Bottle Filler: Push-button activation. Sanitary recessed nozzle.
  - 6. Height: high/low (standard/accessible) in accordance with ICC A117.1.
  - 7. Fountain Arms: 1'-6" ADA Arm and 1'-6" standard arm
  - 8. Push Bar/Button Control: 304 stainless-steel with circumference exceeding 8.6"



9. Control Valve/Flow Regulator: Requires less than 5 lbs to operate. Non-cartridge O-ring delivers steady stream of water through flow regulator. No adjustment necessary. This valve design is to operate and function at 30 to 80 PSI. Ideal operating pressure is 60 PSI.
  10. Water Supply: Maintenance free reinforced nylobraid tubing that is NSF-61 certified. It is supplied with ½” MIP threaded inlet with stainless-steel strainer. Union fittings at every connection. Supply line stops above grade. Water Filter is standard on this model.
  11. Maximum Water Flow: 0.15 gpm
  12. Access to Internal Components: Panel in Pedestal.
  13. Filter: One or more water filters complying with NSF 42 and NSF 53 and with capacity sized for peak flow rate.
  14. Provide freeze resistant kit (Hoeptner Products – Dual Bubbler Freeze Resistant Kit or approved equal).
  15. Include Freeze-Resistant Supply Fittings: Underground freeze-resistant shutoff and flow-control valve assembly.
  16. Bury Depth: Grade to Valve Components: 36 Inches.
  17. Drain: 1.5” schedule 80 solid PVC pipe inside a 4” schedule 40 solid PVC sleeve. Drain line leads to No. 421 pop-up drain emitter by NDS (or approved equal).
  18. Finish: Oven Baked Powder Coat.
  19. All access plates, brackets, vandal resistant bolts and screws shall be stainless-steel.
  20. Color: Oven baked Black powder coat. Verify with DPR landscape architect.
    - a. Provide actual sample of finished metal for review and approval by DPR Project Officer and DPR Landscape Architect
- C. Backflow Preventer Utility Vault, Model 444 by Smith Midland PCC, SOLID bottom and sides (except for pipe perforations). Or approved equal.
1. Drain: 4” schedule 40 solid PVC pipe. Drain line leads to on-site storm drain system.
- D. Watertite base flange (manhole) and Sold Gasket Seal Cover, 1480ZPT and 1840APT by East Jordan Iron Works, or approved equal.

### **PART 3 - EXECUTION**

#### **3.01 EARTHWORK**

- A. Refer to Section 312000 - Earth Moving, for excavating, trenching, and backfilling.

#### **3.02 INSTALLATION OF DRINKING FOUNTAIN**

- A. Install in accordance with manufacturer’s instructions unless more stringent requirements are indicated.
- B. Water Fountain Surface Mount installation, on concrete surface with stainless steel anchor bolts through a mounting plate that is welded to the fountain. Surface mount carrier shall be

used for surface mount installation. Stainless steel anchor bolts and inserts to be provided by Contractor

- C. Concrete Footings. Shall comply with Section 033000 Cast-In-Place Concrete.
- D. Provide grout specifically recommended by manufacturer for exterior applications, non-shrink, nonmetallic grout complying with ASTM C 1107.
- E. 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, NY or approved equal.
- F. Threads of all bolts shall have the ends upset after installation of nuts so as to render the connection vandal resistant.
- G. 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.
- H. Nuts, washers and ends of all bolts shall be painted with touch-up paint.
- I. Protect installed products until Final Completion by Project Officer.

### **3.03 INSTALLATION OF PIPING**

- A. Water-Main Connection: Arrange with Arlington County Department of Environmental Services (DES) for tap of size and in location indicated in water main.
- B. Install copper tube and fittings according to CDA's "Copper Tube Handbook."
- C. Bury piping with depth of cover over top at least 42 inches, with top at least 12 inches below level of maximum frost penetration.
- D. Drainage Pipe:
  - 1. Bury drainpipe from drinking fountain to pop-up emitter as shown on Utility Plans and Details
  - 2. Bury drainpipe from underground vault to tie into on-site storm drain system as shown on Utility Plans and Details.

### **3.04 FIELD QUALITY CONTROL**

- A. Piping Tests: Conduct piping tests in accordance with Arlington County Construction Standards and Specification, Section 2550 Water Mains and Appurtenances.
- B. Prepare reports of testing activities.

### **3.05 IDENTIFICATION**

- A. Install continuous underground warning tape in accordance with Arlington County Construction Standards and Specification, latest edition.

- B. Permanently attach equipment nameplate or marker in accordance with Arlington County Construction Standards and Specification, Section 2550 Water Mains and Appurtenances, latest edition.
- C. Clean and disinfect water-distribution piping in accordance with Arlington County Construction Standards and Specification, Section 2550 Water Mains and Appurtenances, latest edition.
- D. Prepare reports of purging and disinfecting activities.

### **3.06 CLEANING**

- A. Clean and disinfect water-distribution piping as follows:
  - 3. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
  - 4. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
  - 5. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
    - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
    - b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
    - c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
    - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- B. Prepare reports of purging and disinfecting activities.

## **PART 4 - MEASUREMENT**

**4.01** The measurement for ADA DRINKING FOUNTAIN WITH BOTTLE FILLER, VAULT & ASSOCIATED APPURTENANCES to be paid for shall be for ADA Drinking Fountain furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.02** The measurement for the COPPER PIPE to be paid for shall be for Copper Pipe installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.03** The measurement for the DRAIN PIPE (TO POP-UP AND FROM VAULT) to be paid for shall be for Drain Pipe installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.04** The measurement for the PVC TEE AND ELBOW FITTINGS to be paid for shall be for PVC Fittings furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.05** The measurement for the POP-UP EMITTER WITH ¼ VERTICAL BEND to be paid for shall be for Pop-Up Emitters furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**END OF SECTION 221113**

**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 Project Officer.
- E. Electrical work of this project includes, as a brief general description, the following:
  - 1. Exterior lighting.
  - 2. Receptacles.
  - 3. Power distribution.
- 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 Project Officer.
  - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
  - 5. Will reimburse Project Officer 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 and Landscape Architect.
- 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 and Landscape Architect 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 and Landscape Architect 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 Officer and Landscape Architect and 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 and Landscape Architect 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 building conditions or that the shop drawings or product data have been checked to see that item submitted properly fits the building 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 Project Officer, 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 and Landscape Architect 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 CONTRACT CLOSEOUT SUBMITTALS**

- A. Project record documents:
1. Maintain on site one set of the following record documents; record actual revisions to the work of this division:
    - a. Contract Drawings.
    - b. Specifications.
    - c. Addenda.
    - d. Change Orders and other Modifications to the Contract.
    - e. Reviewed shop drawings, product data, and samples.
  2. Maintain record documents separate from documents used for construction.
  3. Record information concurrent with construction progress.
  4. Specifications: Legibly mark and record in each section a description of actual products installed, including the following:
    - a. Manufacturer’s name and product model and number.

- b. Product options, substitutions, or alternates utilized.
  - c. Changes made by addenda and modifications.
5. Record documents and shop drawings: Legibly mark each item to record actual construction, including:
- a. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - b. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the work.
  - c. Field changes of dimension and detail.
  - d. Details not on original Contract Drawings.
6. Submit documents as specified in Division 01.
- B. Operation and maintenance data:
1. Submit sets prior to final inspection as specified in Division 01. Unless otherwise specified in Division 01, submit no fewer than three sets. In addition to requirements specified in Division 01, submit operating and maintenance manuals for the work of this division as specified below.
  2. Binders: Three-ring binders with vinyl-covered hard covers. Provide large enough binders, and sufficient quantity, that the required contents can be easily turned, removed, and reinserted.
  3. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," and title of project. Print on spine of binder "O & M INSTRUCTIONS." If more than one binder is required, print covers and spines with volume numbers. Include in the front of every binder an index to all binders.
  4. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
  5. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, typed on white paper.
  6. Part 1: Directory, listing names, addresses, and telephone numbers of electrical engineers; contractor; electrical subcontractors; and major electrical equipment suppliers.
  7. Part 2: Operation and maintenance instructions, arranged by specification section. For each category, identify names, addresses, and telephone numbers of subcontractors and suppliers. Identify the following:
    - a. Significant design criteria.
    - b. List of equipment.
    - c. Parts list for each component, including recommended spare parts list.
    - d. Operating instructions.
    - e. Maintenance instructions for equipment and systems.
    - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.
  8. Part 3: Project documents and certificates, including the following:
    - a. Shop drawings and product data.
    - b. Photocopies of certificates.

- c. Photocopies of warranties, guarantees, and bonds.
  - d. Test reports: Copies of the results of all tests required under all sections of specifications.
9. Submit one copy of completed volumes in final form 15 days prior to final inspection. This copy will be returned after final inspection, with Engineer comments. Revise content of documents as required prior to final submittal.
10. Submit final volumes revised, within ten days after final inspection.

## **1.12 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).

## **1.13 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)

#### **1.14 TEMPORARY STORAGE**

- A. Maintain upon premises, where directed, a storage area, and be responsible for all contents within these areas. Provide all security measures necessary for this area.
- B. Area shall be maintained and shall be returned to original condition at the completion of the project.
- C. Store electrical construction materials such as wire, raceways and boxes, devices, and equipment in buildings, enclosed trailers, or portable enclosed warehouses.
  - 1. Materials and products subject to damage from moisture: Store in dry locations. If necessary, protect with protective wraps or covers.
  - 2. Plastics and other materials and products subject to damage from heat or cold: Store at manufacturer's recommended temperatures.
  - 3. Plastics and other materials and products subject to damage from sunlight: Protect from sunlight.
- D. Electrical equipment such as motor controllers, panelboards and circuit breakers stored before installation and installed during construction: Provide clean, dry locations at manufacturer's recommended temperatures, and cover or wrap if required to protect from incidental damage.

#### **1.15 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 and Landscape Architect; 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 work stored in place and supplies stored in the building.
  - 1. Store materials and products, subject to damage from moisture, in dry locations. If necessary, protect in wraps or covers.
  - 2. Store plastics, other materials, and products subject to damage from heat or cold at manufacturer's recommended temperatures.
- D. Protect electrical materials and products from weather events and accidents of construction.
- E. Use of sidewalk or roadway areas outside of the property lines shall be with permission and

approval of the local authorities having jurisdiction.

#### **1.16 FIRE PROTECTION**

- A. As a minimum, provide hand-carried, portable, UL-rated extinguishers with each work crew working inside the building.
- B. Select extinguishers in accordance with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

#### **1.17 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 Project Officer and Landscape Architect in writing.
  - 2. Do not perform any work which would disturb the suspected material until written instructions have been received.

#### **1.18 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 Project Officer. Provide detailed schedule for completion of work within 24-hours of receiving written notice from the Project Officer and revise schedule based on any Project Officer 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 Project Officer.
- C. When use of the permanent equipment has been permitted for temporary services during construction of the building, the warranty and correction periods shall nevertheless begin at the time of substantial completion, unless another date of acceptance has been agreed to by the Project Officer.
- D. 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.
- E. Provide copies of warranties as required for Operation and Maintenance Manual specified above,

and by Division 01.

- F. 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**

### **3.1 CUTTING AND PATCHING**

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
- B. Cut walls, floors, partitions, roofs, and other appurtenances for the passage or accommodation of conduits. Close superfluous openings and remove all debris caused by work of this division.
- C. No cutting of any structure or finish shall be done until the condition requiring such cutting has been examined and approved by the Project Officer and Landscape Architect.
- D. New or existing surfaces disturbed as a result of such cutting or otherwise damaged shall be restored to match original work and all materials used for any patching or mending shall conform to the class of materials originally installed.
- E. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

### **3.2 TEMPORARY FACILITIES**

- A. Temporary water facilities, electricity, telephone, toilet facilities, and temporary heat, shall be provided as specified in Division 01.

### **3.3 PROGRESS MEETINGS**

- A. Progress meetings shall be held as specified in Division 01, and also when and if the Contractor, Project Officer or Landscape Architect finds them necessary or advantageous to progress of work.
- B. Contractor, those subcontractors and those material suppliers concerned with current progress or with the scheduling of future progress, Landscape Architect and Project Officer shall each be represented at these meetings by persons familiar with the details of work and authorized to conclude matters relating to work progress.

**END OF SECTION 260101**

## **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 RELATED SECTIONS**

- A. Operation and Maintenance Manuals: Division 01 and Section 260101.
- B. Painting: Division 09.

##### **1.3 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.

##### **1.4 DESIGN REQUIREMENTS**

- A. The drawings and system performances have been designed on the basis of using the particular manufacturers' products specified and scheduled on the drawings.
- B. Products of other manufacturers that are listed under the article "Acceptable Manufacturers," or permitted as "equal," are permitted provided:
  - 1. Product shall meet the specifications.
  - 2. Contractor shall make, without addition to the contract sum, all adjustments for deviations so that the final installation is complete and functions as the design basis product is intended.
- C. Do not propose products with dimensions or other characteristics different from the design basis product that make their use impractical or cause functional fit, access, or connection problems.
- D. The contract drawings are generally diagrammatic, and do not indicate all fittings or offsets in conduit or all pull boxes, access panels, or other specialties required.



1. Install conduit exposed to view parallel with the lines of the building and as close to walls, columns, and ceilings as may be practical, maintaining adequate clearance for access at parts requiring servicing.
2. Install conduit a sufficient distance from other work to permit a clearance of not less than 0.5 inch (15 mm) between its finished covering and adjacent work.
3. No conduit shall be run below the head of a window or door.
4. Pull boxes and other appurtenances which require operation or maintenance shall be easily accessible. Do not cut or form handholes for operation or maintenance of appliances through walls or ceilings.

## **1.5 SUBMITTALS**

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

## **1.6 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 control panels, 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**

### **2.1 MATERIALS**

- A. Electrical equipment backing panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated in accordance with AWWA C27, in thickness indicated, not less than 0.5 inch (13 mm) nominal.
  1. One side finished.
- B. Wood-preservative-treated lumber: Treated by pressure process, AWWA C2, with chemicals acceptable to authorities having jurisdiction, and marked with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
  1. Application: Treat items indicated on the drawings, and the following:
    - a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, or waterproofing.
    - b. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
    - c. Wood framing and furring attached directly to the interior of below-grade exterior

- d. masonry or concrete walls.
  - d. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
  - e. Wood floor plates that are installed over concrete slabs-on-grade.
- C. Aircraft cable: 0.25-inch (6-mm) steel wire rope, galvanized, construction 7 by 19 strands, minimum 7000 lbs (31138 N) breaking strength.

## **2.2 DATE-SENSITIVE EQUIPMENT**

- A. Date-sensitive equipment: Systems, equipment, or components which use or process date and time data in order to perform their functions.
- B. Each item of date-sensitive equipment used in the project shall be warranted by the manufacturer to properly function and correctly use or process all time-related data for all dates and times which occur during a reasonable life expectancy of the equipment.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION OF PRODUCTS AND EQUIPMENT**

- A. Manufacturers' instructions: Except as modified by drawings or specifications, install products and equipment in accordance with manufacturers' instructions and recommendations applicable to the project conditions.
  - 1. Immediately notify Project Officer and Landscape Architect if a difference or discrepancy is found between manufacturers' instructions and the drawings or specifications.
- B. Install plywood backing panels with finished face exposed.

### **3.2 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.

### **3.3 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 Project Officer 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 Project Officer personnel.
- E. Schedule the general and specialized instruction periods for a time agreed upon by the Project Officer and Landscape Architect.

**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 as shown on drawings.

##### **1.2 RELATED SECTIONS**

- A. Cutting and patching: Division 01 and Section 260101.
- B. Repairing pavements: Division 32.
- C. Underground electrical ductbanks: Section 260544.
- D. 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: At the same scale as the contract 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 outside buildings.
- 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, such as Fisher Labs' Pipe and Cable Locators.

### **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. Repair of pavement is specified in Division 32.
- 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 and Landscape Architect.
- E. Provide temporary roadways over trenches with railings and other safeguards, including amber blinker lamps or other warnings for night use.
- F. Note the depths of footings. In cases where conduit is in close proximity to or below footings and where the natural earth under footings is disturbed, after the line is installed the voids shall be filled up to bottoms of such footings with solid concrete.

### **3.3 CUTTING**

- A. Cut concrete and asphalt concrete with masonry saw prior to breaking it into smaller pieces for removal.
- B. Cut sidewalks perpendicular to the length at the closest existing joint that is a minimum of 24 inches back from either side of the top of the new trench.

### **3.4 TRENCHING**

- A. Excavations inside the building shall be carefully planned. Stockpile excavated earth so as not to interfere with other construction. Dig trenches to the proper depths, providing extra depressions where required for hubs of pipes.
- B. Excavations outside the building 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).

- C. 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.
- D. 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 Landscape Architect and do not place any portion of the work on such surfaces until instructions are received.
- E. 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.
- F. 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. Fill over-depth excavation with concrete.

### **3.5 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.
  - 2. Surplus earth shall be mounded up on excavation and left to settle. When directed by the Project Officer and Landscape Architect, surplus earth shall be removed and excavations leveled off to proper grade. Where direct burial cables are placed in trenches, first cover the cables with clean earth.

D. Structure backfill:

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

**3.6 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.

**3.7 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.

**END OF SECTION 260501**

## **SECTION 260504**

### **ELECTRICAL DEMOLITION**

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

##### **1.1 SECTION INCLUDES**

- A. Extent and location of demolition are shown on the drawings.
- B. Removal of items for reuse.

##### **1.2 RELATED SECTIONS**

- A. Demolition: Division 02.

##### **1.3 SUBMITTALS**

- A. Shop drawings: Demolition and removal procedures and schedules.
- B. Project record documents: Record drawings.

##### **1.4 QUALITY ASSURANCE**

- A. Demolition shall be carried out as expeditiously as possible, in accordance with accepted practice and applicable building code provisions.

##### **1.5 PROJECT CONDITIONS**

- A. If, in the course of the work, workers unexpectedly encounter a material not identified for special removal but which they suspect to be asbestos, to contain lead or PCBs, or to present some other hazard:
  - 1. Promptly notify the Project Officer and Landscape Architect in writing.
  - 2. Do not perform any work which would disturb the suspected material until written instructions have been received.
- B. Protect adjacent materials indicated to remain. Install and maintain dust and noise barriers to keep dirt, dust, and noise from being transmitted to adjacent areas. Remove protection and barriers after demolition operations are complete.
- C. Locate, identify, and protect mechanical and electrical services passing through demolition area and serving other areas outside the demolition limits. Maintain services to areas outside demolition limits. When services must be interrupted, install temporary services for affected areas.

#### **PART 2 - PRODUCTS**

Not used.



## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Coordinate removal and storage of existing lighting poles for reuse with lighting fixture manufacturer.
- B. Protect existing building and equipment that is to remain, particularly to prevent entry of either dust or water. Ensure weathertightness at all times. Keep materials on hand to patch and maintain protection.

### **3.2 DEMOLITION**

- A. Comply with demolition and disposal requirements of Division 02.
- B. Perform removal work neatly with the least possible disturbance to the building.
- C. Provide temporary barriers, danger signals, and appurtenances for protection of personnel and equipment during removal operations.
- D. Demolish, remove, demount, and disconnect inactive and obsolete conduit, fittings and specialties, equipment, and fixtures.
  - 1. Underground conduit and ducts embedded may be abandoned in place if they do not interfere with new installations.
  - 2. Remove materials above accessible ceilings.
  - 3. Disconnect and cap items to remain behind finished surfaces.
  - 4. Patch and repair surface materials as required in Division 01 and Section 260101 article, "Cutting and Patching."
- E. Remove the anchors, bolts, and fasteners associated with conduit and equipment to be removed.

### **3.3 ITEMS FOR REUSE**

- A. The following items shall be removed and reused as indicated or specified:
  - 1. Lighting poles.
- B. Remove items to be reused in a manner to prevent damage. Pack or crate if required to protect the items from damage in storage.

### **3.4 DISPOSAL**

- A. Dispose of equipment and materials removed, and rubbish and waste material, as work progresses. Do not allow demolition debris to accumulate on site. Remove products of demolition from the building daily.

**END OF SECTION 260504**

## **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.

##### **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 COPPER BUILDING WIRE (600-Volts Max.)**

- A. Conductors: UL listed and NEMA WC 70 compliant; Copper, 98 percent conductivity, suitable for 600-volt duty; rated 90-degree Celsius temperature for wet/dry applications; solid bare annealed copper for No. 10 and smaller complying with ASTM B 3, and stranded for No. 8 and larger complying with ASTM B 8.
- B. Conductor insulation:
  - 1. Type THHN/THWN-2: Comply with UL 83; PVC insulation, nylon jacket.
  - 2. Type RHH / RHW-2: Comply with UL 44; stranded conductors, XLPE insulation.
- C. Conductor identification: Markings along outer braid denoting conductor size, voltage classification, type of insulation, and manufacturer's trade name, and color code. Identification shall extend to branch circuits and outlets. Use the color coding system tabulated below throughout the building's network of feeders and circuits, unless otherwise required by the authority having jurisdiction.
  - 1. Colors on conductors No. 10 and smaller, or No. 6 and smaller for grounded and grounding conductors: Solid colored insulation.
  - 2. Colors on conductors No. 8 and larger, or No. 4 and larger grounded and grounding conductors: Colored tape wrapped a minimum of 6 inches (150 mm) on either end of conductor.

(See schedule, next page)

COLOR CODE				
VOLTAGE	NEUTRAL	PHASE		
		A	B	C
120-V, 2-wire	White	Black, Red, or Blue, depending on phase		
240/120-V, single phase, 3-wire	White	Black	Red	

- D. Wires used solely for grounding purposes shall be green, where insulated.
- E. Control wiring shall be coded with colors different from those used to designate phase wires.

**2.2 WIRING ACCESSORIES**

- A. Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service where installed.
- B. Twist-on wire connectors (dry locations): Color-keyed, Ideal Industries, Inc., Wingnut®, 3M Company "Scotchlok", or equal by King Innovation.
- C. Twist-on wire connectors (damp and wet locations): Ideal Industries, Inc., UnderGround®, models 60, 64, or 66 as appropriate; King Innovation DryConn®; or equal by 3M Company. Connectors shall be listed under UL 486D.
- D. Compression connectors: Color-keyed, 3M Company "Scotchlok"™ compressor connectors, "10000" series for copper conductors or equal by Thomas & Betts (Blackburn) or IlSCO.
- E. Compression connectors (damp and wet locations): Protect the connector's with a waterproof system, UL-listed for direct burial and 600 volts: 3M Company 8420 series, Thomas & Betts Model DBSK82, or equal by IlSCO.
- F. Compression taps: Series CT-2 tap with CT-2C cover, or Series 54710 color-keyed compression taps, Burndy Corporation "Versitap" or equal by OZ/Gedney.
- G. Power distribution blocks: Equal to Hubbell Burndy "U-Blok."

**2.3 UNDERGROUND CONDUCTORS**

- A. Underground cable, Type RHH/RHW-2: Single-conductor, underground cable.
  - 1. Cable: UL 44 listed; NEMA WC 70 construction; 600-volt, single-conductor. Solid copper No. 10 and smaller, stranded copper No. 8 and larger; and with XLPE insulation.

## **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 COORDINATION WITH DEVICES AND EQUIPMENT**

- A. Where conductor size or parallel conductors shown on drawings connect to terminals on devices or equipment which is not sized for the connection:
  - 1. Provide a junction box as near the equipment as possible, but no more than 10 feet (3 m) away. Obtain approval of location before installing.
  - 2. Provide conductor(s) sized to the ampacity of the equipment, from equipment to junction box.
  - 3. In the junction box, splice the conductors from the equipment to the conductors of sizes, or parallel conductors, shown on the drawings.

### **3.3 INSTALLING EXTERIOR WIRING**

- A. Sizes: Minimum sizes shall be as follows, unless a larger size is indicated on the drawings.
  - 1. 600-volt branch circuits: Copper, No. 12 minimum.
  - 2. Exterior lighting circuits: Copper, No. 12 minimum.
- B. Wiring methods and locations: Wires and cables shall be installed based on the following requirements, unless otherwise noted.
  - 1. Feeders and branch circuits, exposed: Type THHN/THWN-2, single conductors in raceway.
  - 2. Feeders and branch circuits, underground: Type RHW-2, single conductors in raceway.
  - 3. Service entrance: Type THHN/THWN, single conductors in raceway.
- C. Splicing shall be done in outlet boxes and junction boxes and not in conduit. Treat these boxes as wet locations.
  - 1. Conductors No. 8 and larger: Terminated, spliced and taped, wherever practical, with compression connectors. Use tools recommended by the manufacturer.
  - 2. Splices in conductors No. 10 and smaller, including lighting fixtures: Made with wire connectors.
  - 3. Taps in conductors No. 6 and larger: Made with compression taps or power distribution blocks.

### **3.4 INSTALLING CABLE RATED BELOW 100-VOLTS**

- A. Install in raceway, unless otherwise indicated in individual specification sections.
- B. For cable installed in conduit, comply with requirements for raceways and boxes specified in Section 260533, Conduits, and Section 260534, Boxes.
  - 1. Provide separate conduit systems for each low-voltage system.
  - 2. Pull cables without exceeding cable manufacturer's recommended pulling tensions.
    - a. Pull cables simultaneously if more than one is being installed in same raceway.
    - b. Use pulling compound or lubricant, if necessary. Use compounds that will not damage conductor or insulation.
    - c. Use pulling means, including fish tape, cable, rope, and basket-weave wire or cable grips, that will not damage cables or raceway.
- C. Avoid installing near hot utilities, which might adversely affect system performance or result in damage to the cable. If cable must be placed close to such utilities, keep it separate and protect with insulation.
- D. Cable bends shall have a radius not less than the value recommended by the cable manufacturer.
- E. Tag cables connected to electronic equipment, to show function and the location of other end. Securely fasten labels to the cable.

**END OF SECTION 260519**

## **SECTION 260521**

### **WIRING CONNECTIONS**

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

##### **1.1 SECTION INCLUDES**

- A. Power and control wiring for equipment.

##### **1.2 RELATED SECTIONS**

- A. Equipment: Installed items requiring electricity, specified in other sections or shown on drawings.

#### **PART 2 - PRODUCTS**

##### **2.1 MATERIALS**

- A. Conduits, wires and cables, devices, and accessories as specified in other sections.

#### **PART 3 - EXECUTION**

##### **3.1 INSTALLATION**

- A. Except where provided with equipment, furnish and install manual pushbutton stations and pilot lights, with wiring. Where stations and pilot lights are grouped at central locations, mount them under a common faceplate.
- B. Rough in and connect to equipment furnished under other sections and equipment furnished by Project Officer. Make connections as indicated on drawings with exact locations and details determined by approved shop drawings of the equipment.
  - 1. Under equipment sections, equipment will be set in position and the electrical devices and components furnished loose. Assemble, install, and wire under this section.
  - 2. Accomplish rough-in from walls with flush outlet boxes and from floors by means of conduit couplings finishing flush with finished floor.
- C. Certain equipment, as indicated, will be furnished with control panels and auxiliary control components. Mount the panels, furnish and install source wiring and disconnects, and completely connect controls and motors.
- D. Provide power sources for Project Officer-furnished equipment.

### **END OF SECTION 260521**

## **SECTION 260526**

### **GROUNDING AND BONDING**

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

##### **1.1 SECTION INCLUDES**

- A. Grounding and bonding electrical systems and equipment.
- B. Ground system test.

##### **1.2 REFERENCES**

- A. ANSI/TIA/EIA J-STD-607
- B. IEEE STD 142
- C. NFPA 70
- D. ASTM F467 and F468
- E. UL 467

##### **1.3 DEFINITIONS**

- A. Area served by a separately-derived system: The area within the building that contains any part of a circuit of the system.

##### **1.4 SUBMITTALS**

- A. Certifications: System test.

#### **PART 2 - PRODUCTS**

##### **2.1 MANUFACTURED UNITS**

- A. Ground conductor, unless specifically noted otherwise, shall be copper, 98 percent conductivity, solid for No. 10 AWG and smaller and stranded for No. 8 AWG and larger.
- B. Mechanical type ground connectors:
  - 1. Connectors: IEEE 837 and UL 467 compliant, equal to FCI Burndy G Series, listed for use for specific types, sizes, and combinations of conductors and connected items.
  - 2. Nuts, bolts, and washers: Silicon bronze alloy type B per ASTM F467 and F468.

#### **PART 3 - EXECUTION**



### **3.1 INSTALLATION, GENERAL**

- A. Provide the complete grounding of conduit systems, electrical equipment, conductor and equipment enclosures, and neutral conductors in accordance with applicable codes. Grounded phase and neutral conductors shall be continuously identified. Continuity of metal raceways shall be insured by double locknuts.

### **3.2 EQUIPMENT GROUNDING AND BONDING**

- A. Provide insulated equipment grounding conductors to all feeders and branch circuits.

### **3.3 APPLICATIONS**

- A. Underground grounding conductors: Install bare copper conductor, No. 2/0 AWG minimum.
  - 1. Bury at least 24 inches (600 mm) below grade.

### **3.4 GROUNDING SYSTEM TEST**

- A. Ensure that grounding system is continuous and that resistance to earth is not more than 10 ohms.
- B. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall.
- C. Submit written results of each test including location of rods as well as resistance and soil conditions at time measurements were made.

**END OF SECTION 260526**

## **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. Boxes: Section 260534.
- C. 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. Steel conduit and tubing:
  - 1. AFC Cable Systems, Inc. (FMC and LFMC)
  - 2. Allied Tube & Conduit; a Tyco International Ltd-Co.
  - 3. O-Z/Gedney, Unit of General Signal
  - 4. Wheatland Tube Co.
- C. Steel conduit fittings:
  - 1. Appleton Electric Co.

2. Cooper Crouse-Hinds.
3. Hubbell, Inc.; Killark Electric Manufacturing Co.
4. O-Z/Gedney; Unit of General Signal.
5. Spring City Electrical Manufacturing Co.
6. Thomas & Betts Corporation
7. Wheatland Tube Co.

D. 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

E. Wiring troughs and fittings:

1. Hoffman Engineering Co.
2. Lamson & Sessions, Carlon Electrical Products
3. Square D Schneider Electric

F. Conduit hangers and supports:

1. Thomas & Betts “Kindorf”
2. Tyco Power-Strut
3. Unistrut Diversified Products

G. Fasteners:

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

## 2.2 CONDUIT AND FITTINGS

A. Galvanized steel conduit: Hot-dip galvanized with threads galvanized after cutting, one of the following:

1. Rigid full weight, heavy-wall steel conduit (RGS) conforming to UL 6 and ANSI C80.1.
2. Intermediate steel conduit (IMC) conforming to UL 1242 and ANSI C80.6.

B. Steel conduit fittings: Cast malleable iron fittings with smooth finish and full threaded hubs. Include steel or malleable iron locknuts, bushings, and other fittings.

1. Insulating bushings: Equal to Thomas & Betts Series 22.
2. Hub fittings with recessed sealing ring and nylon insulated throat equal to Thomas & Betts Series 370.
3. Fittings for exposed locations: Conduit outlet bodies, zinc or cadmium plated.

- C. Flexible metal conduit (Type FMC): Made of sheet metal strip, interlocked construction, conforming to UL 1.
- D. Liquidtight flexible metal conduit (Type LFMC) shall conform to UL 360.
- E. Connectors for flexible metal conduit: Equal to angle wedge “Tite-Bite” with nylon insulated throat, Thomas & Betts Series 3110 and 3130.
- F. Liquidtight type connectors: UL 14814A. Fittings: With nylon insulated throat, equal to Thomas & Betts Series 5331.
- G. 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.
- H. 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.
- I. Wiring troughs: Steel wiring trough with hinged cover, UL listed as wireways and auxiliary gutters, equal to Square D “Square-Duct.”
  - 1. Cover: Opening complete width and length of trough;
  - 2. Finish: Baked enamel.
- J. Fittings for wiring troughs: Made with removable covers to permit installation of a complete system with access to wires throughout the system, UL listed with the troughs. Connections: Threaded screws at every connector.
- K. Weatherproof expansion fittings: With bonding jumpers, equal to O-Z/Gedney types AX and TX.

### **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.
- D. Bituminous protective coating: Coal tar based, self-priming on steel, applied in a wet film thickness at least 22.0 mils (559 microns) per coat.
- E. Rust inhibitive paint: Alkyd based, equal to Benjamin Moore Super Spec HP D.T.M. Alkyd Low Lustre P23; white, black, or bronzetone; applied in a wet film thickness of at least 2.9 mils.

### **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.
- B. Fasteners to concrete: Self-drilling type expansion anchors, or machine bolt drop in anchors for drilled holes. Fasteners to concrete ceilings shall be vibration- and shock-resistant.

### **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. Wire all raceway systems completely, except where otherwise indicated, as shown on drawings and as required for satisfactory operation of each system.
- C. Where wiring troughs are required or used to facilitate the installation, amply size them to accommodate conductors, in accordance with NFPA 70.
- D. Types and locations of conduits are scheduled at the end of the section.
- E. Do not install conductors or pull rope during installation of conduit.
- F. 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.
- G. Bituminous protective coating:
  - 1. Coat exposed threads on steel conduits in concrete slabs at couplings and fittings, after joints are made up.
  - 2. Coat metallic conduits below grade not in concrete, and where emerging from below grade or slabs, four inches above and below grade or slab.
- H. Rust-inhibitive paint:
  - 1. Exposed threads of exterior conduit.
  - 2. All unfinished metal components.
- I. 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.
- J. 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.

- K. Make vertical runs plumb and horizontal runs level and parallel with building walls and partitions.
- L. Ground conduits as required by NFPA 70.
- M. Where conduits pass through building expansion joints, and wherever relative movement could occur between adjacent slabs, equip with weatherproof expansion fittings and bonding jumpers.
- N. Run conduits concealed in new construction except where connecting to surface-mounted cabinets and equipment, and in electrical and mechanical equipment spaces. Install conduit within walls and partitions.
- O. 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.
- P. 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, OUTLET BOXES**

- A. Install as specified in Section 260534, Boxes.
- B. 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 Project Officer and Landscape Architect.
  - 2. Install boxes flush with wall or ceiling surfaces, with flat covers.

### **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. Buried under building slabs: Top of conduit no less than 12 inches below the vapor barrier. Seal around conduits where they penetrate the vapor barrier.
  - 2. Outside building: Top of conduit no less than 24 inches below finish grade.
- B. Slope: At least 3 inches in 100 feet away from buildings and toward manholes or other drainage points.
- C. 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.
- D. 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.
- D. Under existing roads and paved areas not to be disturbed, jack rigid steel conduit into place.

### **3.7 SCHEDULE OF LOCATIONS**

- A. RGS with screw joint couplings:
  - 1. Conduits in concrete slabs except where noted to be plastic.
  - 2. First five feet of conduit extending outside building.
  - 3. Under roads and paved areas where existing pavement is not to be disturbed, extending at least five feet beyond edges of pavement.
  - 4. Elbows penetrating floor slabs.
- B. IMC with screw joint couplings:
  - 1. Conduits 2.0 inch (53-mm) size and larger except as noted above to be rigid steel.
  - 2. Wiring to exterior equipment.

C. Plastic with solvent cement joints:

1. For exterior circuits, directly buried, except first five feet from building.
2. Where noted under concrete slab, concrete encased.
3. Where noted under concrete slab, direct buried.
4. Where noted in concrete slabs.
5. For concrete encased duct banks.

**END OF SECTION 260533**



## **SECTION 260534**

### **BOXES**

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

##### **1.1 SECTION INCLUDES**

- A. Boxes with covers.

##### **1.2 RELATED SECTIONS**

- A. Conduits: Section 260533.
- B. Wiring devices: Section 262726.
- C. Outlet boxes where required for special systems: Provided by the equipment manufacturers of the various systems.

##### **1.3 SUBMITTALS**

- A. Product data: Each type of box included in the project.

#### **PART 2 - PRODUCTS**

##### **2.1 ACCEPTABLE MANUFACTURERS**

- A. Subject to compliance with requirements, provide products by one of the following:
- B. Boxes:
  - 1. Appleton/EGS Electrical Group
  - 2. RACO/Hubbell Electrical Products
  - 3. Steel City/Thomas & Betts

##### **2.2 MATERIALS**

- A. Outlet, switch, and junction boxes:
  - 1. Cast-metal, where required for weather-exposed, or exposed locations: NEMA FB 1, ferrous alloy or aluminum, Type FD, with gasketed cover.

##### **2.3 BOXES FOR WALLS AND PARTITIONS**

- A. Outlet boxes in concrete construction: Octagonal, two-piece type, of sufficient depth to keep conduits not closer than 1 inch (25 mm) to surface.

- B. Switch and receptacle boxes in masonry partitions and walls: Square cornered tile wall boxes 3.5 inches (90 mm) deep, or four-inch (100-mm) square boxes with raised tile wall device covers. The device covers shall be of extra depths required to suit the block or brick construction in which they are placed.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Provide box at each outlet, switch, and appurtenance. Each box shall be of a type suitable for the duty intended and shall be installed in accordance with the manufacturer's instructions.
  - 1. Where conduit is weather-exposed or exposed, provide cast-steel or cast-aluminum boxes.
- B. Coordinate locations of boxes with installation of conduit as specified in Section 260533.
- C. Do not install boxes back-to-back (through the wall) in partitions.
- D. Firmly secure the boxes in place, plumb, level, and with front of device cover even with finished wall surface.
- E. Provide a single cover plate where two or more devices are grouped together in one box.
- F. Outlet boxes in fire-rated assembly:
  - 1. Clearance between boxes and wallboard shall not exceed 0.125 inch (3.2 mm).
  - 2. Surface area of individual outlet box does not exceed 16 square inches (103 sq cm).
  - 3. Entire surface area of boxes shall not exceed 100 square inches (645 sq cm) per 100 square feet (9.3 sq m) of wall surface.

#### **3.2 IDENTIFICATION**

- A. Identification inside boxes for recess-mounted or concealed in walls and partitions: Plasticized card stock tags marked with permanent waterproof black markers.
  - 1. Power and lighting: Panelboard designation and circuit number(s).

**END OF SECTION 260534**

## SECTION 260544

### UNDERGROUND DUCTS AND UTILITY STRUCTURES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This section includes the following:
  - 1. Ducts in directly buried duct banks.
  - 2. Ducts in concrete-encased duct banks.
  - 3. 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.
  - 3. Duct bank materials, including spacers and miscellaneous components.
  - 4. Warning tape.
- B. Shop drawings: Show fabrication and installation details for underground ducts and utility structures.
- C. Coordination drawings: Show duct profiles and coordination with other utilities and underground structures. Include plans and sections drawn to scale, and show all bends and location of expansion fittings.

### **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 Project Officer 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 and Landscape Architect at least two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Project Officer and Landscape Architect'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 and Landscape Architect.

## **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. Nonmetallic ducts and accessories:
  - a. ARNCO Corp.
  - b. Beck Manufacturing Inc.
  - c. Cantex, Inc.
  - d. CertainTeed Corp.; Pipe & Plastics Group.
  - e. ElecSys, Inc.
  - f. Electri-Flex Co.
  - g. IPEX, Inc.
  - h. Lamson & Sessions; Carlon Electrical Products.
  - i. Manhattan/CDT
  - j. Spiraduct/AFC Cable Systems, Inc.
- 2. 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 DUCTS**

- A. Rigid nonmetallic conduit: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by the same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.
- B. Rigid nonmetallic conduit: NEMA TC 2, Type EPC-80-PVC, UL 651, with matching fittings by the same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.
- C. Plastic utilities duct: NEMA TC 6, Type EB-20-PVC, ASTM F 512, UL 651A, with matching

fittings by the same manufacturer as the conduit, complying with NEMA TC 9.

- D. Reinforced fiberglass epoxy duct: Type FRE, NEMA TC-14A (IPS) medium wall, UL listed and meeting applicable ASTM standards for medium-voltage service.

## **2.4 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".

## **2.5 ACCESSORIES**

- A. Duct spacers: Rigid, nonmetallic, horizontally and vertically interlocking spacers, selected to provide minimum duct spacings and cover depths indicated while supporting ducts during concreting and backfilling.
- B. Duct-sealing compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F (2 deg C). Capable of withstanding temperature of 300 deg F (150 deg C) without slump and of adhering to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.
- C. Warning tape: Underground-line warning tape specified in Section 260553, Identification for Electrical Systems.

## **2.6 CONSTRUCTION MATERIALS**

- A. Waterproofing: Comply with Division 07 section specifying waterproofing.
- B. Mortar: Comply with ASTM C 270, Type M, except for quantities less than 2.0 cu. ft. (60 L) where packaged mix complying with ASTM C 387, Type M, may be used.
- C. Concrete: Use 3000-psi- (20.7-MPa-) minimum, 28-day compressive strength and 0.375-inch (10-mm) maximum aggregate size. Concrete and reinforcement are specified in Division 03 Section "Cast-in-Place Concrete."

## **PART 3 - EXECUTION**

### **3.1 APPLICATIONS**

- A. Underground ducts for electrical cables higher than 600 V: Type EPC-40-PVC concrete-encased duct bank.
- B. Underground ducts for electrical feeders 600 V and below: Type EB-20-PVC or EPC-40-PVC, concrete-encased duct bank.

- C. Underground ducts for electrical branch circuits 600 V and below: Type EPC-40-PVC, directly buried duct bank, except use Type EPC-80-PVC when crossing roads.
- D. 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.
- C. Restore all areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Division 32 Section specifying Landscaping.
- D. Restore disturbed pavement. Refer to “Cutting and Patching” in Section 260101.

### **3.3 CONDUIT AND DUCT INSTALLATION**

- A. Slope: Pitch ducts a minimum slope of 1:300 down toward handholes and away from buildings and equipment.
- B. Curves and bends: Use manufactured elbows for stub-ups at equipment and at building entrances. Use manufactured long sweep bends with a minimum radius of 25 feet (7.5 m), both horizontally and vertically, at other locations.
- C. Use solvent-cement joints in ducts and fittings and make watertight according to manufacturer’s written instructions. Stagger couplings so those of adjacent ducts do not lie in the same plane.
- D. Duct entrances to handholes: Space end bells approximately 10 inches (250 mm) o.c. for 5-inch (125-mm) ducts and vary proportionately for other duct sizes. Change from regular spacing to end-bell spacing 10 feet (3 m) from the end bell without reducing duct line slope and without forming a trap in the line. Grout end bells into handhole walls from both sides to provide watertight entrances.
- E. Building entrances: Make a transition from underground duct to conduit at least 10 feet (3 m) outside the building wall. Use fittings manufactured for this purpose. Follow the appropriate installation instructions below:
  - 1. Concrete-encased ducts: Install reinforcement in duct banks passing through disturbed earth near buildings and other excavations. Coordinate duct bank with structural design to support duct bank at wall without reducing structural or watertight integrity of building wall.
  - 2. Waterproofed wall and floor penetrations: Install a watertight entrance-sealing device with sealing gland assembly on the inside. Anchor device into masonry construction with one or more integral flanges. Secure membrane waterproofing to the device to make permanently watertight.
- F. Concrete-encased, nonmetallic ducts: Support ducts on duct spacers, spaced as recommended by manufacturer and coordinated with duct size, duct spacing, and outdoor temperature. Install as

follows:

1. Separator installation: Space separators close enough to prevent sagging and deforming of ducts and secure separators to earth and to ducts to prevent floating during concreting. Stagger spacers approximately 6 inches (150 mm) between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
  2. Concreting: Spade concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Use a plank to direct concrete down sides of bank assembly to trench bottom. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct bank application. Pour each run of envelope between handholes or other terminations in one continuous operation. If more than one pour is necessary, terminate each pour in a vertical plane and install 0.75-inch (19-mm) reinforcing rod dowels extending 18 inches (450 mm) into concrete on both sides of joint near corners of envelope.
  3. Reinforcement: Reinforce duct banks where they cross disturbed earth and where indicated.
  4. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
  5. Minimum clearances between ducts: 3 inches (75 mm) between ducts and exterior envelope wall, 2 inches (50 mm) between ducts for like services, and 4 inches (100 mm) between power and signal ducts.
  6. Depth: Install top of duct bank at least 24 inches (600 mm) below finished grade in nontraffic areas and at least 30 inches (750 mm) below finished grade in vehicular traffic areas, unless otherwise indicated.
- G. Directly buried ducts: Support ducts on duct spacers, spaced as recommended by manufacturer and coordinated with duct size, duct spacing, and outdoor temperature. Install as follows:
1. Separator installation: Space separators close enough to prevent sagging and deforming of ducts.
  2. Install expansion fittings as shown on shop drawings.
  3. Trench bottom: Continuous, firm, and uniform support for duct bank. Prepare trench bottoms as specified in 26 0501, Excavation and Fill for Electrical Work.
  4. Backfill: Install backfill as specified in Section 26 0501, Excavation and Fill for Electrical Work. After installing first tier of ducts, backfill and compact. Repeat backfilling after placing each tier. After placing last tier, hand-place backfill to 4 inches (100 mm) over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, complete backfilling normally.
  5. Minimum clearances between ducts: 3 inches (75 mm) between ducts for like services and 6 inches (150 mm) between power and signal ducts.
  6. Depth: Install top of duct bank at least 24 inches (600 mm) below finished grade, unless otherwise indicated.
- H. Warning tape: Bury warning tape approximately 12 inches (300 mm) above all concrete-encased duct banks. Align tape parallel to and within 3 inches (75 mm) of the centerline of duct bank.
- I. Stub-ups: Use rigid steel conduit for stub-ups to equipment. For equipment mounted on outdoor concrete bases, extend steel conduit a minimum of 5 feet (1.5 m) from edge of base. Install



insulated grounding bushings on terminations. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches (75 mm) of concrete.

- J. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.
- K. Pulling cord: Install 100-lbf- (445-N-) test nylon cord in ducts, including spares.

### **3.4 HANDHOLE INSTALLATION**

- A. Waterproofing: Apply according to Division 07 Section specifying waterproofing. 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.

### **3.5 FIELD QUALITY CONTROL**

- A. Testing: Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
- B. Duct integrity: Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of the duct. If obstructions are indicated, remove obstructions and retest.
- C. Correct installations if possible and retest to demonstrate compliance. Remove and replace defective products and retest.

### **3.6 CLEANING**

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

**END OF SECTION 260544**

## **SECTION 262716**

### **CABINETS AND ENCLOSURES**

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

##### **1.1 SECTION INCLUDES**

- A. Weatherproof enclosures.

##### **1.2 SUBMITTALS**

- A. Product data: Each type of enclosure required for the project.

#### **PART 2 - PRODUCTS**

##### **2.1 WEATHERPROOF ENCLOSURES**

- A. Type 3R in accordance with NEMA 250 and conforming to UL 57, of size required by NEC to fit equipment or as shown on the drawings.
- B. Construction: Fabricated of 14-gage galvanized steel, with drip shield top and smooth, seam-free sides and back.
- C. Doors: Double doors fabricated from 12-gage galvanized steel, overlap type without center post.
  - 1. Door gaskets: Neoprene, attached with oil-resistant adhesive and held in place with steel retaining strips.
  - 2. Full-length piano hinges.
  - 3. Locks: Keyed, with all keys alike. Provide two keys with each enclosure.
- D. Provide steel channels in rear of cabinet for mounting metering equipment.

##### **2.2 FINISHES**

- A. Satin gray enamel, inside and out.

#### **PART 3 - EXECUTION**

##### **3.1 INSTALLATION**

- A. Securely attach enclosure to frame, set on housekeeping pad, as indicated.

##### **3.2 LOCATIONS**

- A. Provide weatherproof type in exterior locations.

### **END OF SECTION 262716**

**SECTION 262726**  
**WIRING DEVICES**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Receptacles.
- B. Terminal blocks.

**1.2 SUBMITTALS**

- A. Product data: Each type of device used in the project.
- B. Samples: One sample of each type of wiring device and device plate, as requested by Project Officer and Landscape Architect.

**PART 2 - PRODUCTS**

**2.1 RECEPTACLES**

- A. Acceptable manufacturers:
  - 1. Pass & Seymour, Inc.
  - 2. Leviton Manufacturing Co.
  - 3. Hubbell/Bryant Electric
  - 4. Cooper Industries/Cooper Wiring Devices.
- B. Provide devices conforming to UL 498 for receptacles, equal to the following Pass & Seymour catalog numbers or NEMA WD 1 and WD 6 configuration numbers:
  - 1. GFCI receptacles:
    - a. Weatherproof cover: WIUC10FRED.
    - b. Exterior and wet locations: 2097TRWR, 20 amps, weather-resistant, tamper-resistant.
- C. Device color:
  - 1. General-purpose receptacles: Brown.
- D. Device plates: Equal to P&S: Smooth plastic, SP Series, color shall match device color.

**2.2 TERMINAL BLOCKS**

- A. Terminal blocks: Equal to Square D, screw-terminal type, size as required by NFPA 70, NEMA 250 Type 1 enclosure with hinged cover.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install devices in complete compliance with the manufacturer's recommendations.
- B. Receptacles orientation:
  - 1. Install ground pin of vertically mounted receptacles up and on horizontally mounted receptacles to the right.
- C. Device plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- D. Arrangement of devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent devices under single multi-gang wall plates.

### **3.2 IDENTIFICATION**

- A. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on back of plate, and durable wire markers or tags inside outlet boxes.

**END OF SECTION 262726**

## SECTION 265668

### EXTERIOR ATHLETIC LIGHTING SYSTEM WITH LED LIGHT SOURCE

#### PART 1 – GENERAL

##### 1.1 SUMMARY

- A. Work covered by this section of the specifications shall conform to the contract documents, engineering plans as well as state and local codes.
- B. The purpose of these specifications is to define the lighting system performance and design standards for Marcey Road Park Tennis And Basketball using an LED Lighting source. The manufacturer / contractor shall supply lighting equipment to meet or exceed the standards set forth in these specifications.
- C. The sports lighting will be for the following venues:
  - 1. Tennis 1-3
  - 2. Basketball
- D. The primary goals of this sports lighting project are:
  - 1. **Guaranteed Light Levels:** Selection of appropriate light levels impact the safety of the players and the enjoyment of spectators. Therefore light levels are guaranteed to not drop below specified target values for a period of 25 years.
  - 2. **Environmental Light Control:** It is the primary goal of this project to minimize spill light to adjoining properties and glare to the players, spectators and neighbors.
  - 3. **Cost of Ownership:** In order to reduce the operating budget, the preferred lighting system shall be energy efficient and cost effective to operate. All maintenance costs shall be eliminated for the duration of the warranty.
  - 4. **Control and Monitoring:** To allow for optimized use of labor resources and avoid unneeded operation of the facility, customer requires a remote on/off control system for the lighting system. Fields should be proactively monitored to detect luminaire outages over a 25-year life cycle. All communication and monitoring costs for 25-year period shall be included in the bid.

##### 1.2 LIGHTING PERFORMANCE

- A. **Illumination Levels and Design Factors:** Playing surfaces shall be lit to an average target illumination level and uniformity as specified in the chart below. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified below. Appropriate light loss factors shall be applied and submitted for the basis of design. Average illumination level shall be measured in accordance with the IESNA LM-5-04 (IESNA Guide for Photometric Measurements of Area and Sports Lighting Installations). Illumination levels shall not to drop below desired target values in accordance to IES RP-6-15, Page 2, Maintained Average Illuminance and shall be guaranteed for the full warranty period.

Area of Lighting	Average Target Illumination Levels	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Tennis 1-3	30 foot-candles	2.5:1.0	45	20'x20'
Basketball	20 foot-candles	2.5:1.0	40	10'x10'

- B. Color: The lighting system shall have a minimum color temperature of <4000K and a CRI of <65.
- C. Mounting Heights: (POLES ARE EXISTING) To ensure proper aiming angles for reduced glare and to provide better playability, minimum mounting heights shall be as described below. Higher mounting heights may be required based on photometric report and ability to ensure the top of the field angle is a minimum of 10 degrees below horizontal.

POLES ARE EXISTING

# of Poles	Pole Designation	Pole Height
2	B1- B2	40'
4	T1-T2	50'

### 1.3 ENVIRONMENTAL LIGHT CONTROL

- A. Light Control Luminaires: All luminaires shall utilize spill light and glare control devices including, but not limited to, internal shields, louvers and external shields. No symmetrical beam patterns are accepted.
- B. Spill Scans: Spill scans must be submitted indicating the amount of horizontal and vertical foot-candles along the specified lines. Light levels shall be taken at 30-foot intervals along the boundary line. Readings shall be taken with the meter orientation at both horizontal and aimed towards the most intense bank of lights. Illumination level shall be measured in accordance with the IESNA LM-5-04 after 1 hour warm up.
- C. The first page of a photometric report for all luminaire types proposed showing horizontal and vertical axial candle power shall be provided to demonstrate the capability of achieving the specified performance. Reports shall be certified by a qualified testing laboratory with a minimum of five years experience or by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products. A summary of the horizontal and vertical aiming angles for each luminaire shall be included with the photometric report.

### 1.4 Cost of Ownership

- A. Manufacturer shall submit a 25-year Cost of Ownership summary that includes energy consumption, anticipated maintenance costs, and control costs. All costs associated with faulty luminaire replacement - equipment rentals, removal and installation labor, and shipping - are to be included in the maintenance costs.

## PART 2 – PRODUCT

### 2.1 SPORTS LIGHTING SYSTEM CONSTRUCTION

- A. Manufacturing Requirements: All components shall be designed and manufactured as a system. All luminaires, wire harnesses, drivers and other enclosures shall be factory assembled, aimed, wired and tested.

- B. Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed carbon steel shall be hot dip galvanized per ASTM A123. All exposed aluminum shall be powder coated with high performance polyester or anodized. All exterior reflective inserts shall be anodized, coated, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All exposed hardware and fasteners shall be stainless steel, passivated and coated with aluminum-based thermosetting epoxy resin for protection against corrosion and stress corrosion cracking. Structural fasteners may be carbon steel and galvanized meeting ASTM A153 and ISO/EN 1461 (for hot dipped galvanizing), or ASTM B695 (for mechanical galvanizing). All wiring shall be enclosed within the cross-arms, pole, or electrical components enclosure.
- C. System Description: Lighting system shall consist of the following:
1. Galvanized steel poles and cross-arm assembly. POLES ARE EXISTING and will be reused.
  2. Non-approved pole technology:
    - a. Direct bury steel poles which utilize the extended portion of the steel shaft for their foundation will not be accepted due to potential for internal and external corrosive reaction to the soils and long-term performance concerns.
  3. ***Lighting systems shall use existing poles on site.***
  4. Manufacturer will supply all drivers and supporting electrical equipment
    - a. Remote drivers and supporting electrical equipment shall be mounted approximately 10 feet above grade in aluminum enclosures. The enclosures shall be touch-safe and include drivers and fusing with indicator lights on fuses to notify when a fuse is to be replaced for each luminaire. Disconnect per circuit for each pole structure will be located in the enclosure.
    - b. Manufacturer shall provide surge protection at the pole equal to or greater than 40 kA for each line to ground (Common Mode) as recommended by IEEE C62.41.2\_2002.
  5. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.
  6. All luminaires, visors, and cross-arm assemblies shall withstand 150 mi/h winds and maintain luminaire aiming alignment.
  7. Manufacturer shall provide lightning grounding as defined by NFPA 780 and be UL Listed per UL 96 and UL 96A.
    - a. Integrated grounding via concrete encased electrode grounding system.
    - b. If grounding is not integrated into the structure, the manufacturer shall supply grounding electrodes, copper down conductors, and exothermic weld kits. Electrodes and conductors shall be sized as required by NFPA 780. The grounding electrode shall be minimum size of 5/8 inch diameter and 8 feet long, with a minimum of 10 feet embedment. Grounding electrode shall be connected to the structure by a grounding electrode conductor with a minimum size of 2 AWG for poles with 75 feet mounting height or less, and 2/0 AWG for poles with more than 75 feet mounting height.
- D. Safety: All system components shall be UL listed for the appropriate application.

## 2.2 ELECTRICAL

- A. Electric Power Requirements for the Sports Lighting Equipment:
1. Electric power: 240 Volt, 1 Phase
  2. Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.
- B. Energy Consumption: The kW consumption for the field lighting system shall be 7.48kw.

## **2.3 CONTROL**

- A. Instant On/Off Capabilities: System shall provide for instant on/off of luminaires.
- B. Lighting contactor cabinet(s) constructed of NEMA Type 4 aluminum, designed for easy installation with contactors, labeled to match field diagrams and electrical design. Manual off-on-auto selector switches shall be provided.
- C. Remote Lighting Control System: System shall allow owner and users with a security code to schedule on/off system operation via a web site, phone, fax or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs. The owner may assign various security levels to schedulers by function and/or fields. This function must be flexible to allow a range of privileges such as full scheduling capabilities for all fields to only having permission to execute “early off” commands by phone. Scheduling tool shall be capable of setting curfew limits. Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have
- D. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The controller shall determine switch position (manual or auto) and contactor status (open or closed).
- E. Management Tools: Manufacturer shall provide a web-based database and dashboard tool of actual field usage and provide reports by facility and user group. Dashboard shall also show current status of luminaire outages, control operation and service. Mobile application will be provided suitable for IOS, Android and Blackberry devices. Hours of Usage: Manufacturer shall provide a means of tracking actual hours of usage for the field lighting system that is readily accessible to the owner.
  - 1. Cumulative hours: shall be tracked to show the total hours used by the facility
  - 2. Report hours saved by using early off and push buttons by users.
- F. Communication Costs: Manufacturer shall include communication costs for operating the control and monitoring system for a period of 25 years.
- G. Communication with luminaire drivers: Control system shall interface with drivers in electrical components enclosures by means of powerline communication

## **2.4 STRUCTURAL PARAMETERS**

- A. Wind Loads: Wind loads shall be based on the 2015 International Building Code. Wind loads to be calculated using ASCE 7-10, an ultimate design wind speed of 115mph and exposure category C.
- B. Pole Structural Design: The stress analysis and safety factor of the poles shall conform to 2013 AASHTO Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals (LTS-6).

## **PART 3 – EXECUTION**

### **3.1 SOIL QUALITY CONTROL**

- A. It shall be the Contractor’s responsibility to notify the Owner if soil conditions exist other than those on which the foundation design is based, or if the soil cannot be readily excavated. Contractor may



issue a change order request / estimate for the Owner's approval / payment for additional costs associated with:

1. Providing engineered foundation embedment design by a registered engineer in the State of Virginia for soils other than specified soil conditions;
2. Additional materials required to achieve alternate foundation;
3. Excavation and removal of materials other than normal soils, such as rock, caliche, etc.

### **3.2 DELIVERY TIMING**

- A. Delivery Timing Equipment On-Site: The equipment must be on-site 6-8 weeks from receipt of approved submittals and receipt of complete order information.

### **3.3 FIELD QUALITY CONTROL**

- A. Illumination Measurements: Upon substantial completion of the project and in the presence of the Contractor, Project Engineer, Owner's Representative, and Manufacturer's Representative, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA LM-5-04.
- B. Field Light Level Accountability
1. Light levels are guaranteed not to fall below the target maintained light levels for the entire warranty period of 25 years. These levels will be specifically stated as "guaranteed" on the illumination summary provided by the manufacturer.
  2. The contractor/manufacturer shall be responsible for conducting initial light level testing and an additional inspection of the system, in the presence of the owner, one year from the date of commissioning of the lighting.
  3. The contractor/manufacturer will be held responsible for any and all changes needed to bring these fields back to compliance for light levels and uniformities. Contractor/Manufacturer will be held responsible for any damage to the fields during these repairs.
- C. Correcting Non-Conformance: If, in the opinion of the Owner or his appointed Representative, the actual performance levels including footcandles and uniformity ratios are not in conformance with the requirements of the performance specifications and submitted information, the Manufacturer shall be required to adjust meet specifications and satisfy Owner.

### **3.4 WARRANTY AND GUARANTEE**

- A. 25-Year Warranty: Each manufacturer shall supply a signed warranty covering the entire system for 25 years from the date of shipment. Warranty shall guarantee specified light levels. Manufacturer shall maintain specifically-funded financial reserves to assure fulfillment of the warranty for the full term. Warranty does not cover weather conditions events such as lightning or hail damage, improper installation, vandalism or abuse, unauthorized repairs or alterations, or product made by other manufacturers.
- B. Maintenance: Manufacturer shall monitor the performance of the lighting system, including on/off status, hours of usage and luminaire outage for 25 years from the date of equipment shipment. Parts and labor shall be covered such that individual luminaire outages will be repaired when the usage of any field is materially impacted. Manufacturer is responsible for removal and replacement of failed luminaires, including all parts, labor, shipping, and equipment rental associated with maintenance. Owner agrees to check fuses in the event of a luminaire outage.

## **PART 4 – DESIGN APPROVAL**

### **4.0 PRE-BID SUBMITTAL REQUIREMENTS (Non-Musco)**

- A. Design Approval: The owner / engineer will review pre-bid submittals per section 4.0.B from all the manufacturers to ensure compliance to the specification 10 days prior to bid. If the design meets the design requirements of the specifications, a letter and/or addendum will be issued to the manufacturer indicating approval for the specific design submitted.
- B. Approved Product: Musco's Light-Structure System™ with TLC for LED™ is the approved product. All substitutions must provide a complete submittal package for approval as outlined in Submittal Information at the end of this section at least 10 days prior to bid. Special manufacturing to meet the standards of this specification may be required. An addendum will be issued prior to bid listing any other approved lighting manufacturers and designs.
- C. All listed manufacturers not pre-approved shall submit the information at the end of this section at least 10 days prior to bid. An addendum will be issued prior to bid; listing approved lighting manufacturers and the design method to be used.
- D. Bidders are required to bid only products that have been approved by this specification or addendum by the owner or owner's representative. Bids received that do not utilize an approved system/design, will be rejected.

## **PART 5 – MEASUREMENT**

- 5.0** The measurement for LED LIGHT-STRUCTURE RETROFIT SYSTEM INCLUDING TLC FOR LED to be paid for shall be for LED Lighting furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**REQUIRED SUBMITTAL INFORMATION FOR ALL MANUFACTURERS (NOT PRE-APPROVED) 10 DAYS PRIOR TO BID**

All items listed below are mandatory, shall comply with the specification and be submitted according to pre-bid submittal requirements. Complete the Yes/No column to indicate compliance (Y) or noncompliance (N) for each item. Submit checklist below with submittal.

Yes/No	Tab	Item	Description
	A	Letter/ Checklist	Listing of all information being submitted must be included on the table of contents. List the name of the manufacturer's local representative and his/her phone number. Signed submittal checklist to be included.
	B	Equipment Layout	Drawing(s) showing field layouts with pole locations
	C	On Field Lighting Design	Lighting design drawing(s) showing: <ol style="list-style-type: none"> <li>Field Name, date, file number, prepared by</li> <li>Outline of field(s) being lighted, as well as pole locations referenced to the center of the field (x &amp; y), Illuminance levels at grid spacing specified</li> <li>Pole height, number of fixtures per pole, horizontal and vertical aiming angles, as well as luminaire information including wattage, lumens and optics</li> <li>Height of light test meter above field surface.</li> <li>Summary table showing the number and spacing of grid points; average, minimum and maximum illuminance levels in foot candles (fc); uniformity including maximum to minimum ratio, coefficient of variance (CV), coefficient of utilization (CU) uniformity gradient; number of luminaires, total kilowatts, average tilt factor; light loss factor.</li> </ol>
	D	Off Field Lighting Design	Lighting design drawing showing initial spill light levels along the boundary line (defined on bid drawings) in footcandles. Lighting design showing glare along the boundary line in candela. Light levels shall be taken at 30-foot intervals along the boundary line. Readings shall be taken with the meter orientation at both horizontal and aimed towards the most intense bank of lights.
	E	Photometric Report	Provide first page of photometric report for all luminaire types being proposed showing candela tabulations as defined by IESNA Publication LM-35-02. Photometric data shall be certified by laboratory with current National Voluntary Laboratory Accreditation Program or an independent testing facility with over 5 years experience.
	F	Performance Guarantee	Provide performance guarantee including a written commitment to undertake all corrections required to meet the performance requirements noted in these specifications at no expense to the owner. Light levels must be guaranteed to not fall below target levels for warranty period.
	G	Control & Monitoring System	Manufacturer of the control and monitoring system shall provide written definition and schematics for automated control system. They will also provide ten (10) references of customers currently using proposed system in the state of Virginia.
	H	Electrical Distribution Plans	Manufacturer bidding an alternate product must include a revised electrical distribution plan including changes to service entrance, panels and wire sizing, signed by a licensed Electrical Engineer in the state of Virginia.
	I	Warranty	Provide written warranty information including all terms and conditions. Provide ten (10) references of customers currently under specified warranty in the state of Virginia.
	J	Project References	Manufacturer to provide a list of ten projects where the technology and specific fixture proposed for this project has been installed in the state of Virginia. Reference list will include project name, project city, installation date, and if requested, contact name and contact phone number.
	K	Product Information	Complete bill of material and current brochures/cut sheets for all product being provided.
	L	Delivery	Manufacturer shall supply an expected delivery timeframe from receipt of approved submittals and complete order information.
	M	Non-Compliance	Manufacturer shall list all items that do not comply with the specifications. If in full compliance, tab may be omitted.
	N	Cost of Ownership	Document cost of ownership as defined in the specification. Identify energy costs for operating the luminaires. Maintenance cost for the system must be included. All costs should be based on 25 Years

**END OF SECTION 265668**

# **DIVISION 31**

# **EARTHWORK**

## SECTION 311000

### SITE CLEARING, PREPARATION, 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. 011000 – Summary and General Requirements
  2. 012000 - Mobilization
  3. Division 26 - Electrical
  4. 311300 – Tree Protection and Root Pruning
  5. 312500 – Temporary Erosion and Sediment Control
  6. Footings, bases, and foundations for the above-mentioned removals shall be removed under Section 312000 – Earth Moving
  7. 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 event 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 measurement for SITE CLEARING, PREPARATION, DEMOLITION AND REMOVALS to be paid for shall be for Site Clearing, Preparation, Demolition and Removals in accordance with the plans, 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 of existing trees to remain:
  - a. Root Pruning of existing trees roots that are affected by execution of the Work, whether temporary or permanent construction.
  - b. Perimeter Construction Fence/Tree Protection Fence
  - c. Interior Construction Fence/Tree Protection Fence
  - d. Hand demolition of existing site infrastructure, hardscape, softscape, walls.
  - e. Tree Trunk and Limb Protection Wrap
  - f. Mulch Matting
  - g. Temporary Root Protection Matting (includes Construction Access Route)
  - h. Demolition by Hand/as Directed by Arborist
2. Remove Tree and Grind Stump below finished grade.

B. Contractor coordination with Project Officer, Arlington County Certified Arborist/Urban Forester, Certified Arborist subcontractor, County Landscape Architect, Consultant Landscape Architect.

C. Provide all labor, materials, tool and equipment as required to have tree protection applied on all areas called for on plans.

D. 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/>

E. Related Sections:

- a. 311000 Site Clearing, Preparation, Demolition and Removals
- b. 312000 Earth Moving
- c. 312500 Temporary Erosion and Sediment Control
- d. 329100 Planting Preparation
- e. 329200 Seeding and Sodding
- f. 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 2.0
- A. Certification: From Contractor’s 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.
- B. Maintenance Requirements: From Contractor’s arborist, for care and protection of trees affected by construction during and after completing the Work.
- C. Contract arborist Qualifications: Contractor shall submit a copy of valid ISA certification to the Project Officer for approval with confirmation by Urban Forester.
- D. 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.
- E. Provide schedules for performance of work.
- F. 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:
  - a. Temporary Root Protection Mat materials, types and construction uses

- b. Root Pruning Methods
- c. Tree Protection Fence and Signs
- d. Tree Trunk and 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 Urban Forester.
- J. Tree Pruning Standard: Comply with ANSI A300 (Part 1), "Tree, Shrub, and Other Woody Plant Maintenance--Standard Practices (Pruning)."
  - a. Pruning shall remove only dead, dying, damaged or broken limbs greater than 1" – 1.5" in diameter.
  - e. Pruning for clearance shall be reviewed and approved by Project Officer with confirmation by the Urban Forester.

- K. Urban Forester Notification: The Contractor shall notify the Project Officer 72 hours prior to the following events, so that the County's Urban Forester can be notified and present at a pre-construction site meeting (refer to Section 3) and to observe work:
- a. Tree protection fencing installation
  - b. Tree or root-pruning operations.
  - c. Work within tree protection zones.
  - d. 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. Temporary Tree Protection Fence (Perimeter and Interior): 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 703-228-6557 TO REPORT VIOLATIONS" in both English and Spanish. Signs shall be mounted on fence every 50 feet maximum.



- C. Topsoil: Refer to Section 329100 – Plant Preparation. 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: If required in approved plans, temporary root protection matting shall be a double-sided geocomposite, geonet core, non-wove covering such as Tendrain 770-2, as manufactured by Tenax Corporation, Baltimore, MD or approved equal. Six (6) inches of wood chip mulch shall be applied to area to receive root protection matting prior to installation. Matting shall be installed in a single layer.
  - a. May be required for access during hardscape demolition operations where sharp turns are difficult.
  - b. Shall be used for access within critical root zones of trees to remain.
  - c. 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. Landscape nails: When required, spikes shall be 12” as indicated on the drawings.
- G. Tree Trunk and 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.

**PART 3 - PART 3-EXECUTION**

**3.0 CONSTRUCTION ACCESS**

- A. As shown on Tree Protection Plans LF-01 through LF-04.

**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 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:

- a. Demolition of walks and hardscape within tree protection areas shall be directly supervised by an ISA certified arborist.
- b. Mechanized equipment shall not enter tree protection areas (TPAs) or reforestation areas.
- c. 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 PROTECTION 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 Officer 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 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 Urban Forester or contract arborist's written instructions.
- B. The Contractor shall be responsible for any damage to trees within the Tree Protection Area caused by the Contractor’s personnel, vehicles, or equipment at the site. Any damage to a tree to remain shall result in a payment by the Contractor to the Project Officer for the amount of damage based on the latest edition of the Council of Tree and Landscape Appraisers Guide for Plant Appraisal published by the International Society of Arboriculture (ISA). All trees are to be valued as landscape trees.

### **3.06 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 measurement for REMOVE TREE AND GRIND STUMP to be paid for shall be the SITE CLEARING, PREPARATION, DEMOLITION AND REMOVALS in accordance with the plans, specifications and to the satisfaction of the Project Officer.
- 4.02** The measurement for ROOT PRUNING to be paid for shall be for Root Pruning in accordance with the plans, specifications and to the satisfaction of the Project Officer.
- 4.03** The measurement for CONSTRUCTION FENCE / TREE PROTECTION FENCE (PERIMETER) to be paid for shall be for Perimeter Fencing installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
- 4.04** The measurement for CONSTRUCTION FENCE / TREE PROTECTION FENCE (INTERIOR) to be paid for shall be for Interior Fencing installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
- 4.05** The measurement for TEMPORARY ROOT PROTECTION MATTING to be paid for shall be for Root Protection Matting installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
- 4.06** The measurement for TREE TRUNK AND LIMB PROTECTION WRAP to be paid for shall be for Protection Wrap installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
- 4.07** The measurement for MULCH MATTING to be paid for shall be for Mulch Matting furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
- 4.08** The measurement for DEMOLITION BY HAND/AS DIRECTED BY ARBORIST to be paid for shall be for Demolition by Hand in accordance with the plans, 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 011000 – Summary and General Requirements
  - 2. Section 033000 – Cast-in-Place Concrete
  - 3. Section 061300 – Heavy Timber Construction

4. Section 101400 - Signage
5. Section 116833 – Athletic Equipment
6. Section 129300 – Site Furnishings
7. Section 221113 – Facility Water Distribution Piping
8. Division 26
9. Section 311000 – Site Clearing, Preparation, Demolition and Removals
10. Section 311300 – Tree Protection and Root Pruning
11. Section 312500 – Temporary Erosion and Sediment Control
12. Division 32
13. 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. Particle Gradation according to ASTM D 422 and Atterberg Limits according to ASTM D 4318.
  - 3. 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 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. Also, CL & ML with liquid limit less than or equal to 40 and plasticity index less than or equal to 15 and maximum dry density of 105 PCF and with a maximum of 70% passing the US Standard No. 200 sieve.
- C. Unsatisfactory Soils: Soil Classification Groups OL, OH, CH, MH, 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. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

### **2.02 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 20 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 8 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 measurement for SITE EARTHWORK to be paid for shall be for Site Earthwork in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**END OF SECTION 312000**

## **SECTION 312500**

### **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. Filter Log
    - iv. 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 measurement for STABILIZED CONSTRUCTION ENTRANCE (PHASE 1 & 2) to be paid for shall be for Stabilized Construction Entrance installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.02** The measurement for SUPER SILT FENCE (PHASE 1 & 2) to be paid for shall be for Super Silt Fencing furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.03** The measurement for 15" FILTER LOG (PHASE 1 & 2) to be paid for shall be for 15" Filter Logs installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.04** The measurement for STANDARD INLET PROTECTION to be paid for shall be for Inlet Protection installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**END OF SECTION 312500**

# **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 0133000 – Submittal Procedures
- B. Section 033000 – Cast-in-Place Concrete
- C. Section 311000 – Site Clearing, Preparation, Demolition and Removals
- D. Section 312000 – Earth Moving
- E. Section 321123 – Aggregate Base Course and Underdrainage
- F. Section 321313 – Concrete Paving
- G. Section 321713 – Parking Bumpers
- H. Section 321723 – Pavement Markings

#### **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 VEHICULAR GRADE ASPHALT PAVING (PARKING LOT) 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.

**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 Pedestrian Walkways, Plaza Areas and Slab beneath Shade Structure
  - 2. Turndown Edges at Parking Lot and Turndown Edges beneath Precast Seat Walls near Shade Structure
  - 3. Concrete Pads for Benches, Trash/Recycling Receptacles, Bike Racks, Signage, Drinking Fountain and other site furnishings (when surface mounted)
  - 4. Concrete Vehicular Parking Areas and ADA Access Aisle
  - 5. All other horizontal concrete surfaces
- 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 034500 – Precast Architectural Concrete
- I. Section 101400 - Signage
- J. Section 116800 – Site Furnishings
- K. Section 133419 – Fabricated Engineered Shade Structures

- L. Section 311000 – Site Clearing, Preparation, Demolition and Removals
- M. Section 312000 – Earth Moving
- N. Section 321123 – Aggregate Base Course and Underdrainage
- O. Section 321216 – Asphalt Paving
- P. Section 321726 – Tactile Warning Surface (Precast Concrete ADA Paver)
- Q. Section 323113 – Chain Link Fences
- R. Section 323223 – 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.

#### **2.05 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, unlevelled 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 measurement for VEHICULAR GRADE REINFORCED CONCRETE PAVEMENT (ADA PARKING SPACE AND ACCESS AISLE) to be paid for shall be for Vehicular Reinforced Concrete Pavement installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.01** The measurement for 4" REINFORCED CONCRETE PAVEMENT (PEDESTRIAN AREAS) to be paid for shall be for 4" Reinforced Concrete Pavement installed in accordance with the plans, specifications and to the satisfaction of the Project Officer. )

**END OF SECTION 321313**

**SECTION 321315**  
**ASPHALT COURT PAVEMENT**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Furnish all material, labor, services and related items required to complete work indicated on drawings and/or specifications. The items of work to be performed shall include but may not be limited to; asphalt patching, installation of tack coat and fabric, and the import, placement, and compaction of asphalt pavement.

**1.02 RELATED SECTIONS**

- A. Construction Drawings and general provisions of the Contract, including General and Supplementary Conditions and Divisions 1-33 Specification Sections, apply to this Section.
1. Virginia Department of Transportation Road and Bridge Standards
  2. Virginia Department of Transportation Roadway Specifications
  3. Arlington County DES Construction Standards and Specifications
  4. Section 0133000 – Submittal Procedures
  5. Section 033000 – Cast-in-Place Concrete
  6. Section 034500 – Precast Architectural Concrete
  7. Section 061300 – Heavy Timber Construction
  8. Section 116833 – Athletic Equipment
  9. Section 312000 – Earth Moving
  10. Section 321313 – Concrete Paving
  11. Section 321316 – Asphalt Court Surfacing

**1.03 REFERENCES**

- A. This section references the latest revisions of the following documents:
1. American Sports Builders Association (ASBA)
  2. Arlington County DES Construction Standards and Specifications
  3. AASHTO M17 - Mineral Filler for Bituminous Paving Mixtures

- B. These references are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

#### **1.04 QUALITY ASSURANCE**

- A. Contractor must be experienced in installation of asphalt paving for basketball/multi-use court paving with personnel, facilities and equipment adequate for the work specified. The Contractor must acquaint themselves with all work related to site improvements and other work at the site.
- B. Manufacturer Qualifications: Engage a firm experienced in manufacturing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.
- C. Testing:
  - 1. Payment for testing under this section shall be as follows:
    - i. The first run of any test of a given sample of workmanship will be paid for by the Owner. Where possible, the Owner will perform the initial test. In the event that the Owner's capabilities are insufficient to perform the test in a timely manner, the test will be performed by the contractor at a reasonable cost to the Owner.
    - ii. In the event the sample of workmanship is found to be deficient in some way as a result of the initial test, the contractor shall remove from the project site(s) that work or material, and provide work or material as specified and with satisfactory test results at no additional cost to the Owner.
  - 2. Testing shall be done in accordance with the General and Supplementary Conditions of the Contract. Tests must be performed by a certified testing agency or licensed laboratory. Project Officer may require execution of tests described below or elsewhere in this Section. Two copies of the results of each test shall be submitted to the Engineer for approval prior to continuation of the work to be tested, unless otherwise directed.
    - i. ASTM C131 Test Method for Resistance to Degradation of Small Size Course Aggregate.
    - ii. Other tests as may be referenced elsewhere in this Section.
- D. Review forecasted weather conditions and procedures for coping with unfavorable conditions.

#### **1.05 SUBMITTALS**

- A. The Contractor shall submit to Project Officer written materials containing the following information:

1. ASBA certification for construction of courts.
  2. Procedures to be used in construction of Courts with regard to the division of labor and responsibility of the Contractor and all sub-contractors involved.
  3. Materials to be used and the proposed method of application and procedures to be followed.
- B. Reference list from the installer of at least 5 projects of similar scope done in the past 3 years. The list shall include dates, dollar value of Contractor's work, locations and project owner with current contact information.
- C. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.
- D. Submit product data for pavement overlay fabric.

## **1.06 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:
1. Tack Coats: Minimum surface temperature of 60 deg F.
  2. Slurry Seal Coat: Comply with weather limitations of ASTM D 3910.
  3. Asphalt Leveling Course: Minimum surface temperature of 40 deg F and rising at time of placement.
  4. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

## **PART 2 - PRODUCTS**

### **2.01 AGGREGATES**

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: Sound; angular crushed stone; or crushed gravel; complying with ASTM D 692.
- C. Fine Aggregate: Sharp-edged natural sand or sand prepared from stone; gravel, or combinations thereof; complying with ASTM D 1073. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with ASTM D 242.

**2.02 PAVEMENT FABRIC**

A. General: The fabric shall be a material suitable for the application, a non-woven polypropylene asphalt overlay fabric. Placed over BM 25.0 asphalt base course prior to installation of SM 9.5a surface course.

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

- i. Petromat 4597 by Propex
- ii. Mirafi MPV by Tencate

2. Pavement fabric shall have the following properties:

<b>Fabric Properties</b>	<b>Test Method</b>	<b>Minimum Average Roll Values</b>
Grab Tensile Strength (lbs.)	ASTM D4632	120
Grab Tensile Elongation (%)	ASTM D4632	50
Mass/ Unit Area (oz/yd <sup>2</sup> )	ASTM D5261	4.6
Asphalt Retention (gal/ yd <sup>2</sup> )	ASTM D6140	.24
Melting Point (°F)	ASTM D276	320
U.V. Resistance (% strength retained at 500 hrs.)	ASTM D4355	70

**2.03 ASPHALT MATERIALS**

- A. Asphalt Cement: ASTM D 3381 for viscosity-graded material; ASTM D 946 for penetration-graded material.
- B. Tack Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.
- C. Seal Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.
- D. Water: Potable.

## 2.04 MIXES

- A. Hot-Mix Asphalt: Provide dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and designed according to procedures in AI's "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types."
1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
  2. Leveling (Base) Course: Provide mixes having a maximum aggregate size of 3/8" to 3/4" in accordance with the composition, grading, and tolerance requirements of ASTM D 3515.
  3. Surface Course: Provide mixes having a maximum aggregate size of 3/8" and a minimum aggregate size of 1/4" in accordance with the following design range:

<u>Screen</u>	<u>% Passing</u>
1/2	100
3/8	90-100
#4	55-85
#8	32-67
#50	7-23
#200	2-10

- i. Liquid asphalt bitumen: Minimum 5.5% by weight
  - a. Aggregate type: crushed stone, gravel, limestone, etc. Foreign materials such as pyrite, clay, ferrous compounds, dirt and organic material are not acceptable.
  - b. Void content: As specified by VDOT for leveling course, but in no case shall void content exceed 7.0%.
4. Emulsified-Asphalt Slurry: ASTM D 3910, consisting of emulsified asphalt, fine aggregates, and mineral fillers; Composition: Type 2.

## PART 3 - EXECUTION

### 3.01 SUBBASE PREPARATION

- A. Verify that subbase is dry and in suitable condition to support paving and imposed loads.
- B. Thoroughly compact existing soil subbase to 95 percent of the maximum dry density determined by ASTM D 1557. Locate areas that are unstable or that require improvement.



### **3.02 SURFACE PREPARATION**

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subbase is ready to receive paving.
- B. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

### **3.03 ASPHALT**

- 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.
- D. Placement: A course of asphalt shall be installed to the lines and grades as indicated on the drawings. Place hot-mix asphalt mix on prepared surface, spread uniformly in a manner that prevents segregation of mix, and strike off. Place each course in number of lift to required grade, cross section, and thickness, when compacted as indicated on the Plans. The hot plant mix shall have an installation temperature of 275-300 degrees.
- E. Apply tack coat uniformly to all surfaces on which any course of asphalt is to be placed or abutted including prior to pre-leveling.
  - 1. The Contractor's Equipment shall be capable of distributing asphalt uniformly over an area in controlled amounts and shall be equipped with hand operated spray Equipment for use only on inaccessible and irregularly shaped areas.
  - 2. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. of surface.
  - 3. Allow tack coat to cure undisturbed before paving.
  - 4. Where the new asphalt concrete abuts a curb or gutter, cold pavement joint, trimmed meet line, or any metal surface, a thin tack coat of asphalt shall be applied on the vertical face of the abutting surface by hand painting prior to paving. The application on the contact surfaces shall be thin and uniform in order to avoid an accumulation of excess asphalt in puddles.
  - 5. The Contractor shall not apply the tack coat on vertical contact surfaces above the finished height of the asphalt concrete being placed.

6. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- F. Place paving in consecutive strips as not less than 10 feet wide or as approved by Project Officer. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete asphalt leveling course for a section before placing asphalt surface course.
- G. Promptly correct surface irregularities in paving course. 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.
- H. Curing and Cleaning: New asphalt pavement must be completely cured (minimum of fourteen days of warm, dry weather, longer if cold or damp), prior to application of any materials. Pavement needs to be clean and free of all foreign matter. A high-pressure washer, air broom or hand sweeper shall be used; removal of grease and oil requires the use of a strong detergent. After using detergents, the surface must be thoroughly flushed with water. The Contractor must obtain approval of the Project Officer prior to using detergent if there is any chance it could enter the City's storm drainage system.
- I. Water Testing: Check the finished surface of the asphalt for puddling by flooding the entire paved area with water. Any puddle holding water deeper than a five-cent piece should be outlined with chalk and filled in accordance with the specification of the Court Surfacing, Section 321823. It is the Contractor's responsibility to provide water for this test, which may include use of a City hydrant at discretion of Project Officer or through a water truck with sufficient volume to perform the test.
- J. Corrective work for puddling areas, or "Birdbaths"
  1. Any areas holding enough water to cover a five-cent piece (American coin) after draining a minimum of one hour at a minimum of 70 degrees Fahrenheit in sunlight should be outlined with chalk and the water swept out. After the area is cleaned and dried, a tack coat of suitable material must be applied to the entire area within the chalk-line.
  2. Estimate the required quantity of the thin patching mixture to fill such "birdbaths." Apply it to the area, and strike it off with a straight-edge the length of which is in excess of the dimensions of the "birdbath." A proper strike-off will level such a birdbath to the same elevation as the surrounding surface. After the leveling operation, the patch should be allowed to cure properly.
  3. The patch material should be compatible with the surfacing material and should be used in accordance with the surfacing manufacturer's directions.

### **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 grade and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and re-rolling to required elevations. 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: 96 percent of reference laboratory density according to ASTM D 1559, but not less than 94 percent nor greater than 100 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.
- F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- G. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

### **3.05 PAVING FABRIC**

- A. Installation of paving fabric system shall strictly conform to manufacturers' instructions.
- B. After installation of asphalt base course and verification of grades, apply residual tack coat with an application rate between 0.20 gallons/ square yard and 0.30 gallons/ square yard. Apply tack coat to edge of base course pavement.
- C. Fabric Placement:
  - 1. Install smooth side up/ fuzzy side down.
  - 2. Maintain even roll tension during application to avoid wrinkles
  - 3. Overlap fabric 3" - apply tack coat between all overlaps
  - 4. Do not place more filter fabric that can be surfaced paved over in the same day

### **3.06 JOINTS**

- A. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
  - 1. Clean contact surfaces and apply tack coat.

2. Offset longitudinal joints in successive courses a minimum of 6 inches.
3. Offset transverse joints in successive courses a minimum of 24 inches.
4. Construct transverse joints by bulkhead method or sawed vertical face method as described in AI's "The Asphalt Handbook."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

### **3.07 INSTALLATION TOLERANCES**

- A. Planarity and Grade: The planarity of a court is the degree to which the overall court surface is constructed as designed in one true plane (topographic elevation). The surface must also be located vertically at the designed elevations and slopes shown on the plan in order to properly tie into proposed pavement and the drainage system. The finished court shall not vary more than +/- 1/2" from the designed vertical elevation and grade.
- B. Thickness: Compact each course to produce the thickness with the following tolerances:
  1. Base Course: Plus or minus 1/2 inch
  2. Surface Course: Plus 1/4 inch, no minus
- C. Surface Smoothness: In order to drain properly and to be acceptable for play, the asphalt surface must be smooth and regular, lacking humps, dips and 'valleys' formed at seams. An uneven surface will cause unforeseen ball deflection or create a player tripping hazard.
- D. Compact each course of asphalt to produce a uniform density, thickness, and surface smoothness within 1/4" in 10' of the design slope as determined by using a 10-foot straightedge when measured in any direction (IE: horizontally, diagonally, and/ or longitudinally to the design slope.) Therefore any deviation of 1/4" or greater in any length 10' or less shall fail to meet this specification.

### **3.08 SURFACE TREATMENTS**

- A. Slurry Seals: Apply slurry coat in a uniform thickness according to ASTM D 3910 and allow to cure.

### **3.09 FIELD QUALITY CONTROL**

- A. If deemed by Project Officer that constructed asphalt court does not meet this specification, contractor shall engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports. Testing agency shall conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.

- B. Additional testing, at Contractor's expense, shall be performed to determine compliance of corrected Work with specified requirements.
- C. Thickness: In-place compacted thickness of hot-mix asphalt courses shall be determined according to ASTM D 3549.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course shall be tested for compliance with smoothness tolerances.
- E. In-Place Density: Samples of un-compacted paving mixtures and compacted pavement shall be secured by testing agency according to ASTM D 979.
- F. Reference laboratory density shall be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered to site, prepared according to ASTM D 1559, and compacted according to job-mix specifications. In-place density of compacted pavement shall be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
  - 1. One core sample shall be taken for every 1000 sq. yd. or less of installed pavement, but in no case shall fewer than 3 cores be taken.
  - 2. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- G. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

#### **PART 4 - MEASUREMENT**

- 4.01** The measurement for MULTI-USE COURT PAVEMENT to be paid for shall be for Multi-use Court Pavement installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**END OF SECTION 321215**

**SECTION 321316**  
**ASPHALT COURT SURFACING**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Furnish all material, labor, services and related items required to complete work indicated on drawings and/or specifications. The items of work to be performed shall include but may not be limited to; asphalt patching, installation of tack coat and fabric, and the import, placement, and compaction of asphalt pavement.

**1.02 RELATED SECTIONS**

- A. Construction Drawings and general provisions of the Contract, including General and Supplementary Conditions and Divisions 1-33 Specification Sections, apply to this Section.
  - 1. Virginia Department of Transportation Road and Bridge Standards
  - 2. Virginia Department of Transportation Roadway Specifications
  - 3. Arlington County DES Construction Standards and Specifications
  - 4. Section 023150 – Earthwork
  - 5. Section 321315 – Asphalt Court Pavement

**1.03 REFERENCES**

- A. This section references the latest revisions of the following documents:
  - 1. American Sports Builders Association (ASBA)
  - 2. Arlington County DES Construction Standards and Specifications
  - 3. AASHTO M17 - Mineral Filler for Bituminous Paving Mixtures
- B. These references are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

**1.04 QUALITY ASSURANCE**

- A. Contractor must be experienced in installation of asphalt surfacing for basketball/multi-use court paving with personnel, facilities and equipment adequate for the work specified. The Contractor must acquaint themselves with all work related to site improvements and other work at the site.

- B. **Manufacturer Qualifications:** Engage a firm experienced in manufacturing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.
- C. **Testing:**
  - 1. Payment for testing under this section shall be as follows:
    - i. The first run of any test of a given sample of workmanship will be paid for by the Owner. Where possible, the Owner will perform the initial test. In the event that the Owner's capabilities are insufficient to perform the test in a timely manner, the test will be performed by the contractor at a reasonable cost to the Owner.
    - ii. In the event the sample of workmanship is found to be deficient in some way as a result of the initial test, the contractor shall remove from the project site(s) that work or material, and provide work or material as specified and with satisfactory test results at no additional cost to the Owner.
  - 2. Testing shall be done in accordance with the General and Supplementary Conditions of the Contract. Tests must be performed by a certified testing agency or licensed laboratory. Project Officer may require execution of tests described elsewhere in this Section. Two copies of the results of each test shall be submitted to the Engineer for approval prior to continuation of the work to be tested, unless otherwise directed.
- D. Review forecasted weather conditions and procedures for coping with unfavorable conditions.

#### **1.05 SUBMITTALS**

- A. **Product Data:** Submit manufacturer's product data, including surface preparation and application instructions
- B. **Samples:** Submit manufacturer's color samples of color coating
- C. **Shop Drawings:** Submit scaled plan view drawings, with colors chosen by Arlington DPR Landscape Architect during the color submission process. Include dimensions. Arlington County Project Officer to provide digital file of the Arlington County logo for inclusion on the shop drawings.
- D. The Contractor shall submit to Project Officer written materials containing the following information:
  - 1. ASBA certification for construction of courts.
  - 2. Procedures to be used in construction of Courts with regard to the division of labor and responsibility of the Contractor and all sub-contractors involved.

3. Materials to be used and the proposed method of application and procedures to be followed.
- E. Test Reports:
1. Submit independent test results for solar reflectance index
  2. Submit independent test results for 2000 Hour ASTM G154, accelerated weathering UV test, to demonstrate long-term durability and fade resistance
  3. Submit independent test results for 2000 Hour, accelerated weathering ASTM G155 Xenon Arc test, to demonstrate long-term fade resistance and quality of pigment
- F. Reference list from the installer of at least 5 projects of similar scope done in the past 3 years. The list shall include dates, dollar value of Contractor's work, locations and project owner with current contact information.
- G. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.
- H. Manufacturer's Project References: Submit manufacturer's list of successfully completed asphalt tennis court surface color coating system projects, including project name, location, and date of application.
- I. Warranty Documentation: submit manufacturer's standard warranty.

## **1.06 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not apply surfacing materials if substrate is wet or excessively damp or if the following conditions are not met:
1. Do not apply asphalt court surface color coating system when air or surface temperatures are below 50 degrees F during application or within 24 hours after application
  2. Do not apply asphalt court surface color coating system when rain is expected during application or within 24 hours after application

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURER**

- A. SportMaster Sport Surfaces (PO Box 2277, 2520 South Campbell Street, Sandusky, Ohio 44870; Phone: 800-326-1994 or 900-395-7325 Fax 877-825-9226; www.sportmaster.net; E-mail: info@sportmaster.net) or approved equal.

### **2.02 MATERIALS**

- A. Color Coating: SportsMaster "ColorPlus System."
1. Filler Course: acrylic resurfacer with sand (CMT-33)



2. Color Coating: color concentrate with sand (CMT-2)
  3. 100 percent acrylic emulsion coating
  4. Mix on-site with silica sand and water
  5. Color coats tennis and multipurpose courts
  6. Emulsified-Asphalt Slurry: ASTM D 3910, consisting of emulsified asphalt, fine aggregates, and mineral fillers; Composition: Type 2.
  7. Color: Blue Court with Gray Border. Verify with DPR Landscape Architect after providing manufacturer's full range of colors for selection and verification by DPR Landscape Architect.
  8. Finish: sanded, acrylic
- B. Line Markings Primer: SportsMaster "Stripe-Rite."
1. 100 percent acrylic emulsion primer, clear drying
  2. Primes line markings and prevents bleed-under for sharp lines
  3. Chemical Characteristics, by Weight, Nominal:
    - i. Acrylic Emulsion: 38.0 percent
    - ii. Hiding Pigment: 0.0 percent
    - iii. Mineral Inert Fillers: 7.0 percent
    - iv. Film Formers, Additives: 1.5 percent
    - v. Water: 50.0 percent
  4. Weight per Gallon at 77 Degrees F: 8.9 lbs., plus or minus 0.75 lbs.
  5. Non-Volatile Material: 45.17 percent, plus or minus 5 percent
  6. Color: White
- C. Line Paint: SportsMaster "Textured Line Paint."
1. Pigmented, 100 percent acrylic emulsion line paint
  2. Line marking on athletic courts
  3. Chemical Characteristics, by Weight, Nominal:
    - i. Acrylic Emulsion: 25.89 percent
    - ii. Pigment: 14.90 percent

- iii. Mineral Inert Fillers: 13.12 percent
- iv. Additives: 4.73 percent
- v. Water: 41.36 percent
- 4. Weight per Gallon at 77 Degrees F: 10.65 lbs., plus or minus 0.75 lbs.
- 5. Non-Volatile Material: 45.17 percent, plus or minus 5 percent
- 6. Finish: sanded, acrylic
- 7. Color: white

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine asphalt court surfaces to receive color coating system
- B. Verify asphalt court meets ASBA requirements
- C. Notify County Landscape Architect and Construction Manager of conditions that would adversely affect application or subsequent use
- D. Do not begin surface preparation or application until acceptable conditions are corrected

#### **3.02 SURFACE PREPARATION**

- A. Protection of In-Place Conditions: Protected adjacent surfaces and landscaping from contact with asphalt court surface color coating system.
- B. Prepare surfaces in accordance with manufacturer's instructions.
- C. Cure new asphalt surfaces a minimum of 14 to 30 days before application of asphalt court surface color coating system.
- D. Remove dirt, dust, debris, oil, grease, vegetation, loose materials, and other surface contaminants which could adversely affect application of asphalt court surface color coating system. Pressure wash entire surface.
- E. Repair cracks, depressions, and surface defects in accordance with manufacturer's instructions before application of filler course and color coating.
- F. Level depressions 1/8 inch and deeper with patch binder in accordance with manufacturer's instructions.
- G. Apply 1 or 2 coats of filler course as required by surface roughness and porosity to provide smooth underlayment for application of color coating.
- H. Ensure surface repairs are flush and smooth to adjoining surfaces.

### **3.03 APPLICATION**

- A. Apply asphalt court surface color coating system in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Mix materials in accordance with manufacturer's instructions
- C. Apply filler course and color coating with a 50-60 durometer, soft rubber squeegee.
- D. Filler Course:
  - 1. Apply 2 coats on new asphalt or existing acrylic surfaces with extensive cracks or low spot repair
  - 2. Apply 1 coat on existing acrylic surfaces with minimal repairs
- E. Color Coating: Apply a minimum of 2 coats of color coating to prepared surfaces in accordance with manufacturer's instructions.
- F. Allow material drying times in accordance with manufacturer's instructions before applying other materials or opening completed surface to foot traffic

### **3.04 LINE MARKINGS**

- A. Lay out court line markings as shown on Drawings.
- B. Apply line marking primer, after masking tape has been laid, to seal voids between masking tape and tennis court surface to prevent bleed-under when line paint is applied.
- C. Apply a minimum of 1 coat of line paint in accordance with manufacturer's instructions.

### **3.05 PROTECTION**

- A. Allow a minimum of 24 hours curing time before opening court for play.
- B. Protect applied asphalt court surface color coating system to ensure that, except for normal weathering, coating system will be without damage or deterioration at time of Substantial Completion.

### **3.06 FIELD QUALITY CONTROL**

- A. If deemed by Project Officer that constructed asphalt court surface color coating system does not meet this specification, contractor shall engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports. Testing agency shall conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.
- B. Bleeding lines between unlike colors are not acceptable under any circumstances. Contractor is responsible for, at minimum, repairing areas where bleeding occurs. If bleeding occurs, or if line dimensions are not properly installed, Arlington County reserves the right to require full replacement at no additional cost to the county.

**PART 4 - MEASUREMENT**

**4.01** The Measurement for MULTI-USE COURT SURFACING (INCLUDING STRIPING) to be paid for shall be for Multi-use Court Surfacing and Striping installed in accordance with the plans, specifications and to the satisfaction of the Project Officer. be

**END OF SECTION 321215**

**SECTION 321713**  
**PARKING BUMPERS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes concrete wheel stops.

**1.02 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.

**1.03 RELATED SECTIONS**

- A. Section 0133000 – submittal procedures
- B. Section 321216 – Asphalt Paving
- C. Section 321313 – Concrete Paving

**PART 2 - PRODUCTS**

**2.01 PARKING BUMPERS**

- A. Retain "Concrete Wheel Stops" or "Resilient Wheel Stops" Paragraph below if wheel stops are required.
- B. Concrete Wheel Stops: Precast, steel-reinforced, air-entrained concrete, 5000-psi minimum compressive strength, 5 inches high by 9 inches wide (bottom width) by 72 inches long. Provide chamfered corners, transverse drainage slots on underside, and a minimum of two factory-formed or -drilled vertical holes through wheel stop for anchoring to substrate. (2) Longitudinal rebar reinforcement within concrete shall be in compliance with ASTM A-615 Grade 60.
  - 1. Manufacturer: Gillepsie Precast LLC or approved equal.
    - a. 102 Brickyard Road, Chestertown, MD 21620
    - b. (410) 778-0940 (phone)
  - 2. Manufacturer: Redi-Rock of Maryland or approved equal.
    - a. PO Box 370, Laurel, MD 20725
    - b. (301) 776-7840 (phone)
  - 3. Mounting Hardware: #8 rebar, or in accordance with manufacturer's recommendations, whichever is larger. Rebar length 18-24" as instructed by manufacturer's recommendations.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. Install wheel stops according to manufacturer's written instructions unless otherwise indicated.
- B. Install wheel stops in bed of adhesive before anchoring.
- C. Securely anchor wheel stops to pavement with hardware in each preformed vertical hole in wheel stop as recommended in writing by manufacturer. Recess head of hardware beneath top of wheel stop.

### **PART 4 - MEASUREMENT**

- 4.01** The quantity of each PARKING BUMPERS to be paid for under this item shall be the number of EACH, including all incidentals necessary to complete the work, furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**END OF SECTION 321713**

## **SECTION 321723**

### **PAVEMENT MARKINGS**

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

##### **1.01 SECTION INCLUDES**

- A. The Contractor shall provide all labor, materials, services, and equipment necessary to paint the pavement marking as specified herein.
  - 1. ADA Parking Area
  - 2. Parking lot striping

##### **1.02 RELATED DOCUMENTS**

- A. Section 321216 – Asphalt Paving
- B. Section 321313 – Concrete Paving
- C. Construction Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- D. Virginia Department of Transportation Road and Bridge Standards
- E. Virginia Department of Transportation Road and Bridge Specifications
- F. Arlington County DES Construction Standards and Specifications

##### **1.03 QUALITY ASSURANCE**

- A. Product Manufacturer: Company specializing in manufacturing quality paints and finish products with five years experience.
- B. Applicator: Company specializing in commercial painting and finishing with five years documented experience.

##### **1.04 SUBMITTALS**

- A. Provide product data on all finishing products for approval to Project Officer.
- B. Submit two samples 12” long in size illustrating each of the colors selected for the work described within the construction drawings.
- C. Detail of handicap symbol marking.
- D. Installer qualifications and applicable experience.
- E. Provide a written list of paint manufacturer, product name, color, number, sheen, and the area in which the paint was used.
- F. Provide Material Safety Data Sheet (MSDS) for all products used on site.

## **1.05 FIELD SAMPLES**

- A. Provide field samples where directed by County Project Officer.

## **1.06 DELIVERY HANDLING AND STORAGE**

- A. The preformed thermoplastic markings shall be placed in protective plastic film with cardboard stiffeners where necessary to prevent damage in transit. Legends and symbols must also be supplied in flat pieces. The cartons in which packed shall be labeled for ease of identification. A protective film around the box must be applied in order to protect the material from rain or premature aging.
- B. Deliver, store and protect products following manufacturer's directions.
- C. Deliver products to site in sealed and labeled containers, then inspect to verify.
- D. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.
- E. Take precautionary measures to prevent fire hazards and spontaneous combustion.
- F. Provide Material Safety Data Sheet (MSDS) for all products used on site.

## **1.07 ENVIRONMENTAL REQUIREMENTS**

- A. Surface and ambient temperatures must be above 45 degrees F for 24 hours before, during and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.
- B. Do not apply paint during rain or snow, or when relative humidity is above 50 percent, unless required otherwise by manufacturer's instructions.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. All marking materials shall conform to all VDOT specifications. The County retains the right to test any product at the County's discretion. Samples will be provided by the contractor when requested by the Project Officer.
- B. The thermoplastic material shall be tested in accordance with and meet the requirements of AASHTO M 249-79 (1986) and T250 with the appropriate method in Federal Test Method Standard No. 141 or ASTM designation. The solid resin shall be a maleic-modified glycerol ester resin (alkyd binder) and consist of synthetic resins, at least one of which is solid at room temperature, and high-boiling plasticizer. At least ½ of the binder composition shall be a maleic-modified glycerol ester of resin and shall be at least 10 percent by weight of the entire material formulation. The alkyd binder shall not contain petroleum-based hydrocarbon resins.



1. Thickness and Bond Strength – The thermoplastic material shall be applied at a temperature range of 211° ±7° C (412° ± 12.5° F) and thickness of 2.28 mm (.090 in.), the material shall set not less than 2 minutes when the air temperature is 32° C (90° F) and not less than 10 minutes when the air temperature is 10° C (50° F). The thermoplastic material shall be heated for four (4) hours ± 5 Min. at 218° C (425° F), to achieve Bond Strength exceeding 180 psi (1.24 MPa) and Impact Resistance of a minimum of 10 inch pounds.
2. The thermoplastic material shall be a mixture of thermoplastic resins and other materials specifically compounded for traffic marking and which, when properly extruded on the road surface, shall be highly durable.
3. The thermoplastic material shall be readily applicable at temperatures between 204.4° C to 226.6° C (400° F to 440° F), from the proposed equipment to produce a thickness and bond strength as specified above. The material shall not exude fumes that are toxic, obnoxious, or injurious to persons or property, when it is heated during applications. The application of additional glass beads by drop-on methods shall be at a minimum rate of 8 lbs. per 100 sq. ft. of marking.
  - i. Material Certification – The Contractor shall certify with each application for payment against this contract that all materials used in the performance of the work meet the requirements of the contract.
  - ii. Specific Gravity – The Specific gravity of the thermoplastic material shall not exceed 2.3.
  - iii. Composition – The pigment, beads, and filler shall be uniformly dispersed in the resin. The material shall be free from all skins, dirt and foreign objects and shall comply with the requirements in Table 1.

Table 1. Composition (Percentage By Weight)

<u>Component</u>	<u>White</u>	<u>Yellow</u>
Binder	18.0 mi	18.0 min
Glass Beads	30-40	30-40
Titanium Dioxide	10.0 min	-
Calcium Carbonate & Inert Fillers	42.0 max	50.0 max
Yellow Pigment, See Note (a)	0.0 max	2.0 min

Note (a): The percentage of yellow pigment can be reduced if lead pigments are eliminated from the formulation.

- iv. Glass Beads: The pre-mix beads shall be uncoated and conform to AASHTO M 247-81 (1986) Type 1. The drop-on beads shall be moisture resistant coated. A maximum of 5 percent shall pass the 80 percent screen: glass spheres shall have a minimum of 70 percent true spheres on each sieve and 80 percent true spheres overall (test method M 247-81).

- v. Color: The thermoplastic material, after heating for four (4) hours at 425° F (218 C) under agitation, shall meet the following: White pavement marking material shall be equal to Federal Standard Color No. 595-17886, and have a daylight reflectance at 45 degrees, 0 degrees-45% minimum. Yellow pavement marking material shall be equal to Federal Standard Color No. 595-13538 and have a daylight reflectance at 45 degrees, 0 degrees-45% minimum.

There shall be no change in color of the material as a result of repeated reheating or from batch to batch.

- vi. Cracking Resistance – After heating the thermoplastic material for four (4) hours at 425° F, applying to concrete blocks, and cooling to 15° F, the material shall show no cracks when observed from a distance of 12 inches.
- vii. Softening Point – After heating the material for four (4) hours at 425° F and testing in accordance with ASTM D36 the material shall have a softening point of 215° plus or minus 15° F.
- viii. Seasonal and Weather Limitation – Thermoplastic pavement markings shall not be applied by the extrusion means when pavement temperatures are below 50° F. To avoid blistering and poor adhesion, the thermoplastic material shall be applied to dry pavements in a melted state at a temperature of 400° F to 440° F.
- ix. Thickness – Thermoplastic material shall be applied at the specific widths and at a rate to result in a thickness of .090” for longitudinal lines and gore markings and .125’ for all other markings. Application tolerances of no more than .005’ will be acceptable.
- x. Glass beads – Glass beads conforming to the foregoing material specifications for “drop-on” beads, shall be uniformly applied to the surface of the marking material by means of a pressurized bead applicator or other mechanical method, immediately after the material is applied to the pavement surface, and while the marking material is still molten so that the beads will be held uniformly in the surface of the marking and shall be applied at a minimum rate of 8 lb. per 100 sq. ft. of marking.
- xi. Temperature Variation - After application and sufficient drying time, the material shall withstand temperature variation in air and/or road ranging from minus 20° F to plus 140° F. without deformation or discoloration and shall maintain its original dimension and placement free from tack, chipping or spilling.
- xii. Drying time – The maximum drying time shall be two (2) minutes after application. To avoid tracking of the material the Contractor shall ensure that traffic does not cross the thermoplastic until dry.
- xiii. Material Safety Data Sheet – The Contractor shall provide the Project Officer with Material Safety Data Sheets (MSDS) for all materials and supplies used for this contract. The data sheet shall show the allowable temperature range for applying the material. The Contractor shall properly

dispose of unused material and containers in accordance with the Federal Resource Conservation Recovery ACT (RCRA) of 1976.

- xiv. Material Break Down – The material shall not exude fumes which are toxic and injurious to persons or property, when heated to the temperature range specified by the manufacturer for application. The material shall not break down or deteriorate if held at this temperature for four (4) hours or when subject to repeated reheating after cooling to ambient temperature.
- xv. Viscosity – The temperature versus viscosity characteristics of the plastic material shall remain constant throughout repeated reheating and shall be the same from batch to batch.
- xvi. Chemical Deterioration – The material shall not deteriorate by contact with sodium chloride, calcium chloride, or other chemicals used against the formation of ice on roadways, or because of the oil content of pavement materials or from oil dropping from traffic.
- xvii. Material Containers – Each container shall be plainly marked, both on the head and side, with a durable, weather-resistant marking, showing the name and address of the manufacturer, description of the material, batch number, date of manufacture, and volume and weight of contents.

## **PART 3 - EXECUTION**

### **3.01 INSPECTIONS**

- A. During and after the material application, inspections of the markings will be made by the Project Officer, or designee. The Contractor shall cooperate with the County to facilitate such inspections.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

### **3.02 PREPARATION**

- A. Crosswalk: The Contractor will remove all previous pavement markings, as directed by Project Officer, see plans.
- B. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate TSP substitute and bleach. Rinse with clean water and allow surface to dry.
- C. Surfaces scheduled for paint finish: Remove foreign particles (i.e. grease, scale, dirt, etc) to permit adhesion of finishing materials.

### **3.03 PROTECTION**

- A. Protect elements that surround the work of this Section from damage or disfiguration.
- B. Repair damage to other surfaces caused by work of this Section.

- C. Remove empty packaging/ excess materials from site.

**3.04 APPLICATION (parking area)**

- A. Apply products in accordance with manufacturer's instructions.
- B. Do not apply finishes to surfaces that are not dry (see environmental requirements).
- C. Apply each coat to uniform finish.
- D. Apply pavement marking accurately with straight, clean-cut, sharply defined parallel edges and of uniform cross section
- E. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- F. Sand lightly between coats to achieve required finish as needed.
- G. Allow applied coat to dry before next coat is applied.

**PART 4 - MEASUREMENT**

**4.01** The quantity of PAVEMENT MARKINGS to be paid for shall be for Pavement Markings furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**END OF SECTION 321723**

## **SECTION 321726**

### **TACTILE WARNING SURFACE (PRECAST CONCRETE ADA PAVER)**

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

##### **1.01 SUMMARY**

- A. Provide and install precast concrete detectable warning ADA pavers as shown on the construction bid drawings.

##### **1.02 RELATED SECTIONS**

- A. Section 321313 – Concrete Pavement
- B. Arlington County DES Construction Standards and Specifications
- C. Construction Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### **1.03 REFERENCES**

- A. American Society for Testing and Materials (ASTM):
  - 1. ASTM C33 Concrete Aggregates
  - 2. ASTM C139 Concrete Compressive Strength
  - 3. ASTM C 144 Aggregate for Masonry Mortar
  - 4. ASTM C 150 Portland cement
  - 5. ASTM C 642 Water Absorption, Density, Voids in Hardened Conc.
  - 6. ASTM C 666 Rapid Freeze/Thaw Resistance of Conc.
  - 7. ASTM C 979 Pigments for Integrally Colored Concrete
  - 8. ASTM C 1028 Coefficient of Friction

##### **1.04 SUBMITTALS**

- A. Shop Drawings: Provide detailed setting drawings and templates showing recommended installation and jointing.
- B. Samples:
  - 1. Submit two 3" x 3" wide by 2" depth sample of detectable warning ADA paver unit of the color specified for approval.
- C. Manufacturer's Installation Details: Submit complete plan for installation of each paver.
- D. Warranty: Provide certified copies of manufacturer's product warranties.

## **1.05 QUALITY ASSURANCE**

- A. Compliance with Regulations: Comply with requirements of state and local building codes and with rules and regulations relating to building accessibility.
- B. Qualifications of Manufacturer: Company specializing in manufacture of precast concrete detectable ADA paver with a minimum of 10 continuous years of documented experience.

## **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Deliver all materials to the installation site in the manufacturer's original packaging. Packaging shall contain manufacturer's name, customer name, order, identification number, and other related information.
- B. Handle and store stair treads and risers in accordance with manufacturer's recommendations.

## **1.07 WARRANTY**

- A. Provide warranty covering precast concrete detectable warning ADA pavers against defects in material and workmanship for a period of 5 years. Unusual abuse and neglect are excepted.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURER**

- A. Hanover Architectural Products or approved equal.

5000 Hanover Road Hanover, PA 17331 (717) 637-0500 <https://www.hanoverpavers.com/>

### **2.02 MATERIALS**

- A. Product: Precast Concrete ADA Paver
- B. Pavers shall be high density, hydraulically pressed precast concrete pavers, consisting of the following:
  - 1. Compressive Strength > 8,000 psi avg. with no individual unit less than 7,000 psi ASTM C 140
  - 2. Water Absorption < 6% ASTM C 140
  - 3. Flexural Strength > 800 psi avg. ASTM C 293
  - 4. Freeze/Thaw < 0.1 % loss of dry weight ASTM C 1262 (50 Cycles)
  - 5. Center Load 1,850 lbs. WTCL 99

### **2.03 COLOR AND FINISH**

- A. Color: See Contract Drawing construction detail. Verify during submittal phase. Color shall be integral.
- B. Unit size: 12" L x 12" W x 2" H
- C. Factory infused Application of Sealer: Factory apply one coat of penetrating sealer to all surfaces of paving units.

### **2.04 SEALANT**

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

### **2.05 MORTAR**

- A. Setting Bed and Joints: Mortar shall be composed of one (1) part Portland cement and a maximum of two (2) parts sand with not more than five (5) percent of the cement content of hydrated lime. Contractor shall add LATICRETE admixture to mortar as per manufacturer's specifications.
  - 1. Setting bed shall be 1" thick.
  - 2. Joints shall be 3/8" wide at pavers

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that paving components are in place, aligned and level, within tolerances for proper installation of detectable warning pavers and required structural inspections have been completed.

### **3.02 INSTALLATION – GENERAL**

- A. Installation shall comply with requirements of applicable building codes and state and local jurisdictions.
- B. Install concrete detectable warning ADA paver aligned and level with the surrounding paving. Where cutting is necessary, use powered masonry saw.
- C. Do not install concrete detectable warning ADA paver having excessively stained, defaced, or damaged faces, edges, or corners where to remain exposed. Remove dust and dirt from paver units using oil-free compressed air.
- D. Detectable warning paver construction shall conform to all current ADA standards.

### **3.03 CLEANING AND SEALING PAVERS**

- A. Clean exposed surfaces of detectable warning ADA paver. Use cleaners appropriate for precast concrete finishes and colors. No acid based cleaners may be used.

- B. Apply sealer after newly installed pavers as per manufacturer's instructions. Pavers shall be completely dry, clean and free of oil, grease, dust, dirt, sand, efflorescence and frost.
- C. Sealer shall not be applied when temperatures are 50 degrees and below.

### **3.04 COMPLETION**

- A. Protect precast concrete paving units from damage due to subsequent building operations.
- B. After installation and before completion, inspect precast concrete paving units for construction damage and obtain new precast concrete paving units if required.
- C. Immediately prior to final acceptance of project, clean precast concrete paving units.

### **PART 4 - MEASUREMENT**

**4.01** The measurement of PRECAST CONCRETE ADA PAVER to be paid for shall be for Precast Concrete ADA Pavers installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**END OF SECTION 321726**



## SECTION 323113

### CHAIN LINK FENCES AND GATES

#### 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 323223 – 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 <sup>3</sup>	Min. Yield Strength psi	Max. Bend. Moment lb. in.	Calculated Load (lbs.)				
	inches	(mm)	inches	(mm)	Lb./ft.	(kg/m)				10' Free Supported	Cantilever			
											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 corner, 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 corner 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, clasp 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 measurement for the 12' CHAIN LINK FENCE AND FOOTINGS (NORTH, EAST AND SOUTH SIDES OF TENNIS COURT) to be paid for shall be for 12' Chain Link Fencing and Footings installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
  
- 4.02** The measurement for the 4' CHAIN LINK FENCE AND FOOTINGS (NORTH AND SOUTH SIDES OF BASKETBALL COURT) to be paid for shall be for 4' Chain Link Fencing and Footings installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
  
- 4.03** The measurement for the 12' CHAIN LINK FENCE AND FOOTINGS (WEST SIDE OF BASKETBALL COURT) to be paid for shall be for 12' Chain Link Fencing and Footings installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
  
- 4.04** The measurement for the LEAF GATE AND FOOTNGS (TENNIS COURT) to be paid for shall be for Leaf Gate Footings installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.
  
- 4.05** The measurement for the GATE AND FOOTINGS (TENNIS COURT) to be paid for shall be for Gate and Footings installed in accordance with the plans, specifications and to the satisfaction 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 011000 – Summary and General Requirements
  - 2. Section 0133000 – Submittal Procedures
  - 3. Section 311000 – Site Clearing, Preparation, Demolition and Removals
  - 4. Section 311300 – Tree Protection and Root Pruning
  - 5. Section 312000 – Earth Moving
  - 6. Section 321315 – Asphalt Court Pavement
  - 7. Section 321316 – Asphalt Court Surfacing
  - 8. Section 323113 – Chain Link Fences
  - 9. 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, scupper, trench drain and EPDM liner, signed and sealed by a civil engineer licensed in Virginia.

## **1.07 BUILDING PERMIT REQUIREMENTS**

- B. See Specification Section 011000.

## **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: Natural Grey, as verified by Landscape Architect from after reviewing manufacturer's full range.
- C. Shape and Texture: Rockface texture, as verified by Landscape Architect from after reviewing manufacturer's full range.

### **2.03 INSTALLATION MATERIALS**

- A. Pins and Clips: Product supplied by segmental retaining wall unit manufacturer for use with units provided, made from nondegrading polymer reinforced with glass fibers.
- B. Cap Adhesive: Product supplied or recommended by segmental retaining wall unit manufacturer for adhering cap units to units below.
- C. Leveling Base: Comply with requirements in Section 312000 "Earth Moving" and Section 321123 "Aggregate Base Course and Underdrainage."
- D. Drainage Fill: Comply with requirements in Section 312000 "Earth Moving" and Section 321123 "Aggregate Base Course and Underdrainage."
- E. Soil Fill: Comply with requirements in Section 312000 "Earth Moving" for satisfactory soils.
- F. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.
- G. 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.
- H. Geogrid Soil Reinforcement: Product specifically manufactured for use as soil reinforcement and as follows:
- I. 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
2. Include only when beside bioretention on north side of tennis court

## **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. 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 painted 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 measurement for NEAR VERTICAL SEGMENTAL BLOCK RETAINING WALL to be paid for shall be for Segmental Block Retaining Wall installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.02** The measurement for SBW EPDM LINER to be paid for shall be for SBW EPDM Liner furnished and installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**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 311000 Site Clearing, Preparation, Demolition and Removals
  - 3. Section 311300 Tree Protection and Root Pruning
  - 4. Section 312000 Earth Moving
  - 5. Section 312500 Temporary Erosion and Sediment Control
  - 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. Straw Erosion Control Matting/Blanket for Soil Stabilization
- B. By: GEI Works, or approved equal.

<https://www.erosioncontrol-products.com/strawerosioncontrolmats.html>

- C. Shall be used in all steep slopes (steeper than 3:1), including atop reforestation amended soils, bioretention side slopes, and wherever else indicated on plan or required by Project Officer or Arlington County inspectors.
  - 1. Shall be used for temporary stabilization – last up to 12 months before complete biodegrading completely.
  - 2. 100% wheat straw and biodegradable organic jute netting/yarn.
  - 3. Equipped for use on slopes up to 2:1 and flows up to 6fps.
  - 4. No synthetic materials.
  - 5. Width: 8’ or 16’
  - 6. Length: 112.5’ or 562.5’
  - 7. Overlap sections at least 12” and secure to ground per manufacturer’s recommendation. Fasteners shall also be fully biodegradable.

## **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**

PLANTING PREPARATION is incidental to 329200 and 329300.

**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 310000 – Site Clearing, Preparation, Demolition and Removals
  3. Section 311300 – Tree Protection and Root Pruning
  4. Section 312000 – Earth Moving
  5. Section 312500 – Temporary Erosion and Sediment Control
  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 Field 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 soil 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:

<u>Kind of Seed</u>	<u>% by Weight</u>	<u>% Purity</u>	<u>Germination</u>
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 Final 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 3.06 "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 measurement for SODDING AND TOPSOIL to be paid for shall be for Sodding and Topsoil installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**END OF SECTION 329200**

# **SECTION 329300**

## **EXTERIOR PLANTS**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. This Section includes trees, shrubs, groundcover, bulbs, and perennial plants.
- B. Provide all labor, materials, tools and equipment as required to have plants, topsoil, amendments, mulch and seed and/or sod applied on all areas called for on the approved plans.
- C. Related Sections:
  - a. 0133000 Submittal Procedures
  - b. 311000 Site Clearing, Preparation, Demolition and Removals
  - c. 312000 Earth Moving
  - d. 311300 Tree Protection and Root Pruning
  - e. 312500 Temporary Erosion and Sediment Control
  - f. 329100 Planting Preparation
  - g. 329200 Seeding and Sodding
- D. In addition to the specifications contained herein, Work shall be performed in accordance with the:
  - a. Drawings (especially planting plans and reforestation plan) and general provisions of the contract, including general and supplementary conditions
  - b. Erosion and Sediment Control Ordinance (Chapter 57 of the Arlington County Code)
  - c. Arlington County Department of Parks & Recreation 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:
  - a. 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:
  - a. 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.

- b. Contractor shall be responsible for documenting any plant suitability or availability problems.
  - c. 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:

- a. 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”
- b. 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.
- c. Crew leader and supervisor may be the same individual.

B. Installer Qualifications for Reforestation Projects:

- a. ISA Certified Arborist shall be on the worksite during planting of reforested areas.
- b. Demonstrate experience in Reforestation/Afforestation and Stream-Bank Stabilization projects through:
  - i. Project portfolio detailing a minimum of three (3) successfully completed reforestation/afforestation/streambank restoration projects in the CBAY watershed area over the past three years.



- c. 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 its 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. Perennials and groundcovers shall be clearly identified with a waterproof tag bearing legible designation of botanical and common name within the container.
- G. Pre-installation Conference: Conduct conference 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:
  - a. Urban Forester may perform periodic inspections to check on tree plantings.
  - b. 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 and shrubs before delivery.
- B. Protect bark, branches, and root systems from sun-scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery. Plants shall not be bound with wire or rope at any time so as to damage the bark or break branches. Plants shall be handled from the bottom of the root ball only.
- C. All plants in transit shall be tarped or covered and shall be kept from drying out. Desiccation damage shall be cause for rejection. Plants damaged in handling or transportation may be rejected by the Project Officer with confirmation by the Urban Forester/Landscape Architect. Any tree or shrub found to have wounds over 12.5% of the circumference of any limb or trunk, or over 1 inch in any direction, whichever is smaller, shall be rejected.
- D. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants trees in shade, protect from weather and mechanical damage, and keep roots moist. Plants shall not remain unplanted for longer than a three-day period after delivery. Any plants not installed during this time period shall be rejected, unless Project Officer and contractor provide otherwise by written agreement. All plants kept on 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:
  - a. 20 gallons per individual tree
  - b. 4 gallons per individual shrub
  - c. 1 gallon per 1 sq. yd. of shrub or perennial bed
  - d. 1 gallon per 3 sq. yd. of seed or sod

**1.07 FINAL INSPECTION**

- A. Inspection to determine Final Acceptance of planted areas will be made by the Project Officer and Landscape Architect upon Contractor’s request at completion of the Warranty Periods. Provide notification at least fifteen (15) working days before requested inspection date.
  - 1. Planted areas will be acceptable provided all requirements, including plant replacements and maintenance, have been complied with and healthy, thriving, and growing plants are established.
  - 2. Remove all Tree Staking and Guying materials prior to Final Acceptance inspection.
  - 3. Knock down, re-grade, and re-mulch all tree pit saucers prior to Final Acceptance inspection.

- a. The landscaping inspection will review all landscape work under the contract.
- b. All plants shall be alive and in good health at the time of final inspection.
- c. 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.
- d. It shall be the Contractor's responsibility to provide in writing the results of this inspection.
- e. The Contractor shall make replacements during the next planting period unless the County specifies an earlier date.
- f. 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 1.09 after planting and until the replacement plantings are finally accepted by Project Officer.
- g. A replacement plant shall be of the same size as the original plant with no additional soil additives to be used.
- h. 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.

## **1.08 WARRANTY**

- A. Special Warranty: Warrant all exterior plants covered by this Section, for the warranty period indicated, against defects including death and unsatisfactory growth, except for defects resulting from abuse by County, or incidents that are beyond Contractor's control.
  - 1. Warranty Period for Exterior Plants:
    - a. All plantings: From date of Installation to Final Completion.
    - b. Trees, Shrubs, and Perennials: One year from date of Final Completion.
    - c. Seeded Areas: One year from date of Final Completion
  - 2. Remove dead exterior plants immediately. Replace immediately unless required to plant in the succeeding planting season.
  - 3. Replace without cost to County, as soon as weather and soil conditions permit, exterior plants that are more than 25 percent dead or in an unhealthy condition as determined by the Project Officer and Landscape Architect at end of warranty period.

## **1.09 MAINTENANCE**

- A. Trees, Shrubs, Perennials, Bulbs & Groundcovers: Contractor shall maintain plantings at his/her own expense until final acceptance of the plantings as specified herein section 1.07.
- B. Maintenance Period for all exterior plants covered by this Section: Concurrent with Warranty Period and same duration as Warranty Period.

- C. County will assume maintenance following completion of Maintenance Period.
- D. 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.
- E. 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.
- F. Fertilizing: No plants shall be fertilized without prior approval of Project Officer with confirmation by the Urban Forester or Landscape Architect.
- G. 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 and shrubs.
- H. 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.
- I. Stakes and Guy Supports: If installed, Contractor shall monitor and adjust all stakes and guy supports until final acceptance.
- J. Contractor shall log all maintenance procedures, to include all dates and times of activity, on a monthly basis and provide the log to the Project Officer.

## **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 and Shrub Material: Furnish nursery-grown trees and shrubs 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.
  - a. Provide balled and burlapped, bare root or container-grown trees and shrubs, as indicated on the Drawings.
  - b. 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.

- c. Ball sizes shall be in accordance with current ANSI standards.
  - d. 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.
  - e. 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.
  - f. 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.
  - g. All container-grown trees and shrubs that have circling and matted roots shall be rejected.
- C. Perennials: Provide healthy, container-grown plants with well-developed, fibrous root systems from a commercial nursery, of species and variety shown in the Drawings. All container grown plants shall be healthy, vigorous, well rooted and established in the container in which they are growing. A container grown plant shall have a well-established root system reaching the sides of the container to maintain a firm root ball, but shall not have excessive root growth outside the container.
  - D. Bulbs: Provide top size bulbs as indicated on plan in accordance with most current version of ANSI A60 specification.
  - E. Field grown trees and shrubs shall be grown in soils of the Piedmont region, or west of that region in the above approved states and zones.
  - F. 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.
  - G. 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.
  - H. Plant Materials for ecologically sensitive areas: Plant materials identified on planting plan as being located within an Arlington County Natural Resource Conservation Area (NCRA) shall be native species of local provenance.
    - a. 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.
  - a. Remove existing sod, turf, weeds or other plant material.
  - b. Rototill subgrade of planting beds to a minimum depth of 8 inches with the addition of 3 inches organic material. Edge and rake the entire planting bed.
  - c. Remove stones, clods, debris, sticks, roots and other foreign or extraneous matter larger than 1/2 inch in any dimension. Contractor shall legally dispose of them off Arlington County property.
  - d. 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.
  - e. Spread planting soil mix to a depth of 8 inches but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
  - f. 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.
  - g. 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, trees and shrubs 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
  - a. The Contractor shall layout and space plants according to the project landscape plan.

- b. 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, Shrubs, Ground Covers and Perennials)
- a. 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.
  - b. 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 and Shrub Pruning: **Contractor shall conform to the most current version of ANSI A-300 Tree Pruning Standards. Do not cut tree leaders; remove only injured or dead branches from trees and shrubs, or those that pose a hazard to pedestrians.** Make all cuts back to a lateral branch or bud. Cuts should be perpendicular above branch collar. Final pruning shall be done after the tree is in place. Do not prune into old wood on evergreens.
- F. Plant Protection: Contractor shall protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged exterior planting. Injured roots shall be pruned to clean ends before planting with clean, sharp tools per most current ANSI 300 specifications.
- a. Protect shrubs, groundcovers and perennials from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.
- 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.



### **3.03 ADDITIONAL REFORESTATION EXECUTION REQUIREMENTS**

- A. Reforestation plantings shall be laid out in the field by the contractor with county staff on-site. Do not plant overstory/canopy trees within 10' of overhead utility lines.
- B. When planting proposed trees and shrubs, contractor shall cut out a section of the biodegradable matting in order to dig a hole twice as large as the root ball.
- C. See REF-01 for additional information, including but not limited notes, coverage requirements, species list, quantities, spacing and sizes, for example.

### **PART 4 - MEASUREMENT**

- 4.01** The unit price for MULCH TRAIL shall be CUBIC YARD 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 REFORESTATION PLANTING shall be LUMP SUM 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 TREE (LARGE) - 8-10' 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.
- 4.04** The unit price for TREE (SMALL) – 1.5” CALIPER OR 6-7' HEIGHT 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.
- 4.05** The unit price for SHRUBS – 3 GALLON CONTANER (BIORETENTION) 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.
- 4.06** The unit price for PERENNIAL/ORNAMENTAL GRASS – 1 GALLON CONTAINER (ENTRY PLAZA) 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.
- 4.07** The unit price for PERENNIAL/ORNAMENTAL GRASS – 1 GALLON CONTAINER (BIORETENTION) 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.

- 4.08** The unit price for NATIVE MEADOW SEED MIX shall be LB 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.
- 4.09** The unit price for TEMPORARY PLANT PROTECTION FENCING shall be LINEAR FOOT 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. Drain Basins
  - 3. Polymer-Concrete Channel Drainage Systems and ductile iron grate
  - 4. Geotextiles
  - 5. Outlet Protection
  
- B. Provide all labor, materials, tools and equipment necessary to install storm drain pipes, fittings, drain basins, trench castings and channel systems.
  
- C. Related Sections:
  - 1. Section 013300 – Submittal Procedures
  - 2. Section 312000 – Earth Moving
  - 3. 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, specifically Stormwater Management Details Sheet C-23 for Construction Inspection Checklist, Pre-Construction Meeting, Excavation, Filter Layer, Underdrain, Stone Reservoir Placement, Soil Media Placement, Pretreatment, Plant Installation, and Testing. Refer to Sheet C-23 for Maintenance Regimen and Material Specifications.

## **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
  - 4. D3350 Polyethylene Plastics Pipe and Fittings Material

## **1.03 SUBMITTALS**

- A. Product Data: Provide data on all pipe materials, fittings, drain basins, trench casting channel systems and accessories and geotextiles.
- B. Shop Drawings:
  - 1. Provide shop drawings for each drain basin installation. Include plans, elevations, sections, details, frames, covers and grates.
  - 2. Provide shop drawings for polymer-concrete channel drainage system. Include plans, elevations, sections, details and grates.

## **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.

## **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.
- B. Schedule 40 with plain ends for solvent cemented joints.

### **2.02 HDPE PIPE AND FITTINGS**

- A. 4" O.D, perforated HDPE pipes and non-perforated connections, see plan for locations.
- B. 12" Flat panel corrugated perforated polyethylene pipe and fittings shall conform to ASTM D 7001.

### **2.03 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.

## **2.04 POLYMER-CONCRETE CHANNEL DRAINAGE SYSTEMS**

- A. Narrow, Sloped-Invert, Polymer-Concrete Channel Drainage Systems
  1. Source Limitations: Obtain narrow, sloped-invert channel drainage systems from single manufacturer
  2. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
  3. Channel Sections: Narrow, interlocking-joint, sloped-invert, polymer-concrete modular units with end caps.
    - a. Include rounded bottom, with built-in invert slope of 0.5 percent and with outlets in number, sizes, and locations indicated.
    - b. Include extension sections necessary for required depth.
    - c. Dimensions: 4-inch inside width. Include number of units required to form total lengths indicated.
    - d. Frame: Not required.
  4. Grates: Certified to EN1433 load Class E – 135,000 lbs – 2,323 psi with slots or perforations, and of width and thickness that fit recesses in channel sections.
    - a. Material: Ductile Iron shall conform to ASTM 536-84 Grade 65-45-12.
    - b. Locking Mechanism: Manufacturer's standard boltless locking system for securing grates to channel sections.
  5. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.
  6. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

## **2.05 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: 90 lbf; ASTM D 4632.
  3. Grab Elongation: 50%, minimum; ASTM D 4632.
  4. Tear Strength: 40 lbf; ASTM D 4533.
  5. Puncture Strength: 40 lb; ASTM D 6241.
  6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751
  7. Permittivity:  $2 \text{ sec}^{-1}$ , 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. Grab Tensile Strength: 200 lbf; ASTM D 4632.
  2. Grab Tensile Elongation: 15%, minimum; ASTM D 4632.
  3. Tear Strength: 75 lbf; ASTM D 4533.
  4. Puncture Strength: 90 lbf; ASTM D 6241.
  5. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
  6. Permittivity 0.02 per second, minimum; ASTM D 4491.
  7. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355

## **2.06 OUTLET PROTECTION**

- A. Clean washed, 10" to 12" western Maryland or Pennsylvania boulders.

## **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 12 inch minimum cover.
4. Install piping according to ASTM D 2321.

### **3.03 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 PIPE JOINT CONSTRUCTION**

- A. Join gravity-flow, non-pressure drainage piping according to manufacturer's instructions.

### **3.05 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.

### **3.06 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 damaged piping.
    - d. Infiltration: Water leakage into piping.
    - e. Exfiltration: Water leakage from or around piping.
  3. Replace defective piping using new materials and repeat inspections until defects are within allowances specified.
  4. 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.
- 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 measurement for SOLID SCH 40 PVC (4" AND 12") to be paid for shall be for Solid SCH 40 PVC installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.02** The measurement for 6" PERFORATED SCH 40 PVC to be paid for shall be for 6" Perforated SCH 40 PVC installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.03** The measurement for 4" PERFORATED HDPE PIPE (FOUNDATION DRAIN) to be paid for shall be for 4" Perforated HDPE Pipe installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.04** The measurement for 12" FLAT PANEL CORRUGATED PERFORATED POLYETHYLENE PIPE (FLAT DRAIN) to be paid for shall be for 12" Flat Panel Corrugated perforated Pipe installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.05** The measurement for PVC TEES to be paid for shall be for PVC Tees installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.06** The measurement for PVC ELBOWS to be paid for shall be for PVC Elbows installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.07** The measurement for CLEANOUT IN SOIL to be paid for shall be for Cleanouts installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.08** The measurement for OBSERVATION WELL IN SOIL to be paid for shall be for Observation Wells installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.09** The measurement for DRAIN BASIN to be paid for shall be for Drain Basins installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.10** The measurement for TRENCH DRAIN CHANNEL AND GRATE to be paid for shall be for Trench Drain Channels and Grates installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.11** The measurement for GEOTEXTILE FABRIC to be paid for shall be for Geotextile Fabric installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.12** The measurement for OUTLET PROTECTION STONE to be paid for shall be for Outlet Protection Stone installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.13** The measurement for METAL LEVEL SPREADER to be paid for shall be for Metal Level Spreader installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

**4.14** The unit price for 5-8" DIAMETER RIVER ROCK, #8 CHOKER STONE, MULCH (BIO AREAS ONLY), WASHED GRADED #57 AGGREGATE, and FILTER MEDIA to be paid for shall be for all River Rock, Choker Stone, Mulch, #57 Aggregate, and Filter Media installed in accordance with the plans, specifications and to the satisfaction of the Project Officer.

## **END OF SECTION 334000**