

PROJECT BID MANUAL

South Street to Christian Street, Phase 2 Improvements
Schuylkill River Trail Extension
Philadelphia, PA

SRDC PROJECT No. SBSC-002
MPMS No. 107826

SCHUYLKILL RIVER DEVELOPMENT CORPORATION

December 2016



A **non-mandatory Pre-Bid Conference** will be held on **Wednesday, December 21, 2016 at 1:00 PM** at the Schuylkill River Development Corporation Offices at 2401 Walnut Street, Suite 603, Philadelphia, PA 19103.

Proposals will be accepted until 4:00 PM on Friday, January 20, 2017 at the Schuylkill River Development Corporation Offices at 2401 Walnut Street, Suite 603, Philadelphia, PA 19103.

SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS
SRDC PROJECT NO. SBSC-002

December 7, 2016

SECTION 000010

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SECTION 000015

LIST OF DRAWINGS

CIVIL SET

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1	Cover Sheet
2	General Notes
3	Existing Features & Demolition Plan – 1
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<u>DRAWING NO.</u>	<u>TITLE</u>
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2	Site Materials & Furnishings Plan – 1
3	Site Materials & Furnishings Plan - 2
4	Site Materials & Furnishings Plan - 3
5	Site Materials & Furnishings Plan – Plan Enlargements
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12	Planting Plan – Shrubs, Perennials And Groundcover – 5
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7	Electrical Details

SECTION 000100

SCOPE OF WORK

PART 1: GENERAL INFORMATION & REQUIREMENTS

- 1.1 This project, which is being bid by the Schuylkill River Development Corporation (SRDC), involves Phase 2 Improvements for the construction of an approximately 1,400-foot long trail segment along the east bank of the Schuylkill from South Street to the vicinity of Christian Street. The north end of this trail segment will tie in to the southern end of the Schuylkill Banks Boardwalk, which was completed in October 2014, and the existing stair tower to the South Street Bridge. The limit of construction is approximately 121,476 square feet (2.79 acres).

The first phase of construction for the South to Christian trail began in August 2015 and extended until December 2016. The general contractor for Phase 1 was the JPC Group, Inc. of Philadelphia. Basic work items that were completed in Phase 1 include site clearing, installation of a retaining wall at the northern end, site grading, trail layout and paving for most of the trail, installation of the trail lighting system, and curb work for the three outlook areas. Basic work items remaining to be completed in Phase 2 include site furnishings, landscaping, limited site re-grading, paving of an approximately 370 foot long section of the trail, and porous paver installation at the outlook areas.

The overall project build-out is shown on the Contract Drawings (which consist of the Civil, Electrical, and Landscape Sets listed in Section 000015) and further defined by these specifications. Taken together these documents define the complete project, a major portion of which has already been constructed. In general, work items depicted on the Civil and Electrical Drawings are substantially complete, while work items depicted on the Landscape Drawings remain. The Bid Tabs in Section 000030 clarify the extent of remaining work in a detailed manner by listing items and quantities for only the Phase 2 elements. However, prospective contractors are strongly encouraged to visit the site to gain a clear understanding of work that has been completed to-date and work that remains to be completed.

SRDC is eager to have this work completed in a timely manner and intends to make a decision and enter into a contract quickly. It is our expectation that prospective bidders are able and committed to begin quickly, with the desire being to have this work completed by **July 14, 2017**. The Bid Submission date is **January 20, 2017**.

- 1.2 **Insurance.** Contractor must maintain and show evidence that he has insurance covering the work, equal or greater to the limits listed below:

a.) Comprehensive/Commercial General Liability and Property Damage Insurance	\$1,000,000 per occurrence \$2,000,000 aggregate
b.) Automobile Liability Insurance	\$1,000,000 each occurrence
c.) Workman's Compensation Insurance	Statutory Limits
d.) Railroad Protective Insurance	\$5,000,000 per occurrence \$10,000,000 aggregate

Insurance Notes

- Liability coverage must be on an “Occurrence Basis” and not a “Claims Made Basis”
- The project location must be indicated on the Certificate of Insurance.
- Cancellation period must state “30- days’ prior written notice will be given to certificate holder prior to cancellation, non-renewal or reduction below the limits indicated.”
- The issuing agent must sign the certificate.
- The Schuylkill River Development Corporation, the Children’s Hospital of Philadelphia (CHOP), the Commonwealth of Pennsylvania, and the City of Philadelphia must be named as additional insured.
- A copy of the certificate of insurance must be provided to the Schuylkill River Development Corporation, 2401 Walnut Street, Suite 603, Philadelphia, PA 19103 prior to starting work. It does not need to be provided with the bid.

- 1.3 **Indemnification.** The Contractor shall hold the Commonwealth of Pennsylvania, the City of Philadelphia, the Schuylkill River Development Corporation (SRDC), the Children’s Hospital of Philadelphia (CHOP), and Urban Engineers, Inc. (UEI) harmless from and indemnify the Commonwealth, City, SRDC, and UEI against any and all claims, liabilities, demands, and actions based upon or arising out of any activities performed by the Contractor, its employees, agents, assigns, officers, or subcontractors under this Contract and shall defend any and all actions brought against any or all of the four above named entities based upon any such claims or demands.
- 1.4 **Project Administration and Inspection.** The Contractor is required to have a superintendent/foreman on site during all work. SRDC will provide project inspection using its own forces and/or the services of a Construction Manager. It is anticipated that there will be at least one on-site job meeting every two weeks to review up-coming work. The contractor must have responsible representation at these meetings.
- 1.5 **Project Site Security.** The contractor is responsible for securing the work area at the conclusion of each work day. This is to protect the public from an unsafe construction area and to secure and protect the contractor’s work, equipment and materials.
- 1.6 **Project Site Visits.** From time to time, SRDC may desire to have selected persons visit the job site. The contractor must accommodate these visitors, who will be accompanied by SRDC personnel.
- 1.7 **Project Timeline.** Contract award is expected to occur within a week following the Bid Submission, with a Notice to Proceed occurring within a week following contract award. All work on this project is to be completed by **July 14, 2017**. This includes the time for procurement of material and equipment. This is an expedited schedule that is to a large degree dictated by the planting season. The contractor must be willing and able to meet this schedule, and is encouraged to use all available time to complete the contract within the required time limit. Should the contractor find this schedule too demanding, we would discourage his/her from submitting a bid.
- 1.8 **Environmental Permits/Approvals/Clearances.** The environmental permits, approvals, and/or clearances listed below have already been obtained for this project:

- PADEP Water Obstruction and Encroachment Permit (Amendment to Permit No. E51-246 for the Schuylkill Banks Boardwalk Project)
- PADEP NPDES Permit for Construction Activities (Permit No. PAI015114007)
- PWD Post Construction Stormwater Management Plan Approval
- PFBC Species Impact Review Letter
- PHMC Historic/Archaeological Resources Clearance Letter

Electronic copies of the permits/letters listed above are available for viewing and download on SRDC's website. Contractors intending to bid on this project **must** review these permits and incorporate any restrictions or requirements into their bid. Note that, per PADEP and PFBC approvals, any in-stream work must occur between June 30th and October 15th of any year. If it is determined that any other permits or clearances are required for construction of this project, it shall be the Contractor's responsibility to obtain these permits or clearances.

- 1.9 **Geotechnical Data.** A Preliminary Geotechnical Summary Report that includes soil boring data was prepared for this project by American Geotechnical & Environmental Services (AGES) and is dated April 2015. An electronic copy of this report is available for viewing and download on SRDC's website.

The Preliminary Geotechnical Summary Report, including its appendices, provides Owner's information for the Bidders' convenience and is intended to supplement rather than serve in lieu of Bidders' own investigations. This information is made available for Bidders' convenience and information, but is not a warranty of existing conditions. The Preliminary Geotechnical Summary Report is not part of the Contract Documents.

- 1.10 **Access to Project Site and Parking Limitations.** It is anticipated that this project will be constructed using a combination of alternative site access methods including the South Street Bridge stairs, the Schuylkill Banks Boardwalk, and at the contractor's discretion by barge. Contractors should be aware that an at-grade crossing of the CSX rail tracks will NOT be available during construction and prepare their bids accordingly.

Primary access to the site for material delivery and removal will be via the Schuylkill Banks Boardwalk during off-peak periods and solely at the discretion of SRDC. Peak hour use may be approved on a limited basis by SRDC. Peak hours are defined as 7:00 am to 9:30 am and 4:00 pm to 7:00 pm on weekdays and 7:00 am to 7:00 pm on weekends. Vehicle loads on the boardwalk are restricted to an H-20 (20 Ton) vehicle at a maximum frequency of four vehicles per hour, with speeds kept to a minimum. Also, vehicles must be kept a minimum of 300 feet apart. Due to the pergola at the top of the South Street ramp, there is a 9 ft. height maximum for vehicles accessing the site from the boardwalk. The Contractor must obtain permission from SRDC for any use of the Schuylkill Banks Boardwalk at least 24 hours prior to use and must establish Maintenance and Protection of Traffic (MPT) for bicycles and pedestrians using the boardwalk.

The Contractor will not be permitted to park employee vehicles on site and will need to develop alternate arrangements for worker parking in the vicinity of the site. No parking of vehicles on the boardwalk or existing trail will be permitted at any time. Worker access will be available on foot via the South Street bridge stairs and/or the Schuylkill Banks Boardwalk. Due to limited site access, legitimate and necessary work vehicles will be allowed to be left on site overnight or at other times when work is not in progress.

Vehicles left on site are done so at the contractor's own risk.

The contractor is to submit a Site Access Plan outlining their overall plan for accessing the site, described by major work task. The plan should be a maximum of three pages. For more information on site access, see **Section 011000 – Summary**.

- 1.11 **Access to Schuylkill Banks Boardwalk and South Street stair tower to remain open during construction.** Much of the work will need to be completed using portions of the Schuylkill Banks Boardwalk and South Street stair tower. Except when expressly authorized by SRDC, the Contractor must keep the main trail open for trail users during the course of this work and exercise caution so as to not create unsafe conditions for users. To protect trail users and the worksite, the Contractor may install temporary fencing or barricades at his/her sole cost but the location and extent of such fencing must be kept to a minimum and be approved by SRDC or its representative prior to installation. Any damage to the work area must be repaired by the Contractor, incidental to this contract.
- 1.12 **Repair of Damage.** Contractor, as incidental to this contract, is responsible for any damages to existing facilities and/or surfaces resulting from this work. Existing facilities include, but are not limited to, the Phase 1 construction for the South to Christian trail, the Schuylkill Banks Boardwalk, and the South Street stair tower. Damaged areas must be restored to pre-construction conditions.
- 1.13 **Coordination with CHOP Project.** The Contractor should be aware that the Children's Hospital of Philadelphia (CHOP) is currently building a new facility adjacent to the project site, between the railroad tracks and Schuylkill Avenue. The CHOP project will involve work on the South to Christian project site to construct a pedestrian bridge landing (approximate location is shown on **Sheet 3** of the **Landscape Drawings**). CHOP's work is expected to periodically affect the project site through the duration of this project. Thus, the Contractor will need to coordinate their construction schedule with the CHOP project over the duration of this project.
- 1.14 **Performance of Work.** The prime contractor is required to perform at least **20%** of the work with his/her own forces.
- 1.15 **Disadvantaged Business Enterprise Participation.** SRDC has established a DBE requirement of 10% of the total construction cost for this project. The contractor is encouraged to exceed this goal. DBE participation will be a factor in the contractor selection process.
- 1.16 **Payment.** The construction contract will be with SRDC on a Unit Price basis (refer to **Section 012200 – Unit Prices** for what is included with each item). Invoices based upon work completed by pay item – as specified on the bid proposal sheets (**Section 000300**) – may be submitted on a monthly basis. Invoices should use the same format as the bid proposal sheets, listing the quantities that have been completed by pay item up to the date of the invoice. Assuming that the work is proceeding satisfactorily and the invoice is accurate, invoices will be paid within 60 days.

Contractor shall be aware that 10% of each invoice amount will be held by SRDC as retainage. The retained amount (10% of the Contract total) will be released upon completion and final acceptance of the Contract work.

1.17 **Contract Provisions.** As this work is covered, in part, by grant funding, there are provisions/requirements that must be adhered to during the course of work. These provisions will become part of the contract. Copies of these requirements are attached and include:

- Attachment A – Provisions for Commonwealth Contracts
- Attachment B – Nondiscrimination/Sexual Harassment Clause
- Attachment C – Department of Environmental Protection General Conditions
- Attachment D – Pennsylvania Prevailing Wage Act

For purposes of these provisions the term GRANTEE shall be understood to mean CONTACTOR; the terms DEPARTMENT or COMMONWEALTH shall be understood to mean SRDC.

The Contractor shall also comply with the Federal Occupational Safety & Health Act of 1970 (O.S.H.A) and Pennsylvania Act 287, as amended by Act 181 of 2006.

1.18 **Bonding Requirements.** Contractor must provide the following bond amounts:

- A. **Bid Bond:** A bid bond in the amount of 5% of the base bid amount is to be provided with the bid submission
- B. **Performance Bond and Labor & Material Payment Bonds:** Each bond must be in the amount of 100% of the contract bid price
- C. **Maintenance Bond:** Must cover a period of one year following completion of the project and should be in an amount of at least 10% of contract price
- D. **Payment Bond:** A payment bond is required in the amount of 100% of the contract bid price

1.19 **Codes, Regulations and Standards.** Contractor is responsible for adhering to all applicable Codes, Regulations and Standards relating to the work under this contract. The following codes and regulations are applicable to this project. The list does not represent all codes, regulations and standards:

- The Philadelphia Municipal Code
- The Philadelphia Electrical Code
- The Philadelphia Fire Prevention Code
- The Philadelphia Mechanical Code

It is not the intent of the Contract Documents to conflict with any Code, or Regulation. Report any conflicts to the Design Engineer for clarification.

Standards: The following standards and policies cover this contract:

- For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes or intended use.
- The referenced standards shall have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such

standards are made a part of the Contract Documents by reference.

- Should specified reference standards conflict with Contract Documents, request clarification from Design professional before proceeding but generally the more stringent requirement shall apply.
- In the absence of specific instructions in the specifications, materials, products, equipment, and their installation shall conform to the applicable codes, regulations and standards specified herein.
- The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any referenced document.
- Dates of codes, regulations and standards specified shall be the latest date prior to the date of issue of this Project Manual, except where, prior to the date of issue of this Project Manual, modified or otherwise directed by the applicable codes and their supplements and amendments adopted by the code authorities having jurisdiction.
- Each entity engaged in construction of the Project shall be familiar with industry standards applicable to its construction activity. If unfamiliar, obtain copies and review with all workers. Obtain copies of standards when required by individual specification sections. Maintain copy at job site until Substantial Completion.

1.20 **Project Submittals.** The Contractor must provide an electronic copy of each submittal to SRDC and its designated representatives. Submissions shall meet the requirements of **Section 013300 – Submittal Procedures.**

1.21 **Project Substitution.** The Site Furnishings (Section 129300) and Porous Unit Pavers (Section 321443) for this project shown in the Drawings and Specifications are specified as proprietary items. This is because SRDC wishes to keep the appearance and functionality of the trail consistent with existing sections of Schuylkill Banks. Contractors are advised to bid the project knowing that no substitutions will be permitted for these items. Substitutions for other items are covered under **Section 012500 – Substitution Procedures.**

1.22 **Contract Modification Procedures.**

A. Change Order Procedure

If a change in the design of any portion of the work or the requirements of the Project Manual is deemed necessary by SRDC, SRDC may order an alteration to, or a change in, the work covered by the Contract Documents, and the contractor shall comply with such orders. If such changes increase the cost of the work to the Contractor, SRDC will allow additional compensation. If such changes diminish the cost of the work to the Contractor, SRDC may deduct the amount of the diminution. No consequential loss or profit due to reduction in the scope of work will be allowed the Contractor, but the Contractor may be entitled to an extension of time if the condition warrants it. No changes shall be made except upon an approved Change Order Form, signed and executed by the Contractor and SRDC authorizing the change and fixing the method of compensation or deduction. This Section specifies administrative and procedural requirements for handling and processing Change Orders.

The execution of a change order (increase or decrease) will require a proposal from the Contractor on company letterhead. Such proposal will include a complete

description of the change and schedule impact and a complete cost breakdown including such items as Labor, Materials, Equipment, Crew Composition, Sub-Contractor costs, and associated Insurance and Bonding costs (if applicable). The proposal is to be submitted to SRDC Director of Capital Projects. Upon review and approval by SRDC Project Team, a signed Change Order Form will be forwarded to the Contractor for final execution.

B. Contractor's Responsibility to Inform

Communication, either verbal or written, between SRDC or its Design Professional and the Contractor, Subcontractors, or other parties involved, during the normal course of administration of the Contract, does not in any way constitute acceptance of a Change Order or direction to modify the Contract unless said communication is in the form of a written Change Order or Construction Change Directive as specified herein.

Communication from SRDC or its Design Professional including, but not limited to the following, does not constitute approval of a Change Order:

1. Submittal review including submittals returned with notations and corrections;
2. Site observation, conservation and reports;
3. Participation in pre-construction, pre-installation, progress or other meeting;
4. Clarification sketches or drawings.

It is the responsibility of the Contractor to inform SRDC that any communication has, in the Contractor's opinion, caused reason to modify the Contract. The Contractor shall not undertake work which, in his opinion, requires a Change Order without completing procedures outlined herein.

Work done without completing Change Order procedures is entirely at the Contractor's own risk, even if the Contractor believes that communications from SRDC or its Design Professional contain instructions to do work outside of the Contract scope.

SRDC and its Design Professional will not willfully instruct work to be done that differs from the contract except through the Change Order procedures contained herein.

C. Minor Changes in the Work

Supplemental instructions, not involving an adjustment to the Contract Sum or Contract Time, may be issued in writing by SRDC.

D. Force Account

When SRDC and Contractor are not in total agreement on the terms of a Change Order Proposal, SRDC may issue a Construction Change Directive instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. The Construction Change Directive will contain a complete description of the change in the Work.

Documentation – Maintain detailed records on a time and material basis of work required by the Construction Change Directive. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and

time adjustments to the Contract.

1. Contractor's documentation will not, by itself, establish the final cost.
2. SRDC reserves the right to determine the value of the change in Work per the requirements of this Section and Section 1.23E

E. Determination of Cost

For Change Orders or Force Account, the Contractor shall be limited to the following mark-ups for material, labor, and equipment:

- Materials – maximum of 10% of actual material cost
- Labor – maximum of 20% of actual labor cost
- Equipment – maximum of 3% of actual equipment costs
- Administrative cost for work by prime contractor – no mark-up
- Administrative cost of work by sub-contractors – max. of 2% of change order

Note: Contractors are advised that these mark-ups may be different from allowances permitted by other contracting agencies

- 1.23 **Project Warranty.** The landscaping elements of the project are subject to warranty, as described in **Section 329300 – Plants**. The permeable paving is also subject to warranty, as described in **Section 321443 – Porous Unit Paving**. These requirements are considered incidental to the items and must be considered in the bid.
- 1.24 **Closeout Procedures.** When the Work is considered complete and ready for final inspection, SRDC will make a final inspection and note any deficiencies. Contractor shall take immediate steps to remedy the stated deficiencies and notify SRDC when all work is completed. Once SRDC agrees that the project is 100% complete, the Contractor shall submit Underwriter's certificate, as-built drawings, operations and maintenance manuals, warranties, spare parts, etc. SRDC will process final payment once SRDC is satisfied with final submissions and after Project Testing and Warranty period described in part 1.25. Closeout procedures are covered in detail under **Section 017700 – Closeout Procedures**.

PART 2: BID ADVERTISEMENT & EVALUATION

- 2.1 **Pre-Bid Site Visit.** Contractors are advised and strongly encouraged to visit the project site before quoting on this project to view and assess the project scope, site conditions and limitations. SRDC would be pleased to escort contractors on this site visit and answer any questions about the project. To make arrangements for such a visit, call Joseph Syrnick or Lane Fike at 215.309.5523, extension 102 or 101, respectively.
- 2.2 **Pre-Bid Meeting.** A pre-bid meeting will be held on **Wednesday, December 21, 2016 at 1:00pm** at the offices of SRDC, 2401 Walnut Street, Suite 603, Philadelphia, PA 19103. Following the office meeting, prospective bidders will have an opportunity to walk the project site with SRDC and the Design Team. Bidders are strongly encouraged to attend this meeting. SRDC will compile minutes from this meeting and post to their website within **10 calendars days** from the pre-bid meeting.
- 2.3 **Bid Format.** The bid format will be based on **Unit Prices** with a specified Total Bid Amount. The Total Bid Amount is intended to cover all elements of the project, including the contractor's project management and supervision. The Bid Proposal Sheets

provided in **Section 000300** are to be completed by the Bidder and submitted as part of the Bid, either in written form or by using the electronic version available on SRDC's website and emailing to SRDC at lucy.mcdonald@srcd.net.

SRDC reserves the right to accept or to reject all bids. It is SRDC's intention to award a complete project if the bid amounts fit within the project budget.

- 2.4 **Bid Submission.** Bids are due by **4:00pm on Friday, January 20th, 2017**. There will be no public bid opening. Bids may be submitted to SRDC as a hard copy (mailed or hand-delivered) to SRDC offices or by email to lucy.mcdonald@srcd.net. Submission requirements are outlined in **Section 000200 – Bid Proposal Form**. The signed Bid Proposal Form (Section 000200), the Bid Proposal Sheets (Section 000300), the DBE Proposal Form (Section 000350), the signed Certification Page (Section 000400), and acknowledgement sheets from any Addenda (if applicable) must be returned to SRDC to be considered a complete bid proposal. It is the contractor's responsibility to assure delivery of the proper documents to SRDC by the prescribed deadline.

Any questions related to this bid advertisement shall be submitted in writing via email to joseph.syrnick@srcd.net by **12:00pm on Monday, January 9, 2016**. Responses will be posted to SRDC's website within **5 calendar days** from this due date. It is the responsibility of Contractors intending to bid on this project to notify SRDC and provide contact information via email to joseph.syrnick@srcd.net. SRDC will use this contact information to issue any addenda or responses to questions.

- 2.5 **Bid Evaluation.** SRDC will evaluate the bids received and award the contract to the lowest responsive and responsible bidder. SRDC reserves the right to reject any and all bids.
- 2.6 **Addendums.** SRDC reserves the right to issue Addenda to the Contract Documents at any point during the bidding or construction periods to clarify, revise, or supersede information in the Specifications, Drawings, and/or previously issued Addenda. Portions of the Addenda affecting the Contract Documents will be incorporated into the Contract by enumeration of the Addendum in the Owner/Contractor Agreement.

END OF SECTION 000100

SECTION 000150

MODIFICATIONS TO CIVIL DRAWINGS

Introduction

This section is intended to notify Bidders of modifications to the Civil Drawings that are necessitated as a result of the Phase 1 construction. The modifications described below shall supersede information shown on the Civil Drawings. Exhibits are attached to this section as necessary to depict these items.

This section does not include modifications to the Landscape or Electrical Drawing sets. In general, work items depicted on the Civil and Electrical Drawings are substantially complete, while work items depicted on the Landscape Drawings remain. The Contractor shall use the Landscape Drawings as the primary drawings for construction of landscaping elements, site grading, porous paver layout at the outlook areas, railing layouts, and site furnishings. Where discrepancies exist between the Civil and Landscape Drawings, the Landscape Drawings shall govern.

Modifications to Civil Drawings

- **Sheet 2 (Survey Data)** – The survey data listed in the General Notes was updated during the Phase 1 construction. While the site benchmark listed under Note #8 is still valid, the Control Points listed under Note #18 are no longer valid. Two new control points were set during the Phase 1 construction, as noted below. The Contractor should use these two control points for construction layout.

Control Point #1001

Northing: 234262.922

Easting: 2687514.338

Elevation: 10.865

Control Point #1002

Northing: 233687.597

Easting: 2687073.845

Elevation: 10.912

- **Sheet 2 (Table of Contents)** – The Sheet Numbers for the Landscape Drawings have been updated. Refer to Section 000015 – List of Drawings instead of the Civil Drawings for Sheet Numbers.
- **Sheet 8 (Site & Grading Plan 2)** – The existing berm to the east of the trail between Stations 107+00 and 109+50 is to be re-graded to match the grading contours shown on Sheet 8 of the Civil Drawings. In addition, the southern end of the berm is to be extended south to Station 106+25 (see **Exhibit A** for modified grading). Additional soil sampling was performed in December 2016 to identify areas of excess soil that can be used to re-grade the berm. In conjunction with the Soil Sampling Plan (Sheet 16 of the Civil Drawings), the contractor shall use the soil information provided in **Exhibit B** when re-grading the berm.
- **Sheets 11/12 (Signage & Striping Plans)** – During the Phase 1 construction, to avoid a pre-existing manhole, minor revisions were made to the trail's horizontal alignment for an

approximately 300' long section between Station 109+50 and 112+50 (see **Exhibit C**). Within this section, there is a 250' long section between Station 110+00 and 112+50 that has not yet been paved. Paving along this section shall conform to the modified horizontal alignment, as shown in the sketch. The modified baseline can be provided in a CAD format upon request.

- **Sheet 16 (Soil Sampling Plan)** – In the Sampling and Analysis section, the 7th bullet should not specify a width for the grass shoulders (see **Exhibit D**). Refer to the Landscape Drawings for grass shoulder widths, which vary along the trail.
- **Sheet 28 (Railings)** – The following modifications should be incorporated into the layout and fabrication of railings for this project (see **Exhibit E**):
 - The standard post-to-post dimension for the “Pipe Railing” and “Stainless Steel Railing with Infill Panel” details is 5 feet, except where noted on the Landscape Drawings
 - The size of the Post Mounting Plate is to be modified as noted on **Exhibit E**
 - Weep holes are to be provided along the bottom channel of the “Stainless Steel Railing with Infill Panel”
- **Sheet 28 (Railings)** – A foundation detail has been added for the “Stainless Steel Railing with Infill Panel” (see **Exhibit F**). This detail only applies to the plaza area at the northern limit of the project (i.e. Boardwalk Landing Plan Enlargement on Sheet 5 of the Landscape Drawings).
- **Sheet 28 (Railings)** – A railing detail has been added to address transition areas where the “Pipe Railing” and the “Stainless Steel Railing with Infill Panel” railings interface (see **Exhibit G**).
- **Sheet 29 (Trail Cross-Sections)** – Paving for the remaining unpaved trail section between Station 110+00 and 113+68 shall use “Typical Trail Section – Alternative #2” (see **Exhibit H**). At each end of the paving, the joints are to be offset by 6" from the previously placed layer to offset the joints between the layers (see **Exhibit I** and the attached excerpt from PennDOT Publication 408).

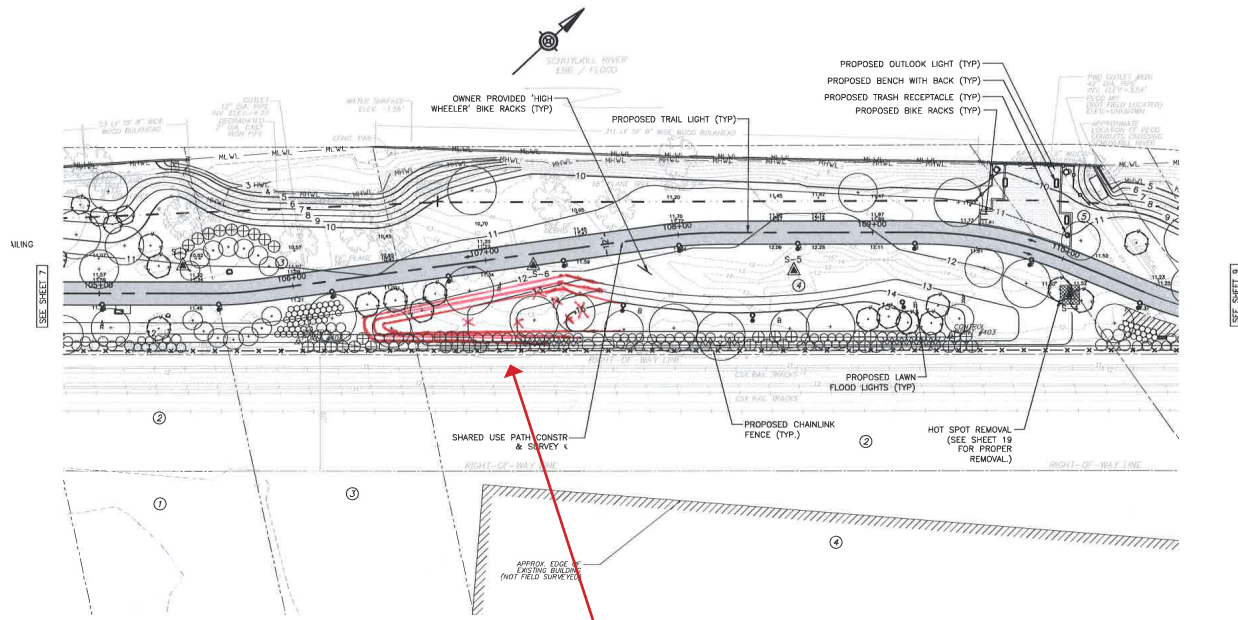
Exhibit A

GENERAL NOTES:

1. FOR TYPE, SIZE AND LOCATION OF PROPOSED TREE PLANTINGS, REFER TO LANDSCAPE SERIES.
2. FOR SOIL SAMPLE RESULTS SEE E&S PLAN SHEETS 13 - 15.
3. DAMAGED AREAS OUTSIDE OF LIMIT OF DISTURBANCE MUST BE REPAIRED TO THE EXISTING CONDITION PRIOR TO PROJECT CONSTRUCTION.
4. ELECTRICAL CONDUIT FOR PATH LIGHTING NOT SHOWN. FOR LOCATION AND SIZE, REFER TO ELECTRICAL SHEET SET.

DISTRICT	COUNTY	ROUTE	SECTION
6-0	PHILADELPHIA	-	
CITY OF PHILADELPHIA			
REVISION NUMBER	REVISIONS		
A	CONFORMED SET		
			9

SCHUYLKILL RIVER TRAIL EXTENSION
SITE & GRADING PLAN 2



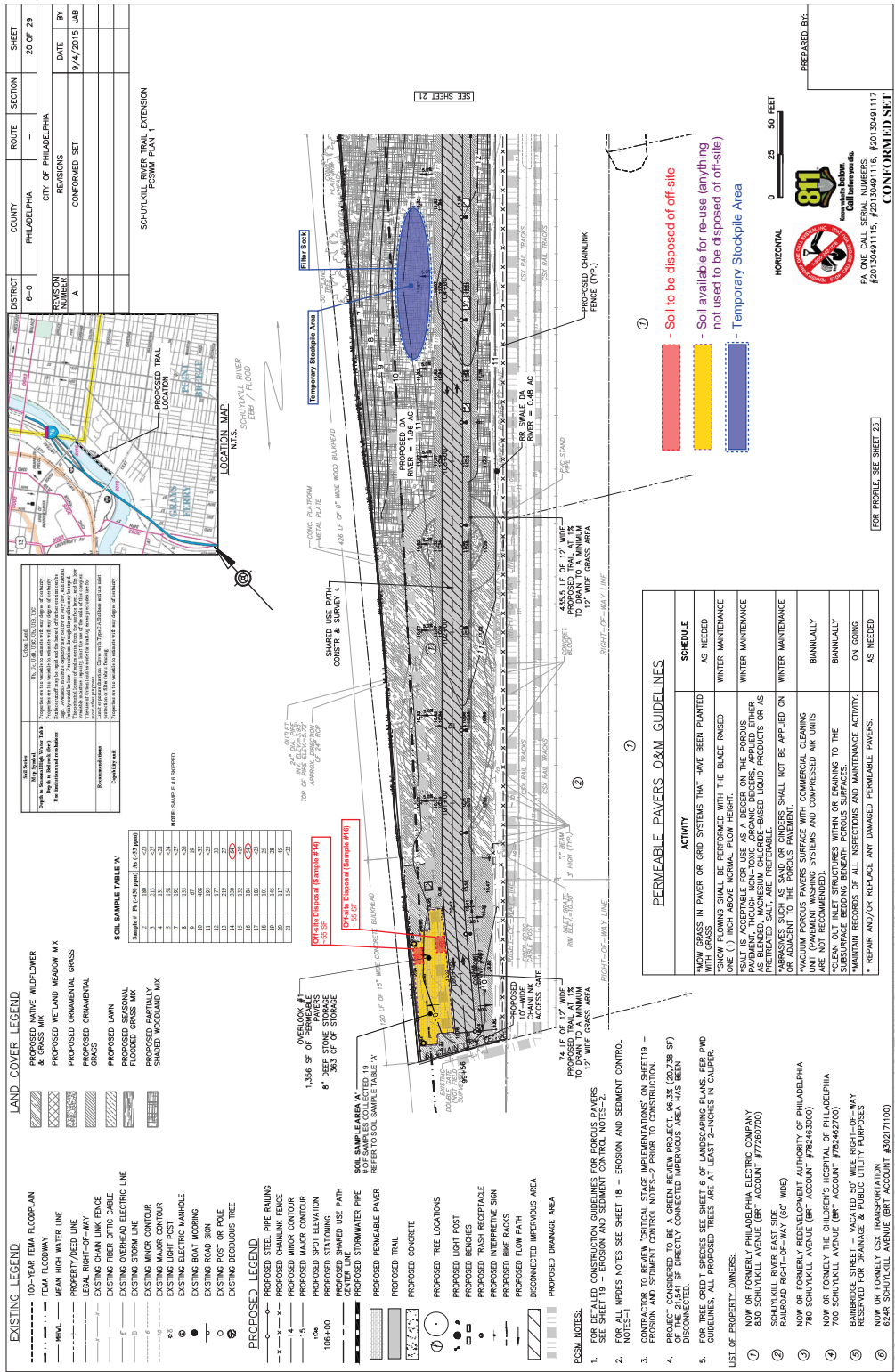
BERM AREA TO BE RE-GRADED TO MATCH THE CONTOURS SHOWN ON THIS PLAN, INCLUDING EXTENDING THE BERM SOUTH TO STATION 106+25

SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS
SRDC PROJECT NO. SRBC-002

MODIFICATIONS TO CIVIL DRAWINGS

December 7, 2016

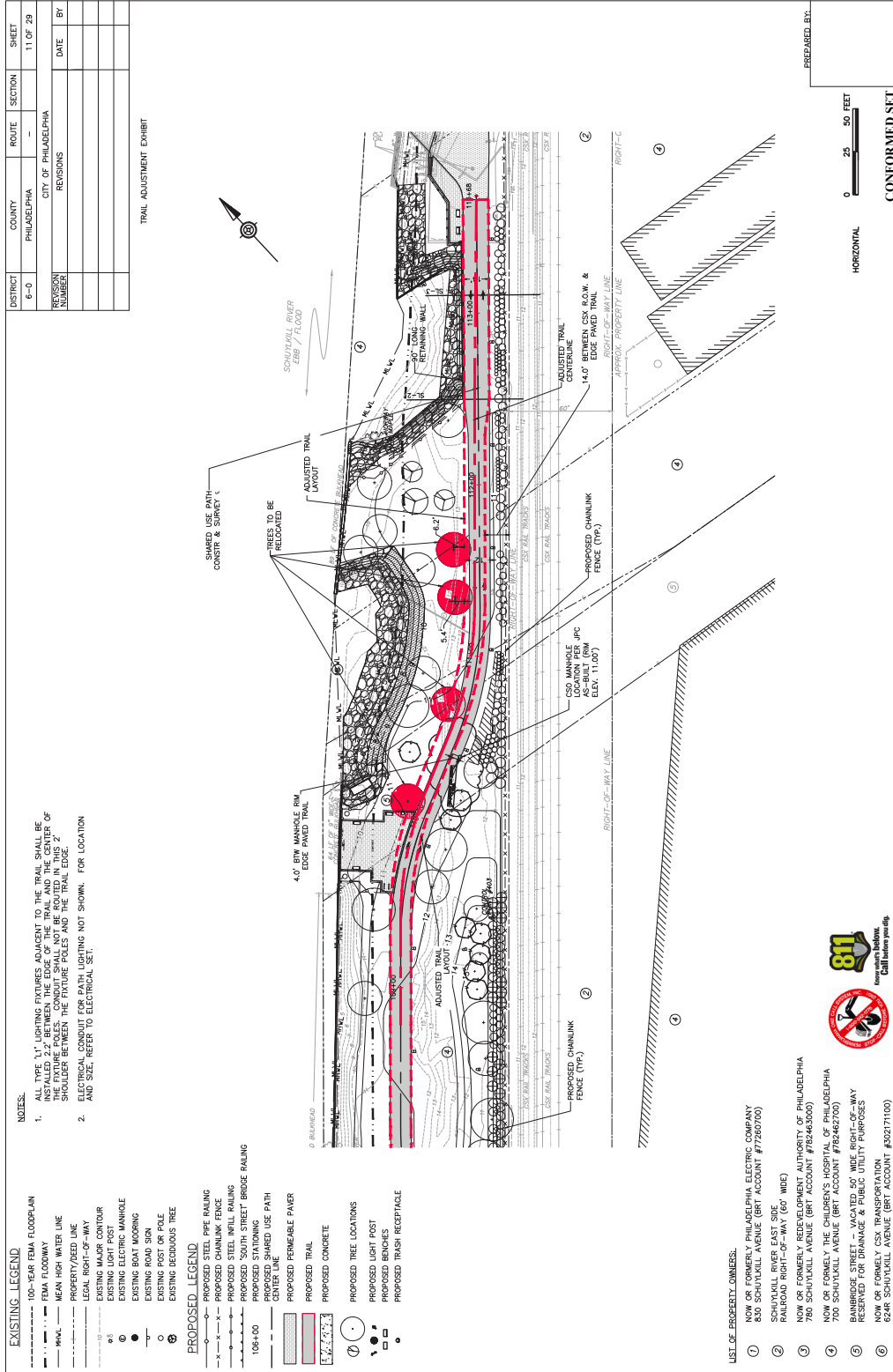
Exhibit B1



SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS SRDC PROJECT NO. SRBC-002 MODIFICATIONS TO CIVIL DRAWINGS

December 7, 2016

Exhibit C



DISTRICT	COUNTY	ROUTE	SECTION	SHEET
6-0	PHILADELPHIA	-	-	11 OF 29
REVISION NUMBER	CITY OF PHILADELPHIA	REVISIONS	DATE	BY

NOTES:

- ALL TYPE 'L' LIGHTING FIXTURES ADJACENT TO THE TRAIL SHALL BE INSTALLED 2'-2" BETWEEN THE EDGE OF THE TRAIL AND THE CENTER OF THE FUTURE PAVED TRAIL. LIGHTING SHALL NOT BE ROUTED IN THIS 2'-2" SPACE.
- ELECTRICAL CONDUIT FOR PATH LIGHTING NOT SHOWN. FOR LOCATION AND SIZE, REFER TO ELECTRICAL SET.

EXISTING LEGEND

- 100'-YEAR FEMA FLOODPLAIN
- FEMA FLOODWAY
- MEAN HIGH WATER LINE
- PROPERTY/DEED LINE
- LEGAL RIGHT-OF-WAY
- EXISTING MAJOR CONTOUR
- EXISTING LIGHT POST
- EXISTING MANHOLE
- EXISTING BENCH
- EXISTING ROAD SIGN
- EXISTING POST OR POLE
- EXISTING BECULOUS TREE

PROPOSED LEGEND

- PROPOSED STEEL PIPE RAILING
- PROPOSED CHAINLINK FENCE
- PROPOSED STEEL INFILL RAILING
- PROPOSED 'SOUTH STREET' BRIDGE RAILING
- 10R+00
- PROPOSED STATIONING
- PROPOSED SHARED USE PATH
- PROPOSED PERMEABLE PAVEMENT
- PROPOSED TRAIL
- PROPOSED CONCRETE
- PROPOSED TREE LOCATIONS
- PROPOSED LIGHT POST
- PROPOSED BENCHES
- PROPOSED TRASH RECEPTACLE

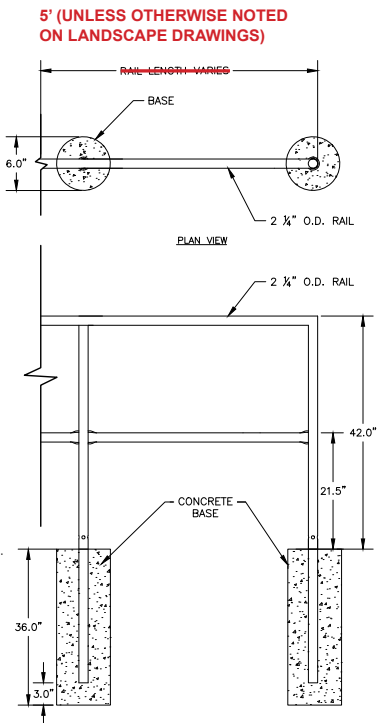
- LIST OF PROPERTY OWNERS:**
- NOW OR FORMERLY PHILADELPHIA ELECTRIC COMPANY
850 SCHUYLKILL AVENUE (BRT ACCOUNT #71260700)
 - SCHUYLKILL AVENUE (BRT ACCOUNT #71260700)
SCHUYLKILL AVENUE (60' WIDE)
 - NOW OR FORMERLY REDEVELOPMENT AUTHORITY OF PHILADELPHIA
780 SCHUYLKILL AVENUE (BRT ACCOUNT #792463000)
 - NOW OR FORMERLY THE CHILDREN'S HOSPITAL OF PHILADELPHIA
700 SCHUYLKILL AVENUE (BRT ACCOUNT #782462700)
 - BANBROS STREET - VACATED 50' WIDE RIGHT-OF-WAY
RESERVED FOR DRAINAGE & PUBLIC UTILITY PURPOSES
 - NOW OR FORMERLY CSX TRANSPORTATION
624K SCHUYLKILL AVENUE (BRT ACCOUNT #902171100)

SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS SRDC PROJECT NO. SRBC-002

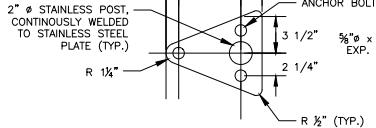
MODIFICATIONS TO CIVIL DRAWINGS

December 7, 2016

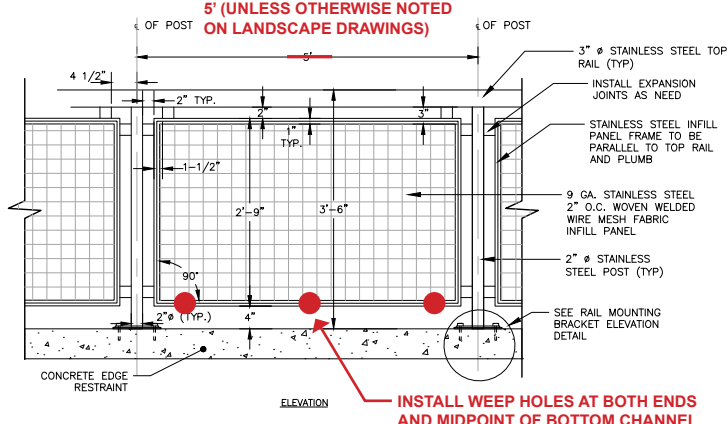
Exhibit E



2-1/4" GALVANIZED PIPE RAIL OR

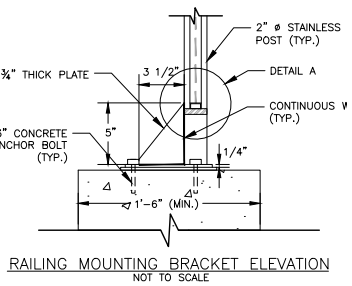


CHAINLINK FENCING
NOT TO SCALE



- NOTE:
1. SUBMIT SHOP DRAWINGS FOR APPROVAL BY OWNER'S REPRESENTATIVE PRIOR TO FABRICATION OF RAILING
 2. ADJUST ANGLES OF INFILL PANELS TO MAINTAIN 2' SPACING FROM TOP RAIL AND POST FOR PANELS S' PLATFORM EXTENDING TO WALKWAY BENT 2.
 3. RAILING AND INFILL PANEL TO BE SIMILAR TO THE FENCE ON MARKET ST./CHESTNUT ST. RAMPS ON SC

STAINLESS STEEL RAILING WITH INFILL PANEL
NOT TO SCALE

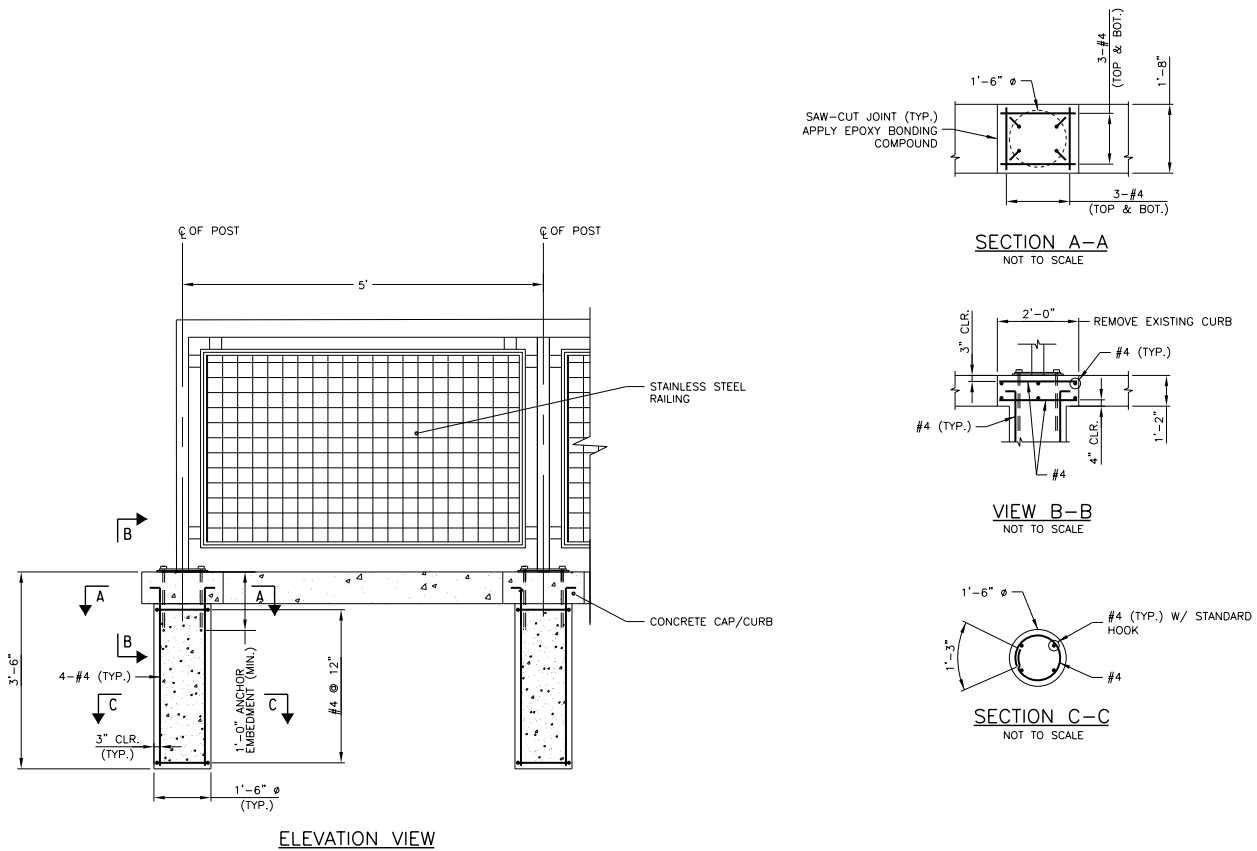


SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS
SRDC PROJECT NO. SRBC-002

MODIFICATIONS TO CIVIL DRAWINGS

December 7, 2016

Exhibit F



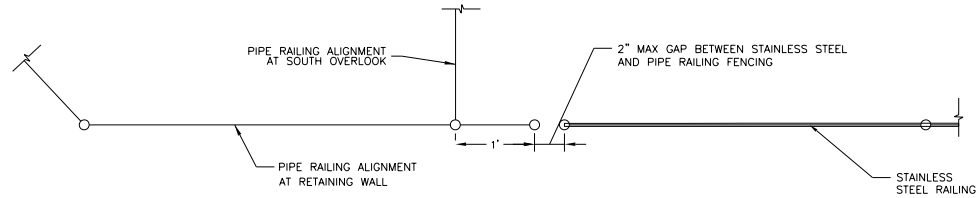
STAINLESS STEEL RAILING – FOUNDATION DETAIL (AT BOARDWALK PLAZA)
NOT TO SCALE

SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS
SRDC PROJECT NO. SRBC-002

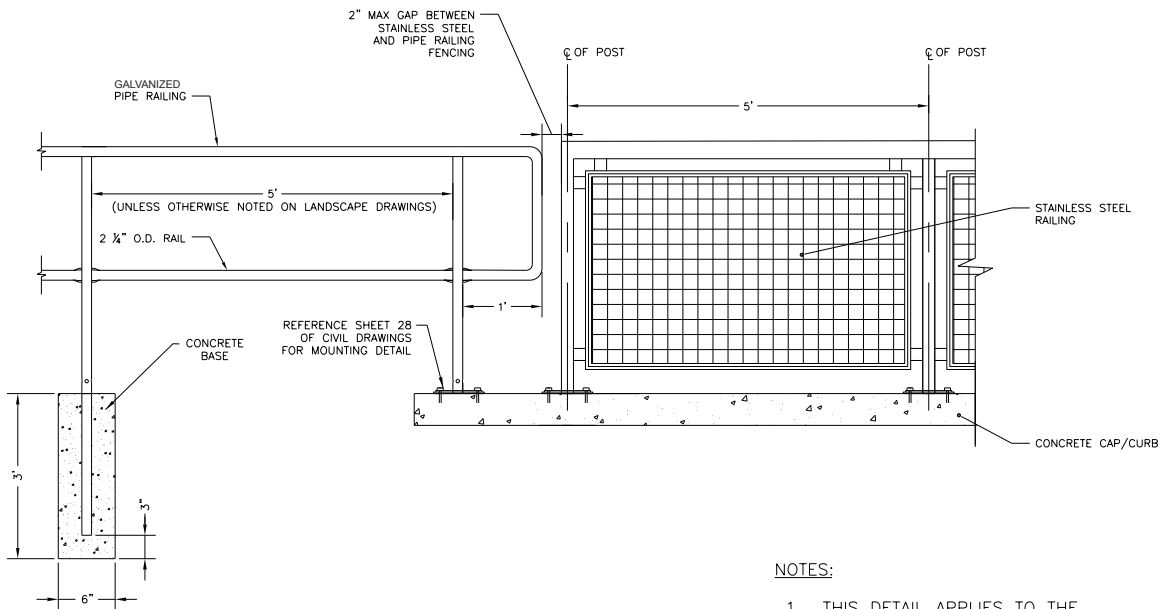
MODIFICATIONS TO CIVIL DRAWINGS

December 7, 2016

Exhibit G



PLAN VIEW



ELEVATION VIEW

NOTES:

1. THIS DETAIL APPLIES TO THE RAILING TRANSITION AT THE SOUTHERN END OF THE RETAINING WALL AND AT THE SOUTH OVERLOOK.

STAINLESS STEEL RAILING TO PIPE RAILING TRANSITION

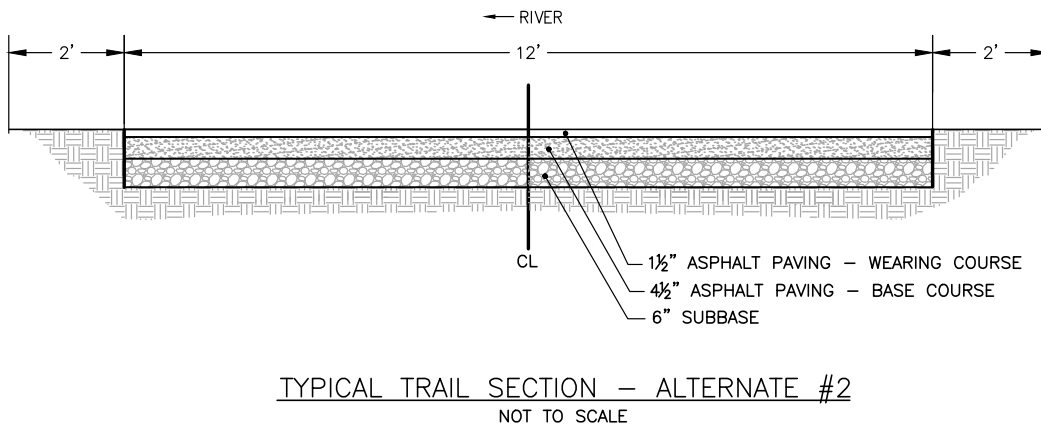
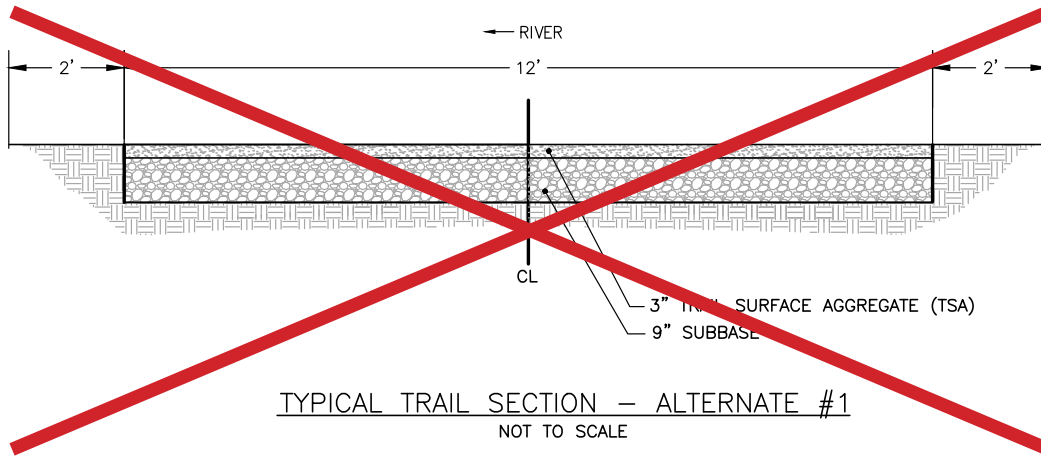
NOT TO SCALE

SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS
SRDC PROJECT NO. SRBC-002

MODIFICATIONS TO CIVIL DRAWINGS

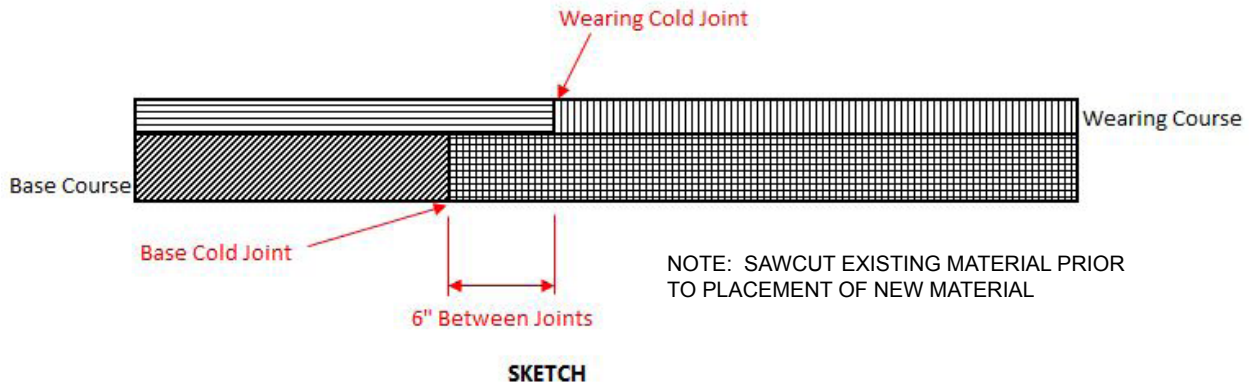
December 7, 2016

Exhibit H



SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS
SRDC PROJECT NO. SRBC-002

Exhibit I



SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS
SRDC PROJECT NO. SRBC-002

MODIFICATIONS TO CIVIL DRAWINGS

December 7, 2016

Excerpt from PennDOT Pub 408, Section 409.3

(k) Joints.

1. Longitudinal Joints.

1.a General. Offset joints in a layer from the joint in the layer immediately below by approximately 6 inches. Plan joint locations to ensure that the joint in the top layer is at the approximate pavement centerline for two-lane roadways and within 12 inches of the lane lines for roadways with more than two lanes. Avoid joint locations directly beneath planned pavement marking applications where possible.

Before placing abutting lanes, paint the entire area of the joint with a uniform coating of bituminous material, the PG-Binder used in the pavement course or PG 64-22. Painting of the joint face is not required for scratch courses.

Place and compact the mixture at the joint according to the Paving Operation QC Plan. Ensure the surface across the joint and along the joint is within the surface tolerances specified in Section 409.3(l).

Adhere to the following additional requirements for the construction of longitudinal joints that will not be evaluated as specified in Section 405:

Assure a true line when paving. Place and closely follow lines or markings for this purpose. When compacting loose mixture at an unsupported edge, make the first roller pass with the edge of the roller drum extending beyond and overhanging the unsupported edge by 3 to 6 inches. Do not allow pneumatic-tire rollers to cause lateral movement at any unsupported edge.

When placing uncompacted mixture adjacent to a previously compacted lane, operate the paver so that the material overlaps the edge of the previously placed lane by 1 to 1 1/2 inches. Ensure that mixture behind the screed is tightly pushed against the free face of the existing lane. Maintain the uncompacted mixture uniformly higher than the existing lane by at least 1/4 inch per inch of material being placed to assure full compaction. When possible, use automated joint matchers when constructing joints between traveled lanes. Do not bump back or lute the overlapped material unless overlap inadvertently exceeds the specified tolerances. When compacting the loose mix at the longitudinal joint, keep the roller drum approximately 6 to 12 inches from the joint for the first pass

409-16
Change No. 3

SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS
SRDC PROJECT NO. SRBC-002

MODIFICATIONS TO CIVIL DRAWINGS

December 7, 2016

SECTION 000200

BID PROPOSAL FORM

SRDC PROJECT NO. SBSC – 002

PROJECT TITLE: **SRTE South Street to Christian Street, Phase 2 Improvements**

TO: SCHUYLKILL RIVER DEVELOPMENT CORPORATION
2401 WALNUT STREET, SUITE 603
PHILADELPHIA, PA 19103
ATTENTION: LUCY MCDONALD

BID SUBMISSION DATE: **January 20, 2017**

A. I/We, the undersigned Bidder hereby agree, that if this Proposal is accepted, to enter into a contract with the Schuylkill River Development Corporation (SRDC), to provide all labor, materials, tools, equipment, supervision and services necessary to perform and complete the work required for the General Construction improvements of the above referenced Project as defined in and in accordance with the Contract Documents.

B. PROJECT SCHEDULE

Work on this project is to be completed by **July 14, 2017** as time is of the essence. Completion of the project earlier than this date is desirable, although no monetary bonus will be awarded.

Our expectant start day for this project is _____. The project duration is expected to be _____ calendar days.

C. PERFORMANCE OF THE WORK BY CONTRACTOR:

I, the undersigned Bidder, shall perform on the site and with my own organization at least twenty percent (20%) of the total amount of work to be performed under this Contract.

I shall perform the following work (list by the Divisions outlined in **Section 000010**):

- D. Our DBE % is _____
- E. I certify that I have received, read and understand the contract documents, including the minutes of the Pre-Bid meeting, answers/clarifications resulting from the meeting, and all addenda, and have a "complete" understanding of the project.
- F. I certify that I have the required insurance and can provide an acceptable insurance certificate if I am the successful bidder.
- G. I certify that I can provide performance and payment bonds in accordance with **Part 1.18 of Section 000100 Scope of Work.**
- H. BID
- Our bid for this project is:
1. Total Amount of Bid \$ _____

Note that **Section 000300 – Bid Proposal Sheets** must also be completed, either in written form or by using the electronic version available on SRDC’s website.

Note: This signed Bid Proposal Form (Section 000200), the Bid Proposal Sheets (Section 000300), the DBE Proposal Form (Section 000350), the signed Certification Page (Section 000400), and acknowledgement sheets from any Addenda (if applicable) must be returned to SRDC to be considered a complete bid proposal.

The remainder of this page is intentionally left blank.

IF BIDDER IS AN INDIVIDUAL OR PARTNERSHIP, FORM MUST BE DATED AND SIGNED HERE

This _____ Day of _____, 2017

Signature of Owner or Partner

Business Name of Bidder

Type of Print Name and Title

Address, including Zip Code

Telephone Number

IF BID IS BY A CORPORATION, THIS FORM MUST BE DATED AND SIGNED HERE BY A) THE PRESIDENT OR VICE PRESIDENT AND B) COUNTERSIGNED BY THE SECRETARY, ASSISTANT SECRETARY, TREASURER, OR ASSISTANT TREASURER AND THE CORPORATE SEAL SHALL BE AFFIXED. IF THIS FORM IS NOT SO SIGNED, A DULY CERTIFIED CORPORATE RESOLUTION AUTHORIZING FORM OR EXECUTION USED MUST BE ATTACHED TO THE BID EXECUTED BY THE DULY CERTIFIED INDIVIDUAL.

This _____ Day of _____, 2017

Corporate Seal

Corporate or Business Name of Bidder

Address, Including Zip Code

Telephone Number

Signature of President

Signature of Secretary

Type or Print Name and Title

Type or Print Name and Title

Federal Employer Identification Number:

SECTION 000300

BID PROPOSAL SHEETS

SCHUYLKILL RIVER TRAIL EXTENSION - SOUTH TO CHRISTIAN						
TO THE SCHUYLKILL RIVER DEVELOPMENT CORPORATION (SRDC)						
Sir: _____						
hereby proposes to do all the designated work on the aforesaid project between the limits indicated and will do all other work incident thereto, in accordance with the plans, specifications and the Standard Contract Requirements, for the following price:						
ITEM NUMBER	APPROXIMATE QUANTITY	ITEM AND UNIT PRICES BID	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
015000-01	1 L.S.	Contractor Mobilization at _____ _____ L.S.				
015000-02	500 L.F.	8" Sediment Filter Log at _____ _____ per L.F.				
015000-03	19 C.Y.	Rip-rap Rock, Class R-6 at _____ _____ per C.Y.				
017300-01	1 L.S.	Construction Layout at _____ _____ L.S.				
024116-01	1 EACH	Manhole Lid and Rim Adjustment at _____ _____ EACH				
024119-01	1 L.S.	Selective Demolition at _____ _____ L.S.				
026113-01	785 C.Y.	Handling, Transportation & Disposal of Residual Waste at _____ _____ per C.Y.				
033053-01	2 C.Y.	Miscellaneous Cast-In-Place Concrete (4" Thick Bench Pads) at _____ _____ per C.Y.				
055213-01	185 L.F.	Pipe Railings at _____ _____ per L.F.				
055213-02	50 L.F.	Stainless Steel Railing with Infill Panel at _____ _____ per L.F.				

SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS
SRDC PROJECT NO. SBSC-002
000300-1
BID PROPOSAL SHEETS

December 7, 2017

ITEM NUMBER	APPROXIMATE QUANTITY	ITEM AND UNIT PRICES BID	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
129300-01	12 EACH	Bench Fixtures and Concrete Foundations (SRDC Standard 4' Long) at _____ EACH				
129300-02	4 EACH	Trash Receptacle Fixtures and Concrete Foundations(SRDC standard) at _____ EACH				
129300-03	2 EACH	Bike Racks (High-Wheelers, Installation-only with Concrete Foundations) at _____ EACH				
129300-04	4 EACH	Bike Rack Fixtures and Concrete Foundations (Standard Black U-Racks) at _____ EACH				
129300-05	1 EACH	Boulder with Bronze Plaque at _____ EACH				
311000-01	1 L.S.	Site Clearing at _____ L.S.				
312000-01	100 C.Y.	Earth Moving at _____ per C.Y.				
321123-01	300 S.Y.	Subbase for Trail, No. 2A (2" Depth) at _____ per S.Y.				
321216-01	334 S.Y.	Asphalt Paving - Base Course (4.5" Depth) at _____ per S.Y.				
321216-02	528 S.Y.	Asphalt Paving - Wearing Course (1.5" Depth) at _____ per S.Y.				
321443-01	2830 S.F.	Porous Unit Paving at _____ per S.F.				
321723-01	132 L.F.	Pavement Markings at _____ per L.F.				

SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS
SRDC PROJECT NO. SBSC-002
000300-2
BID PROPOSAL SHEETS

December 7, 2017

ITEM NUMBER	APPROXIMATE QUANTITY	ITEM AND UNIT PRICES BID	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
323113-01	11 L.F.	Chain Link Fence at _____ per L.F.				
329100-01	21,840 S.F.	Topsoil (6"), includes Fertilizer, Mulch, and Lawn Turf-Type Tall Fescue Blend (MIX D) at _____ per S.F.				
329200-01	8851 EACH	Ornamental Grass (#1) at _____ EACH				
329200-02	11,946 S.F.	Seasonally Flooded Grass Seed (MIX A) at _____ per S.F.				
329200-03	6706 S.F.	Wildflower Meadow Seed (MIX B) at _____ per S.F.				
329200-04	16,028 S.F.	Woodland Meadow Seed (MIX C) at _____ per S.F.				
329200-05	3741 S.F.	Wetland Meadow Seed (MIX E) at _____ per S.F.				
329200-06	389 EACH	Perennial (4" Pot) at _____ EACH				
329200-07	1430 EACH	Perennial Plugs at _____ EACH				
329200-08	514 C.Y.	Amended Planting Soil for Trees (30" depth) at _____ per C.Y.				
329200-09	60 C.Y.	Amended Planting Soil for Buffer (18" depth) at _____ per C.Y.				
329200-10	337 C.Y.	Amended Planting Soil for Ornamental Grass (12" depth) at _____ per C.Y.				

SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS
SRDC PROJECT NO. SBSC-002
000300-3
BID PROPOSAL SHEETS

December 7, 2017

ITEM NUMBER	APPROXIMATE QUANTITY	ITEM AND UNIT PRICES BID	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
329200-11	517 C.Y.	Organic Soil Amendment for Native Grass/Meadow, 6" depth (tilled into existing soil) at _____ per C.Y.				
329300-01	9414 S.F.	Buffer Plantings at _____ per S.F.				
329300-02	1 EACH	Canopy Trees - 5" at _____ EACH				
329300-02	20 EACH	Canopy Trees - 3 1/2" at _____ EACH				
329300-03	34 EACH	Canopy Trees - 2 1/2" - 3" at _____ EACH				
329300-04	28 EACH	Canopy Trees - 12' at _____ EACH				
329300-05	2 EACH	Canopy Trees - 16' at _____ EACH				
329300-06	2 EACH	Coniferous Trees - 12' at _____ EACH				
329300-07	11 EACH	Coniferous Trees - 16' at _____ EACH				
329300-08	20 EACH	Ornamental Trees - 10' -12' multi stem at _____ EACH				
329300-09	11 EACH	Ornamental Trees - 3.5" cal. at _____ EACH				
329300-10	1015 EACH	Live Cuttings at _____ EACH				
329300-11	3000 EACH	Bulbs at _____ EACH				

SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS
SRDC PROJECT NO. SBSC-002
000300-4
BID PROPOSAL SHEETS

ITEM NUMBER	APPROXIMATE QUANTITY	ITEM AND UNIT PRICES BID	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
SP-01	1 L.S.	Pre-determined Price for Design-Build Irrigation System at ___TWENTY THOUSAND, SIX HUNDRED DOLLARS_____ L.S.	\$20,600	0	\$20,600	0
SP-02	1 L.S.	CHOP Bridge Landing Area at _____ _____ L.S.				
SP-03	1 L.S.	Miscellaneous Plantings (Site A) at _____ _____ L.S.				
SP-04	1 L.S.	Miscellaneous Plantings (Site B) at _____ _____ L.S.				
SP-05	1 L.S.	Miscellaneous Plantings (Site C) at _____ _____ L.S.				
SP-06	3 C.D.	Tree Trimming and Vine Removal at _____ _____ C.D.				
SP-07	700 S.F.	Bituminous Paving Adjustments at _____ _____ S.F.				
SP-08	13 EACH	Boulders Along Trail at _____ _____ EACH				
SP-09	18 EACH	Bollard Painting at _____ _____ EACH				
SP-10	1 L.S.	Railing Repair near Composting Toilets at _____ _____ L.S.				
SP-11	63 S.F.	Concrete Pads for Benches at _____ _____ S.F.				
SP-12A	8 S.F.	South Overlook Bulkhead PennDOT (Type I) Repair at _____ _____ per S.F.				

SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS
SRDC PROJECT NO. SBSC-002
000300-5
BID PROPOSAL SHEETS

ITEM NUMBER	APPROXIMATE QUANTITY	ITEM AND UNIT PRICES BID	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
SP-12B	126 S.F.	South Overlook Bulkhead PennDOT (Type II) Repair at _____ per S.F.				
SP-12C	510 S.F.	South Overlook Bulkhead Top Coating _____ per S.F.				
SP-13	1 L.S.	Pre-determined Price for Signage Package at _____ THIRTY TWO THOUSAND, SEVEN HUNDRED FIFTY TWO DOLLARS _____ L.S.	\$32,752	0	\$32,752	0
SP-14	6350 S.Y.	Topdressing and Seeding _____ per S.Y.				
SP-15	1 L.S.	Locating and Marking Underground Utilities _____ L.S.				
SP-16	1 L.S.	Water Irrigation Service Line at _____ L.S.				
SP-17	1 L.S.	Weep Hole Drilling at Existing Railings at _____ L.S.				
SP-18	1 L.S.	Irrigation Hotbox Electrical Terminations & Devices at _____ L.S.				
TOTAL BID AMOUNT: \$ _____						

SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS
SRDC PROJECT NO. SBSC-002
000300-6
BID PROPOSAL SHEETS

December 7, 2017

SECTION 000350

DBE - PROPOSAL FORM

_____ proposes to use the following firms/businesses to fulfill the 10%
(contractor name)

DBE requirement on this contract:

<u>Name of DBE Firm</u>	<u>Description of Work</u>	<u>Proposed Amount of Work by DBE Firm</u>
_____	_____	\$ _____
_____	_____	\$ _____
_____	_____	\$ _____
_____	_____	\$ _____
_____	_____	\$ _____
Total		\$ _____
% of contract		_____ %

_____ Date

_____ Signature

_____ Print Name

_____ Contractor Name

SECTION 000400

CERTIFICATION PAGE

This certifies that I/We understand that this project is being funded with State funding and as such has a number of special provisions that need to be met. These provisions entail additional requirements, administrative and otherwise, including additional reporting procedures, that may not be in other non-State funded projects and which may involve additional costs to satisfy.

The special Provisions include the following:

- Attachment A – Provisions for Commonwealth Contracts
- Attachment B – Nondiscrimination/Sexual Harassment Clause
- Attachment C – Department of Environmental Protection General Conditions
- Attachment D – Pennsylvania Prevailing Wage Rates

I/We have read and understand the Special Provisions contained in this Bid Proposal and understand that they are an important component of this project. We have considered them and included them in our bid.

Signature

Printed Name

Company Name

ATTACHMENT A – PROVISIONS FOR COMMONWEALTH CONTRACTS

CONTRACTOR INTEGRITY PROVISIONS

It is essential that those who seek to contract with the Commonwealth of Pennsylvania ("Commonwealth") observe high standards of honesty and integrity. They must conduct themselves in a manner that fosters public confidence in the integrity of the Commonwealth procurement process.

In furtherance of this policy, Contractor agrees to the following:

1. Contractor shall maintain the highest standards of honesty and integrity during the performance of this contract and shall take no action in violation of state or federal laws or regulations or any other applicable laws or regulations, or other requirements applicable to Contractor or that govern contracting with the Commonwealth.
2. Contractor shall establish and implement a written business integrity policy, which includes, at a minimum, the requirements of these provisions as they relate to Contractor employee activity with the Commonwealth and Commonwealth employees, and which is distributed and made known to all Contractor employees.
3. Contractor, its affiliates, agents and employees shall not influence, or attempt to influence, any Commonwealth employee to breach the standards of ethical conduct for Commonwealth employees set forth in the Public Official and Employees Ethics Act, 65 Pa.C.S. §§1101 et seq.; the State Adverse Interest Act, 71 P.S. §776.1 et seq.; and the Governor's Code of Conduct, Executive Order 1980-18, 4 Pa. Code §7.151 et seq., or to breach any other state or federal law or regulation.
4. Contractor, its affiliates, agents and employees shall not offer, give, or agree or promise to give any gratuity to a Commonwealth official or employee or to any other person at the direction or request of any Commonwealth official or employee.
5. Contractor, its affiliates, agents and employees shall not offer, give, or agree or promise to give any gratuity to a Commonwealth official or employee or to any other person, the acceptance of which would violate the Governor's Code of Conduct, Executive Order 1980-18, 4 Pa. Code §7.151 et seq. or any statute, regulation, statement of policy, management directive or any other published standard of the Commonwealth.
6. Contractor, its affiliates, agents and employees shall not, directly or indirectly, offer, confer, or agree to confer any pecuniary benefit on anyone as consideration for the decision, opinion, recommendation, vote, other exercise of discretion, or violation of a known legal duty by any Commonwealth official or employee.
7. Contractor, its affiliates, agents, employees, or anyone in privity with him or her shall not accept or agree to accept from any person, any gratuity in connection with the performance of work under the contract, except as provided in the contract.
8. Contractor shall not have a financial interest in any other contractor, subcontractor, or supplier providing services, labor, or material on this project, unless the financial interest is disclosed to the Commonwealth in writing and the Commonwealth consents to Contractor's financial interest prior to Commonwealth execution of the contract. Contractor shall disclose the financial interest to the Commonwealth at the time of bid or proposal submission, or if no bids or proposals are solicited, no later than Contractor's submission of the contract signed by Contractor.

9. Contractor, its affiliates, agents and employees shall not disclose to others any information, documents, reports, data, or records provided to, or prepared by, Contractor under this contract without the prior written approval of the Commonwealth, except as required by the Pennsylvania Right-to-Know Law, 65 P.S. §§ 67.101-3104, or other applicable law or as otherwise provided in this contract. Any information, documents, reports, data, or records secured by Contractor from the Commonwealth or a third party in connection with the performance of this contract shall be kept confidential unless disclosure of such information is:
 - a. Approved in writing by the Commonwealth prior to its disclosure; or
 - b. Directed by a court or other tribunal of competent jurisdiction unless the contract requires prior Commonwealth approval; or
 - c. Required for compliance with federal or state securities laws or the requirements of national securities exchanges; or
 - d. Necessary for purposes of Contractor's internal assessment and review; or
 - e. Deemed necessary by Contractor in any action to enforce the provisions of this contract or to defend or prosecute claims by or against parties other than the Commonwealth; or
 - f. Permitted by the valid authorization of a third party to whom the information, documents, reports, data, or records pertain; or
 - g. Otherwise required by law.
10. Contractor certifies that neither it nor any of its officers, directors, associates, partners, limited partners or individual owners has been officially notified of, charged with, or convicted of any of the following and agrees to immediately notify the Commonwealth agency contracting officer in writing if and when it or any officer, director, associate, partner, limited partner or individual owner has been officially notified of, charged with, convicted of, or officially notified of a governmental determination of any of the following:
 - a. Commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements or receiving stolen property.
 - b. Commission of fraud or a criminal offense or other improper conduct or knowledge of, approval of or acquiescence in such activities by Contractor or any affiliate, officer, director, associate, partner, limited partner, individual owner, or employee or other individual or entity associated with:
 1. obtaining;
 2. attempting to obtain; or
 3. performing a public contract or subcontract

Contractor's acceptance of the benefits derived from the conduct shall be deemed evidence of such knowledge, approval or acquiescence.

 - c. Violation of federal or state antitrust statutes.

- d. Violation of any federal or state law regulating campaign contributions.
- e. Violation of any federal or state environmental law.
- f. Violation of any federal or state law regulating hours of labor, minimum wage standards or prevailing wage standards; discrimination in wages; or child labor violations.
- g. Violation of the Act of June 2, 1915 (P.L.736, No. 338), known as the Workers' Compensation Act, 77 P.S. 1 et seq.
- h. Violation of any federal or state law prohibiting discrimination in employment.
- i. Debarment by any agency or department of the federal government or by any other state.
- j. Any other crime involving moral turpitude or business honesty or integrity.

Contractor acknowledges that the Commonwealth may, in its sole discretion, terminate the contract for cause upon such notification or when the Commonwealth otherwise learns that Contractor has been officially notified, charged, or convicted.

11. If this contract was awarded to Contractor on a non-bid basis, Contractor must, (as required by Section 1641 of the Pennsylvania Election Code) file a report of political contributions with the Secretary of the Commonwealth on or before February 15 of the next calendar year. The report must include an itemized list of all political contributions known to Contractor by virtue of the knowledge possessed by every officer, director, associate, partner, limited partner, or individual owner that has been made by:
- a. Any officer, director, associate, partner, limited partner, individual owner or members of the immediate family when the contributions exceed an aggregate of one thousand dollars (\$1,000) by any individual during the preceding year; or
 - b. Any employee or members of his immediate family whose political contribution exceeded one thousand dollars (\$1,000) during the preceding year.

To obtain a copy of the reporting form, Contractor shall contact the Bureau of Commissions, Elections and Legislation, Division of Campaign Finance and Lobbying Disclosure, Room 210, North Office Building, Harrisburg, PA 17120.

12. Contractor shall comply with requirements of the Lobbying Disclosure Act, 65 Pa.C.S. § 13A01 et seq., and the regulations promulgated pursuant to that law. Contractor employee activities prior to or outside of formal Commonwealth procurement communication protocol are considered lobbying and subjects the Contractor employees to the registration and reporting requirements of the law. Actions by outside lobbyists on Contractor's behalf, no matter the procurement stage, are not exempt and must be reported.
13. When Contractor has reason to believe that any breach of ethical standards as set forth in law, the Governor's Code of Conduct, or in these provisions has occurred or may occur, including but not limited to contact by a Commonwealth officer or employee which, if acted upon, would violate such ethical standards, Contractor shall immediately notify the Commonwealth contracting officer or Commonwealth Inspector General in writing.

14. Contractor, by submission of its bid or proposal and/or execution of this contract and by the submission of any bills, invoices or requests for payment pursuant to the contract, certifies and represents that it has not violated any of these contractor integrity provisions in connection with the submission of the bid or proposal, during any contract negotiations or during the term of the contract.
15. Contractor shall cooperate with the Office of Inspector General in its investigation of any alleged Commonwealth employee breach of ethical standards and any alleged Contractor non-compliance with these provisions. Contractor agrees to make identified Contractor employees available for interviews at reasonable times and places. Contractor, upon the inquiry or request of the Office of Inspector General, shall provide, or if appropriate, make promptly available for inspection or copying, any information of any type or form deemed relevant by the Inspector General to Contractor's integrity and compliance with these provisions. Such information may include, but shall not be limited to, Contractor's business or financial records, documents or files of any type or form that refers to or concern this contract.
16. For violation of any of these Contractor Integrity Provisions, the Commonwealth may terminate this and any other contract with Contractor, claim liquidated damages in an amount equal to the value of anything received in breach of these provisions, claim damages for all additional costs and expenses incurred in obtaining another contractor to complete performance under this contract, and debar and suspend Contractor from doing business with the Commonwealth. These rights and remedies are cumulative, and the use or non-use of any one shall not preclude the use of all or any other. These rights and remedies are in addition to those the Commonwealth may have under law, statute, regulation, or otherwise.
17. For purposes of these Contractor Integrity Provisions, the following terms shall have the meanings found in this Paragraph 17.
 - a. "Confidential information" means information that a) is not already in the public domain; b) is not available to the public upon request; c) is not or does not become generally known to Contractor from a third party without an obligation to maintain its confidentiality; d) has not become generally known to the public through a act or omission of Contractor; or e) has not been independently developed by Contractor without the use of confidential information of the Commonwealth.
 - b. "Consent" means written permission signed by a duly authorized officer or employee of the Commonwealth, provided that where the material facts have been disclosed, in writing, by pre-qualification, bid, proposal, or contractual terms, the Commonwealth shall be deemed to have consented by virtue of execution of this contract.
 - c. "Contractor" means the individual or entity that has entered into this contract with the Commonwealth, including those directors, officers, partners, managers, and owners having more than a five percent interest in Contractor.
 - d. "Financial interest" means:
 1. Ownership of more than a five percent interest in any business; or
 2. Holding a position as an officer, director, trustee, partner, employee, or holding any position of management.
 - e. "Gratuity" means tendering, giving or providing anything of more than nominal monetary value including, but not limited to, cash, travel, entertainment, gifts, meals, lodging, loans, subscriptions, advances, deposits of money, services, employment, or contracts of any kind. The exceptions set forth in the Governor's Code of Conduct, Executive Order 1980-18, the 4 Pa.

Code §7.153(b), shall apply.

- f. "Immediate family" means a spouse and any unemancipated child.
- g. "Non-bid basis" means a contract awarded or executed by the Commonwealth with Contractor without seeking bids or proposals from any other potential bidder or offeror.
- h. "Political contribution" means any payment, gift, subscription, assessment, contract, payment for services, dues, loan, forbearance, advance or deposit of money or any valuable thing, to a candidate for public office or to a political committee, including but not limited to a political action committee, made for the purpose of influencing any election in the Commonwealth of Pennsylvania or for paying debts incurred by or for a candidate or committee before or after any election.

OFFSET PROVISION

The Contractor agrees that the Commonwealth may set off the amount of any state tax liability or other obligation of the Contractor or its subsidiaries to the Commonwealth against any payments due the Contractor under any contract with the Commonwealth.

CONTRACTOR RESPONSIBILITY PROVISIONS

For the purpose of these provisions, the term Contractor is defined as any person, including, but not limited to, a bidder, offeror, loan recipient, grantee, or subgrantee, who has furnished or seeks to furnish goods, supplies, services, or leased space, or who has performed or seeks to perform construction activity under contract, subcontract, grant, or subgrant with the Commonwealth, or with a person under contract, subcontract, grant, or subgrant with the Commonwealth or its state-affiliated entities, and state-related institutions. The term Contractor may include a permittee, licensee, or any agency, political subdivision, instrumentality, public authority, or other entity of the Commonwealth.

- a. The Contractor must certify, in writing, for itself and all its subcontractors, as of the date of its execution of any Commonwealth contract, that neither the Contractor, nor any subcontractors, nor any suppliers are under suspension or debarment by the Commonwealth or any governmental entity, instrumentality, or authority and, if the Contractor cannot so certify, then it agrees to submit, along with the bid/proposal, a written explanation of why such certification cannot be made.
- b. The Contractor must also certify, in writing, that as of the date of its execution, of any Commonwealth contract it has no tax liabilities or other Commonwealth obligations.
- c. The Contractor's obligations pursuant to these provisions are ongoing from and after the effective date of the contract through the termination date thereof. Accordingly, the Contractor shall have an obligation to inform the contracting agency if, at any time during the term of the contract, it becomes delinquent in the payment of taxes, or other Commonwealth obligations, or if it or any of its subcontractors are suspended or debarred by the Commonwealth, the federal government, or any other state or governmental entity. Such notification shall be made within 15 days of the date of suspension or debarment.
- d. The failure of the Contractor to notify the contracting agency of its suspension or debarment by the Commonwealth, any other state, or the federal government shall constitute an event of default of the contract with the Commonwealth.
- e. The Contractor agrees to reimburse the Commonwealth for the reasonable costs of investigation

incurred by the Office of Inspector General for investigations of the Contractor's compliance with the terms of this or any other agreement between the Contractor and the Commonwealth, which results in the suspension or debarment of the Contractor. Such costs shall include, but shall not be limited to, salaries of investigators, including overtime; travel and lodging expenses; and expert witness and documentary fees. The Contractor shall not be responsible for investigative costs for investigations which do not result in the Contractor's suspension or debarment.

- f. The Contractor may obtain the current list of suspended and debarred Commonwealth contractors by either searching the internet at <http://www.dgs.state.pa.us/> or contacting the:

Department of General Services
Office of Chief Counsel
603 North Office Building
Harrisburg, PA 17125
Telephone Number: (717) 783-6472
FAX Number: (717) 787-9138

THE AMERICANS WITH DISABILITIES ACT

- a. Pursuant to federal regulations promulgated under the authority of The Americans With Disabilities Act, 28 C.F.R. § 35.101 et seq., the Contractor understands and agrees that no individual with a disability shall, on the basis of the disability, be excluded from participation in this Contract or from activities provided for under this Contract. As a condition of accepting and executing this contract, the Contractor agrees to comply with the "General Prohibitions Against Discrimination", 28 C.F.R. § 35.130, and all other regulations promulgated under Title II of The Americans With Disabilities Act which are applicable to the benefits, services, programs, and activities provided by the Commonwealth of Pennsylvania through contracts with outside contractors.
- b. The Contractor shall be responsible for and agrees to indemnify and hold harmless the Commonwealth of Pennsylvania from all losses, damages, expenses, claims, demands, suits, and actions brought by any party against the Commonwealth of Pennsylvania as a result of the Contractor's failure to comply with the provisions of subparagraph a above.

RIGHT TO KNOW LAW

I. If this contract is a grant agreement:

- a. Grantee or Subgrantee understands that this Grant Agreement and records related to or arising out of the Grant Agreement are subject to requests made pursuant to the Pennsylvania Right-to-Know Law, 65 P.S. §§ 67.101-3104 ("RTKL"). For the purpose of these provisions, the term "the Commonwealth" shall refer to the granting Commonwealth Agency.
- b. If the Commonwealth needs the Grantee's or Subgrantee's assistance in any matter arising out of the RTKL related to this Grant Agreement, it shall notify the Grantee or Subgrantee using the legal contact information provided in the Grant Agreement. The Grantee or Subgrantee, at any time, may designate a different contact for such purpose upon reasonable prior written notice to the Commonwealth.
- c. Upon written notification from the Commonwealth that it requires Grantee's or Subgrantee's assistance in responding to a request under the RTKL for information related to this Grant Agreement that may be in Grantee's or Subgrantee's possession, constituting, or alleged to constitute, a public record in accordance with the RTKL ("Requested Information"), Grantee or Subgrantee shall:

- 1) Provide the Commonwealth, within ten (10) calendar days after receipt of written notification, access to, and copies of, any document or information in Grantee's or Subgrantee's possession arising out of this Grant Agreement that the Commonwealth reasonably believes is Requested Information and may be a public record under the RTKL; and
 - 2) Provide such other assistance as the Commonwealth may reasonably request, in order to comply with the RTKL with respect to this Grant Agreement.
- d. If the Grantee or Subgrantee considers the Requested Information to include a request for a Trade Secret or Confidential Proprietary Information, as those terms are defined by the RTKL, or other information that Grantee or Subgrantee considers exempt from production under the RTKL, Grantee or Subgrantee must notify the Commonwealth and provide, within seven (7) calendar days of receiving the written notification, a written statement signed by the representative of Grantee or Subgrantee explaining why the requested material is exempt from public disclosure under the RTKL.
 - e. The Commonwealth will rely upon the written statement from Grantee or Subgrantee in denying a RTKL request for the Requested Information unless the Commonwealth determines that the Requested Information is clearly not protected from disclosure under the RTKL. Should the Commonwealth determine that the Requested Information is clearly not exempt from disclosure, Grantee or Subgrantee shall provide the Requested Information within five (5) business days of receipt of written notification of the Commonwealth's determination.
 - f. If Grantee or Subgrantee fails to provide the Requested Information within the time period required by these provisions, Grantee or Subgrantee shall indemnify and hold the Commonwealth harmless for any damages, penalties, costs, detriment or harm that the Commonwealth may incur as a result of Grantee's or Subgrantee's failure, including any statutory damages assessed against the Commonwealth.
 - g. The Commonwealth will reimburse Grantee or Subgrantee for any costs associated with complying with these provisions only to the extent allowed under the fee schedule established by the Office of Open Records or as otherwise provided by the RTKL if the fee schedule is inapplicable.
 - h. Grantee or Subgrantee may file a legal challenge to any Commonwealth decision to release a record to the public with the Office of Open Records, or in the Pennsylvania Courts, however, Grantee or Subgrantee shall indemnify the Commonwealth for any legal expenses incurred by the Commonwealth as a result of such a challenge and shall hold the Commonwealth harmless for any damages, penalties, costs, detriment or harm that the Commonwealth may incur as a result of Grantee's or Subgrantee's failure, including any statutory damages assessed against the Commonwealth, regardless of the outcome of such legal challenge. As between the parties, Grantee or Subgrantee agrees to waive all rights or remedies that may be available to it as a result of the Commonwealth's disclosure of Requested Information pursuant to the RTKL.
 - i. The Grantee's or Subgrantee's duties relating to the RTKL are continuing duties that survive the expiration of this Grant Agreement and shall continue as long as the Grantee or Subgrantee has Requested Information in its possession.

II. If this contract is a lease agreement:

- a. The Pennsylvania Right-to-Know Law, 65 P.S. §§ 67.101-3104 ("RTKL") applies to this Lease. For the purpose of these provisions, the term "Commonwealth" shall refer to the Department of General Services or the tenant Commonwealth agency.

- b. If the Commonwealth needs the Lessor's assistance in any matter arising out of the RTKL related to this Lease, it shall notify the Lessor using the legal contact information provided in this Lease. The Lessor, at any time, may designate a different contact for such purpose upon reasonable prior written notice to the Commonwealth.
- c. Upon written notification from the Commonwealth that it requires the Lessor's assistance in responding to a request under the RTKL for information related to this Lease that may be in the Lessor's possession, constituting, or alleged to constitute, a public record in accordance with the RTKL ("Requested Information") the Lessor shall:
 - 1) Provide the Commonwealth, within ten (10) calendar days after receipt of written notification, access to, and copies of, any document or information in the Lessor's possession arising out of this Lease that the Commonwealth reasonably believes is Requested Information and may be a public record under the RTKL; and
 - 2) Provide such other assistance as the Commonwealth may reasonably request, in order to comply with the RTKL with respect to this Lease.
- d. If the Lessor considers the Requested Information to include a request for a Trade Secret or Confidential Proprietary Information, as those terms are defined by the RTKL, or other information that the Lessor considers exempt from production under the RTKL, the Lessor must notify the Commonwealth and provide, within seven (7) calendar days of receiving the written notification, a written statement signed by a representative of the Lessor explaining why the requested material is exempt from public disclosure under the RTKL.
- e. The Commonwealth will rely upon the written statement from the Lessor in denying a RTKL request for the Requested Information unless the Commonwealth determines that the Requested Information is clearly not protected from disclosure under the RTKL. Should the Commonwealth determine that the Requested Information is clearly not exempt from disclosure, the Lessor shall provide the Requested Information within five (5) business days of receipt of written notification of the Commonwealth's determination.
- f. If the Lessor fails to provide the Requested Information within the time period required by these provisions, the Lessor shall indemnify and hold the Commonwealth harmless for any damages, penalties, costs, detriment or harm that the Commonwealth may incur as a result of the Lessor's failure, including any statutory damages assessed against the Commonwealth.
- g. The Commonwealth will reimburse the Lessor for any costs associated with complying with these provisions only to the extent allowed under that fee schedule established by the Office of Open Records or as otherwise provided by the RTKL if the fee schedule is inapplicable.
- h. The Lessor may file a legal challenge to any Commonwealth decision to release a record to the public with the Office of Open Records, or in the Pennsylvania Courts; however, the Lessor shall indemnify the Commonwealth for any legal expenses incurred by the Commonwealth as a result of such a challenge and shall hold the Commonwealth harmless for any damages, penalties, costs, detriment or harm that the Commonwealth may incur as a result of the Lessor's failure, including any statutory damages assessed against the Commonwealth, regardless of the outcome of such legal challenge. As between the parties, the Lessor agrees to waive all rights or remedies that may be available to it as a result of the Commonwealth's disclosure of Requested Information pursuant to the RTKL.
- i. Lessor's duties relating to the RTKL are continuing duties that survive the expiration of this Lease and shall continue as long as the Lessor has Requested Information in its possession.

III If this contract is other than a grant or lease agreement:

- a. The Pennsylvania Right-to-Know Law, 65 P.S. §§ 67.101-3104 ("RTKL") applies to this Contract. For the purpose of these provisions, the term "Commonwealth" shall refer to the contracting Commonwealth agency.
- b. If the Commonwealth needs the Contractor's assistance in any matter arising out of the RTKL related to this Contract, it shall notify the Contractor using the legal contact information provided in this Contract. The Contractor, at any time, may designate a different contact for such purpose upon reasonable prior written notice to the Commonwealth.
- c. Upon written notification from the Commonwealth that it requires the Contractor's assistance in responding to a request under the RTKL for information related to this Contract that may be in the Contractor's possession, constituting, or alleged to constitute, a public record in accordance with the RTKL ("Requested Information") the Contractor shall:
 - 1) Provide the Commonwealth, within ten (10) calendar days after receipt of written notification, access to, and copies of, any document or information in the Contractor's possession arising out of this Contract that the Commonwealth reasonably believes is Requested Information and may be a public record under the RTKL; and
 - 2) Provide such other assistance as the Commonwealth may reasonably request, in order to comply with the RTKL with respect to this Contract.
- d. If the Contractor considers the Requested Information to include a request for a Trade Secret or Confidential Proprietary Information, as those terms are defined by the RTKL, or other information that the Contractor considers exempt from production under the RTKL, the Contractor must notify the Commonwealth and provide, within seven (7) calendar days of receiving the written notification, a written statement signed by a representative of the Contractor explaining why the requested material is exempt from public disclosure under the RTKL.
- e. The Commonwealth will rely upon the written statement from the Contractor in denying a RTKL request for the Requested Information unless the Commonwealth determines that the Requested Information is clearly not protected from disclosure under the RTKL. Should the Commonwealth determine that the Requested information is clearly not exempt from disclosure, the Contractor shall provide the Requested Information within five (5) business days of receipt of written notification of the Commonwealth determination.
- f. If the Contractor fails to provide the Requested Information within the time period required by these provisions, the Contractor shall indemnify and hold the Commonwealth harmless for any damages, penalties, costs, detriment or harm that the Commonwealth may incur as a result of the Contractor's failure, including any statutory damages assessed against the Commonwealth.
- g. The Commonwealth will reimburse the Contractor for any costs associated with complying with these provisions only to the extent allowed under the fee schedule established by the Office of Open Records or as otherwise provided by the RTKL if the fee schedule is inapplicable.
- h. The Contractor may file a legal challenge to any Commonwealth decision to release a record to the public with the Office of Open Records, or in the Pennsylvania Courts, however, the Contractor shall indemnify the Commonwealth for any legal expenses incurred by the Commonwealth as a result of such a challenge and shall hold the Commonwealth harmless for any damages, penalties, costs,

detriment or harm that the Commonwealth may incur as a result of the Contractor's failure, including any statutory damages assessed against the Commonwealth, regardless of the outcome of such legal challenge. As between the parties, the Contractor agrees to waive all rights or remedies that may be available to it as a result of the Commonwealth's disclosure of the Requested Information pursuant to the RTKL.

- i. The Contractor's duties relating to the RTKL are continuing duties that survive the expiration of this Contract and shall continue as long as the Contractor has Requested Information in its possession.

PENNSYLVANIA ELECTRONIC PAYMENT PROGRAM (PEPP):

I. For Procurement Contracts

- a. The Commonwealth will make contract payments through the Automated Clearing House (ACH) Network. Within 10 days of award of the contract or purchase order, the Contractor must submit or must have already submitted its ACH information within its user profile in the Commonwealth's procurement system (SRM).
- b. Contractor must submit a unique invoice number with each invoice submitted. The unique invoice number will be listed on the Commonwealth of Pennsylvania's ACH remittance advice to enable the Contractor to properly apply the Department's payment to the invoice submitted.
- c. It is the responsibility of the Contractor to ensure that the ACH information contained in SRM is accurate and complete. Failure to maintain accurate and complete information may result in delays in payments.
- d. Contractor may enroll for PEPP at: <http://www.vendorregistration.state.pa.us/cvmu/paper/Forms/ACH-EFTenrollmentform.pdf>

II. For Grant Contracts:

- a. The Commonwealth will make payments to the Grantee through the Automated Clearing House (ACH) Network. Within 10 days of the grant award, the Grantee must submit or must have already submitted its ACH information to the Commonwealth's Payable Service Center, Vendor Data Management Unit at 717-214-0140 (FAX) or by mail to the Office of Comptroller Operations, Bureau of Payable Services, Payable Service Center, Vendor Data Management Unit, 555 Walnut Street - 9th Floor, Harrisburg, PA 17101
- b. The Grantee must submit a unique invoice number with each invoice submitted. The unique invoice number will be listed on the Commonwealth of Pennsylvania's ACH remittance advice to enable the Grantee to properly apply the Department's payment to the respective invoice or program.
- c. It is the responsibility of the Grantee to ensure that the ACH information contained in the Commonwealth's central vendor master file is accurate and complete. Failure to maintain accurate and complete information may result in delays in payments.
- d. Grantee may enroll for PEPP at: <http://www.vendorregistration.state.pa.us/cvmu/paper/Forms/ACH-EFTenrollmentform.pdf>

NONDISCRIMINATION/SEXUAL HARASSMENT CLAUSE [Contracts]

The Contractor agrees:

1. In the hiring of any employee(s) for the manufacture of supplies, performance of work, or any other activity required under the contract or any subcontract, the Contractor, each subcontractor, or any person acting on behalf of the Contractor or subcontractor shall not, by reason of gender, race, creed, or color, discriminate against any citizen of this commonwealth who is qualified and available to perform the work to which the employment relates.
2. Neither the Contractor nor any subcontractor nor any person on their behalf shall in any manner discriminate against or intimidate any employee involved in the manufacture of supplies, the performance of work, or any other activity required under the contract on account of gender, race, creed, or color.
3. The Contractor and each subcontractor shall establish and maintain a written sexual harassment policy and shall inform their employees of the policy. The policy must contain a notice that sexual harassment will not be tolerated and employees who practice it will be disciplined.
4. The Contractor and each subcontractor shall not discriminate by reason of gender, race, creed, or color against any subcontractor or supplier who is qualified to perform the work to which the contract relates.
5. The Contractor and each subcontractor shall, within the time periods requested by the commonwealth, furnish all necessary employment documents and records and permit access to their books, records, and accounts by the contracting agency and the Bureau of Minority and Women Business Opportunities (BMWBO), for purpose of ascertaining compliance with provisions of this Nondiscrimination/Sexual Harassment Clause. Within fifteen (15) days after award of any contract, the Contractor shall be required to complete, sign and submit Form STD-21, the "Initial Contract Compliance Data" form. If the contract is a construction contract, then the Contractor shall be required to complete, sign and submit Form STD-28, the "Monthly Contract Compliance Report for Construction Contractors", each month no later than the 15th of the month following the reporting period beginning with the initial job conference and continuing through the completion of the project. Those contractors who have fewer than five employees or whose employees are all from the same family or who have completed the Form STD-21 within the past 12 months may, within the 15 days, request an exemption from the Form STD-21 submission requirement from the contracting agency.
6. The Contractor shall include the provisions of this Nondiscrimination/Sexual Harassment Clause in every subcontract so that those provisions applicable to subcontractors will be binding upon each subcontractor.
7. The commonwealth may cancel or terminate the contract and all money due or to become due under the contract may be forfeited for a violation of the terms and conditions of this Nondiscrimination/Sexual Harassment Clause. In addition, the agency may proceed with debarment or suspension and may place the Contractor in the Contractor Responsibility File.

NONDISCRIMINATION/SEXUAL HARASSMENT CLAUSE [Grants]

The Grantee agrees:

1. In the hiring of any employee(s) for the manufacture of supplies, performance of work, or any other activity required under the grant agreement or any subgrant agreement, contract, or subcontract, the Grantee, a subgrantee, a contractor, a subcontractor, or any person acting on behalf of the Grantee shall not, by reason of gender, race, creed, or color, discriminate against any citizen of this commonwealth who is qualified and available to perform the work to which the employment relates.
2. The Grantee, any subgrantee, contractor or any subcontractor or any person on their behalf shall not in any manner discriminate against or intimidate any of its employees on account of gender, race, creed, or color.
3. The Grantee, any subgrantee, contractor or any subcontractor shall establish and maintain a written sexual harassment policy and shall inform their employees of the policy. The policy must contain a notice that sexual harassment will not be tolerated and employees who practice it will be disciplined.
4. The Grantee, any subgrantee, contractor or any subcontractor shall not discriminate by reason of gender, race, creed, or color against any subgrantee, contractor, subcontractor or supplier who is qualified to perform the work to which the grant relates.
5. The Grantee, any subgrantee, any contractor or any subcontractor shall, within the time periods requested by the commonwealth, furnish all necessary employment documents and records and permit access to their books, records, and accounts by the granting agency and the Bureau of Minority and Women Business Opportunities (BMWBO), for purpose of ascertaining compliance with provisions of this Nondiscrimination/Sexual Harassment Clause. Within 15 days after award of any grant, the Grantee shall be required to complete, sign and submit Form STD-21, the "Initial Contract Compliance Data" form. Grantees who have fewer than five employees or whose employees are all from the same family or who have completed the STD-21 form within the past 12 months may, within the 15 days, request an exemption from the STD-21 form from the granting agency.
6. The Grantee, any subgrantee, contractor or any subcontractor shall include the provisions of this Nondiscrimination/Sexual Harassment Clause in every subgrant agreement, contract or subcontract so that those provisions applicable to subgrantees, contractors or subcontractors will be binding upon each subgrantee, contractor or subcontractor.
7. The commonwealth may cancel or terminate the grant agreement and all money due or to become due under the grant agreement may be forfeited for a violation of the terms and conditions of this Nondiscrimination/Sexual Harassment Clause. In addition, the granting agency may proceed with debarment or suspension and may place the Grantee, subgrantee, contractor, or subcontractor in the Contractor Responsibility File.

**DEPARTMENT OF ENVIRONMENTAL PROTECTION
GENERAL CONDITIONS**

Legality - All work under this Agreement shall be performed in accordance with

1. applicable statutes, rules, and regulations of the Federal, State, and local governments.
2. Subcontracts - No contract or agreement may be entered into by the Contractor for execution of the project activities or provision of services to the project (other than purchases of supplies, or standard commercial or maintenance services) which is not incorporated in the approved Project Scope of Work or approved in advance by the Department. Any such arrangements shall provide that the Contractor will retain ultimate control and responsibility for the project, and that the subcontractor shall be bound by these conditions and any other requirements applicable to the Contractor in the conduct of the project.
3. Changes - The parties to the Agreement hereby agree to execute minor adjustments to this Agreement via a letter of mutual consent. Any significant adjustments to this Agreement shall, however, require a formally executed amendment. Significant adjustments shall include:
 - A. Changes to the scope of work involving the addition of specific work tasks.
 - B. Changes in payment terms. However, reallocation of contract budget category dollar amounts to and from other budget categories shall be considered minor adjustments, as long as the maximum contract dollar amount payable by Department to Contractor is not exceeded.
 - C. Increase in the maximum grant dollar amount to be paid by the Department to the Contractor.
4. Suspension - When the terms and conditions of this Agreement are not materially being met, the Department may, upon written notice to the Contractor, suspend the Agreement until corrective action has been taken to the satisfaction of the Department, or until the Agreement is terminated.
5. Assignment - Contractor and the Commonwealth recognize that in actual economic practice, overcharges by Contractor's suppliers resulting from violations of State or Federal antitrust laws are, in fact, borne by the Commonwealth. As part of the consideration for the award of this Agreement, and intending to be legally bound hereby, Contractor assigns to the Commonwealth all right, title, and interest in and to any claims Contractor now has or may hereafter acquire under State or Federal antitrust laws relating to the goods or services which are the subject of this Agreement.

6. Termination - The Department may terminate the Agreement in whole, or in part, at any time before the Project completion date:
 - A. Whenever it is determined that the terms and conditions of the Agreement have not been met. Prompt notification in writing of the termination, with effective date, will be made by the Department. Payments or recoveries by the Department shall be in accordance with the legal rights and obligations of the parties.
 - B. In the event that anticipated State and/or Federal funds are not obtained or continued at a sufficient level.
 - C. At the discretion of the Department upon written notification to the Contractor with effective termination date. Payments or recoveries by the Department shall be in accordance with the legal rights and obligations of the parties.
7. Extension of Time - Extensions of the Agreement period of performance for additional periods beyond its established Project completion date are minor adjustments which may be accomplished by a letter of mutual consent, subject to the approval of the Department Comptroller.
8. Conflict of Interest -
 - A. Interest of members of the Commonwealth and others - No officer, member, or employee of the Commonwealth, and no member of its General Assembly who exercises any function or responsibilities under this Agreement, shall participate in any decision relating to this Agreement which affects his personal interest or the interest of any corporation, partnership, or association in which he is directly or indirectly interested; nor shall any such officer, member, or employee of the Commonwealth, and no member of its governing body, have any interest, direct or indirect, in this Agreement or the proceeds thereof.
 - B. Interest of Contractor - The Contractor covenants that it presently has no interest and shall not acquire any interest, direct or indirect, which would conflict in any manner or degree with the performance of its work hereunder. The Contractor further covenants that in the performance of this Agreement, it shall not knowingly employ any person having such interest. Contractor further certifies that no member of the board of directors of the Contractor or any of its officers have such adverse interest.
9. Hold Harmless - Contractor shall be responsible for and agrees to indemnify and hold harmless the Commonwealth from and against damages to property or injuries (including death) to any persons and other losses, damages, expenses, claims, demands, suits, and actions by any party against the Commonwealth in connection with the work performed by Contractor.

10. Interest Payments - For purposes of the interest payments required under Act 266 of 1982, if additional work is directed by the Department which is not included herein, and no Agreement amendment has been executed by the parties for said work, or if the term of this Agreement has expired, payment will not be due hereunder until after the Agreement amendment for additional work or time extension has been fully executed by all of the parties.
11. Disputes - All questions or disputes arising between the parties hereto respecting any matter pertaining to this Agreement, or any part thereof, or any breach of said Agreement arising thereunder, shall be referred to the Board of Claims of the Commonwealth of Pennsylvania (as set forth in the Act of May 20, 1937 (P.L. 728, No.193), as amended, 72 P.S. §4651-1 et seq.), or otherwise resolved in accordance with applicable law.
12. Fiscal Records - Contractor agrees to maintain books, records, documents, correspondence, and other evidence pertaining to the costs and expenses of this Agreement (hereinafter collectively referred to as "the records"), to the extent and in such detail as will properly reflect all costs, direct and indirect, of labor, materials, equipment, supplies, and services, and other costs and expenses of whatever nature for which funding has been provided under the provisions of this Agreement, and in accordance with generally accepted accounting principles and the Department's fiscal regulations and guidelines. .
13. Retention of Records - The records shall be retained and be made available for audit for a period of three (3) years after final payment is made and the Agreement has expired, and all other pending matters are resolved.
14. Right to Audit - The Department and the Office of Auditor General, or any of their duly authorized representatives, shall have access to the records of the Contractor for the purpose of making an audit of financial transactions, compliance with Agreement terms, and an evaluation of Agreement performance. It is further understood that the Department is authorized to make examination, excerpts, copies, and transcriptions of such records during the course of an audit.
15. Copyright and Patent Indemnity - The Contractor shall indemnify and hold the Commonwealth harmless from and against any damages or suit or proceeding brought against the Commonwealth on account of any alleged infringement of any copyright or patent arising out of the performance of this Agreement, including all work, services, materials, reports, supplies, and computer programs provided by the Contractor.
16. Copyright and Publication Rights - All publication rights and copyrights, in the documentation produced by the Contractor in connection with the work provided for under this Agreement, shall rest with the Commonwealth. The Contractor shall not publish any of the results of the work without the written permission of the Department.

17. Sensitive Information - The Contractor shall not publish or otherwise disclose, except to the Commonwealth and except matters of public record, any information or data obtained hereunder from private individuals, organizations, or public agencies, in a publication whereby the information or data furnished by or about any particular person or establishment can be identified, except with the consent of such person or establishment.

18. Indirect Costs - Where indirect costs are part of the amount charged the Department, the method of determining those costs must be identified with sufficient documentation to support its use. Regardless of the method used to calculate indirect costs, the amount charged must not exceed actual costs incurred.

Attachment D – Pennsylvania Prevailing Wage Act

The contract with the Contractor is subject to the provisions, duties, obligations, remedies, and penalties of the Pennsylvania Prevailing Wage Act, 43 P.S. 165-1 et seq., which is incorporated herein by reference as if fully set forth herein. The general prevailing minimum wage rates, as determined by the Secretary of Labor and Industry, shall be paid for each craft or classification of all workers needed to perform this Contract during the term hereof for the locality in which the work is to be performed.

**GENERAL
REQUIREMENTS**

SECTION 011000

SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Project information.
- 2. Work covered by Contract Documents.
- 3. Access to site.
- 4. Work restrictions.
- 5. Specification and drawing conventions.

- B. Related Requirements:

- 1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
- 2. Section 000100 "Scope of Work" for Site Access Information

1.3 PROJECT INFORMATION

- A. **Project Identification:** SRTE – South Street to Christian Street, Phase 2 Improvements

- 1. **Project Location:** Schuylkill Banks, Philadelphia, PA

- B. **Owner:** Schuylkill River Development Company (SRDC), 2401 Walnut Street, Suite 603, Philadelphia, PA, 19103

- 1. **Owner's Representative:** Joseph R. Synchron, PE, PLS, President & CEO

- C. **Design Engineer:** Urban Engineers, Inc., 530 Walnut Street, 7th Floor, Philadelphia, PA 19106; John Federico, PE, AICP, Project Manager, 215-922-8081 x1358

- D. **Design Engineer's Consultants:** The Design Engineer has retained the following design professionals who have prepared designated portions of the Contract Documents:

SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS

SRDC PROJECT NO. SBSC-002

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SUMMARY

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1. **Landscape Architect:** Ground Reconsidered*, 230 S. Broad Street, Suite 604, Philadelphia, PA, 19102; Julie A. Bush, ASLA

** Formerly known as LRSLA Studio, Inc.*

2. **Electrical Engineer:** Arora Engineers, Inc., 61 Wilmington-West Chester Pike, Chadds Ford, PA 19317; James Burris, PE

*** Formerly known as Burris Engineers, Inc.*

3. **Geotechnical Engineer:** American Geotechnical & Environmental Services, Inc., 1000 First Avenue, Suite 403, King of Prussia, PA, 19406; Solveig Sahlin, PE

E. Construction Manager: To Be Determined

Construction Manager has been engaged for this Project to serve as an advisor to Owner and to provide assistance in administering the Contract for Construction between Owner and Contractor, according to a separate contract between Owner and Construction Manager.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Refer to Section 000100 – Scope of Work, Part 1.1 for the Work of Project

- B. Type of Contract:

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

1.5 ACCESS TO SITE

- A. General: Refer to Section 000100 – Scope of Work, Part 1.10 for information about site access.

1.6 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

- B. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

- C. Controlled Substances: Use of tobacco products and other controlled substances on project site is not permitted.

1.7 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012100

ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
 - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.
- B. Types of allowances include the following:
 - 1. Lump-sum allowances.
 - 2. Unit-cost allowances.
 - 3. Quantity allowances.
 - 4. Contingency allowances.
 - 5. Testing and inspecting allowances.
- C. Related Requirements:
 - 1. Section 012200 "Unit Prices" for procedures for using unit prices.
 - 2. Section 014000 "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.

1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Design Engineer of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At Design Engineer's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Design Engineer from the designated supplier.

1.4 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.5 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 COORDINATION

- A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.7 LUMP-SUM AND QUANTITY ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Design Engineer under allowance and shall include taxes, freight and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Design Engineer under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Design Engineer, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.8 CONTINGENCY ALLOWANCES

- A. Use the contingency allowance only as directed by Design Engineer for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
- B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.

SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS

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ALLOWANCES

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- C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.
- D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.9 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
 - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 - 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 - 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
 - 1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
 - 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Pre-Determined Price: Include the sum of **\$20,600** for Design/Build of the Irrigation System as described in Special Provision #1 for Design-Build Irrigation System. Note that a portion of this work was completed during Phase 1 of the trail construction and has already been paid.
 - 1. This allowance includes material cost, receiving, handling, and installation. There shall be no additional mark-up allowed for this item. Any additional costs to the prime contractor associated with this work should be included in the Mobilization pay item.
- B. Allowance No.2: Pre-Determined Price: Include the sum of **\$32,752** for the installation of signage as identified in Special Provision #13 for Signage Package.
 - 1. This allowance includes material cost, receiving, handling, and installation. There shall be no additional mark-up allowed for this item. Any additional costs to the prime contractor associated with this work should be included in the Mobilization pay item.

END OF SECTION 012100

SECTION 012200

UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.
- B. Related Requirements:
 - 1. Section 000100 "Scope of Work" for procedures for submitting and handling Change Orders.
 - 2. Section 014000 "Quality Requirements" for general testing and inspecting requirements.

1.3 DEFINITIONS

- A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. Unit Price: Contractor Mobilization

1. Description: Installation and mobilization of temporary office facilities and project required construction equipment according to Section 015000 "Temporary Facilities and Controls"
2. Unit of Measurement: Lump sum.

B. Unit Price: 8" Sediment Filter Log.

1. Description: Purchase of materials, labor, and equipment associated with the installation of perimeter E&S controls as described in Section 015000 "Temporary Facilities and Controls".
2. Unit of Measurement: Linear foot.

C. Unit Price: Rip-Rap Rock, Class R-6

1. Description: Purchase of materials, labor, and equipment associated with the installation of Class R-6 Rip-Rap Rock for slope stabilization.
2. Unit of Measurement: Cubic Yard of Stone.

D. Unit Price: Construction Layout

1. Description: Survey and Layout as described in Section 017300 "Execution".
2. Unit of Measurement: Lump Sum.

E. Unit Price: Manhole Lid and Rim Adjustment

1. Description: Manhole Lid and Rim Adjustment as described in Section 024116 "Structure Demolition".
2. Unit of Measurement: Each.

F. Unit Price: Selective Demolition

1. Description: Removal of metal from the top surface of the bulkheads as described in Section 024119 "Selective Demolition".
2. Unit of Measurement: Lump Sum.

G. Unit Price: Handling, Transportation, & Disposal of Residual Waste

1. Description: Removal, transportation, and disposal of Residual Waste as identified in Section 026113 "Excavation of Contaminated Materials Handling".
2. Unit of Measurement: Cubic Yard.
3. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 012100 "Allowances."

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UNIT PRICES

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- H. Unit Price: Miscellaneous Cast-In-Place Concrete (4" Thick Bench Pads)
1. Description: Purchase of materials, labor, and equipment associated with the installation of concrete as identified in Section 033053 "Miscellaneous Cast-In-Place".
 2. Unit of Measurement: Cubic Yard.
- I. Unit Price: Pipe Railings
1. Description: Purchase of materials, labor, and equipment associated with the installation of Steel Pipe Railing as identified in Section 055213 "Pipe and Tube Railings" including concrete foundations for railing posts.
 2. Unit of Measurement: Linear Feet.
- J. Unit Price: Stainless Steel Railing with Infill Panel
1. Description: Purchase of materials, labor, and equipment associated with the installation of Stainless Steel Railing with Infill Panel as identified in Section 055213 "Pipe and Tube Railings" including selective demolition, excavation, and construction of concrete foundations and all associated materials.
 2. Unit of Measurement: Linear Feet.
- K. Unit Price: Bench Fixtures and Concrete Foundations (SRDC Standard 4' Long)
1. Description: Purchase of materials, labor, and equipment associated with the installation of trail benches as identified in Section 129300 "Site Furnishings" including concrete foundations and subbase.
 2. Unit of Measurement: Each.
- L. Unit Price: Trash Receptacle Fixtures and Concrete Foundations (SRDC standard)
1. Description: Purchase of materials, labor, and equipment associated with the installation of trash receptacles as identified in Section 129300 "Site Furnishings" including concrete foundations and subbase.
 2. Unit of Measurement: Each.
- M. Unit Price: Bike Racks (High-Wheelers, Installation-only with Concrete Foundations)
1. Description: Labor and equipment associated with the installation of bike racks as identified in Section 129300 "Site Furnishings" including concrete foundations and subbase.
 2. Unit of Measurement: Each.
- N. Unit Price: Bike Rack Fixtures and Concrete Foundations (Standard Black U-Racks)
1. Description: Purchase of materials, labor, and equipment associated with the installation of bike racks as identified in Section 129300 "Site Furnishings" including concrete foundations and subbase.
 2. Unit of Measurement: Each.

- O. Unit Price: Boulder with Bronze Plaque
1. Description: Purchase of materials, labor, and equipment associated with the installation of a boulder with engraving as identified in the Civil and Landscape Drawings and as identified in Section 129300.
 2. Unit of Measurement: Each.
- P. Unit Price: Site Clearing
1. Description: The clearing, grubbing, and removal of invasive species, trees, and debris as required, according to Section 311000 "Site Clearing".
 2. Unit of Measurement: Lump Sum.
- Q. Unit Price: Earth Moving
1. Description: Excavation and rough re-grading of the site, including preparation of trail and outlook area subgrades as required, according to Section 312000 "Earth Moving".
 2. Unit of Measurement: Cubic Yards.
- R. Unit Price: Subbase for Trail, No. 2A (2" Depth)
1. Description: Purchase of materials, labor, and equipment associated with the installation of the 2-Inch subbase for an approximately 250 long section of the Shared-Use Trail, as specified in Section 321123 "Aggregate Materials".
 2. Unit of Measurement: Square Yards.
- S. Unit Price: Asphalt Paving - Base Course (4.5" Depth)
1. Description: Purchase of materials, labor, and equipment associated with the installation of the 4.5-Inch base course for an approximately 370 long section of the Shared-Use Trail, as specified in Section 321216 "Asphalt Paving".
 2. Unit of Measurement: Square Yards.
- T. Unit Price: Asphalt Paving - Wearing Course (1.5" Depth)
1. Description: Purchase of materials, labor, and equipment associated with the installation of the 1.5-Inch wearing course for an approximately 370 long section of the Shared-Use Trail, as specified in Section 321216 "Asphalt Paving".
 2. Unit of Measurement: Square Yards.
- U. Unit Price: Porous Unit Paving
1. Description: Purchase of materials, labor, and equipment associated with the installation of the Porous Paver Outlook areas as specified in Section 321443 "Porous Unit Paving".
 2. Unit of Measurement: Square Feet.

- V. Unit Price: Pavement Markings
1. Description: Purchase of materials, labor, and equipment associated with the installation of the trail striping as specified in Section 321723 "Pavement Markings".
 2. Unit of Measurement: Linear Feet.
- W. Unit Price: Chain Link Fence
1. Description: The installation of chain link fence as specified in Section 323113 "Chain Link Fence".
 2. Unit of Measurement: Linear Feet.
- X. Unit Price: Topsoil (6"), includes Fertilizer, Mulch, and Lawn Turf-Type Tall Fescue Blend (MIX D)
1. Description: Purchase of materials, labor, and equipment associated with the application of lawn area seed as specified in Section 329100 "Planting Preparation" and 329200 "Turf Grasses and Meadows".
 2. Unit of Measurement: Square Feet.
- Y. Unit Price: Ornamental Grass (#1)
1. Description: Purchase of materials, labor, and equipment associated with the application of Ornamental Grass (#1) seed as specified in Section 329200 "Turf Grasses and Meadows".
 2. Unit of Measurement: Each.
- Z. Unit Price: Seasonally Flooded Grass Seed (Mix A)
1. Description: Purchase of materials, labor, and equipment associated with the application of Seasonally Flooded Grass Seed (Mix A) as specified in Section 329200 "Turf Grasses and Meadows".
 2. Unit of Measurement: Square Feet.
- AA. Unit Price: Wildflower Meadow Seed (Mix B)
1. Description: Purchase of materials, labor, and equipment associated with the application of Wildflower Meadow Seed (Mix B) as specified in Section 329200 "Turf Grasses and Meadows".
 2. Unit of Measurement: Square Feet.
- BB. Unit Price: Woodland Meadow Seed (Mix C)
1. Description: Purchase of materials, labor, and equipment associated with the application of Woodland Meadow Seed (Mix C) as specified in Section 329200 "Turf Grasses and Meadows".
 2. Unit of Measurement: Square Feet.

- CC. Unit Price: Wetland Meadow Seed (Mix E)
1. Description: Purchase of materials, labor, and equipment associated with the application of Wetland Meadow Seed (Mix E) as specified in Section 329200 "Turf Grasses and Meadows".
 2. Unit of Measurement: Square Feet.
- DD. Unit Price: Perennial (4" Pot)
1. Description: Purchase of materials, labor, and equipment associated with the planting of Perennials as specified in Section 329200 "Turf Grasses and Meadows".
 2. Unit of Measurement: Each.
- EE. Unit Price: Perennial Plugs
1. Description: Purchase of materials, labor, and equipment associated with the planting of Perennial plugs as specified in Section 329200 "Turf Grasses and Meadows".
 2. Unit of Measurement: Each.
- FF. Unit Price: Amended Planting Soil for Trees (30" depth)
1. Description: Purchase of materials, labor, and equipment associated with amended planting soil areas for Trees as specified in Section 329200 "Turf Grasses and Meadows".
 2. Unit of Measurement: Cubic Yards.
- GG. Unit Price: Amended Planting Soil for Buffer (18" Depth)
1. Description: Purchase of materials, labor, and equipment associated with amended planting soil areas for buffer as specified in Section 329200 "Turf Grasses and Meadows".
 2. Unit of Measurement: Cubic Yards.
- HH. Unit Price: Amended Planting Soil for Ornamental Grass (12" Depth)
1. Description: Purchase of materials, labor, and equipment associated with amended planting soil areas for Ornamental Grass as specified in Section 329200 "Turf Grasses and Meadows".
 2. Unit of Measurement: Cubic Yards.
- II. Unit Price: Organic Soil Amendment for Native Grass/Meadow, 6" depth (tilled into existing soil)
1. Description: Purchase of materials, labor, and equipment associated with amended planting soil areas for organic soil amendments for native grass and meadow depth as specified in Section 329200 "Turf Grasses and Meadows".
 2. Unit of Measurement: Cubic Yards.

- JJ. Unit Price: Buffer Plantings
1. Description: Purchase of materials, labor, and equipment associated with the installation of buffer plantings as specified in Section 329300 "Plantings".
 2. Unit of Measurement: Square Feet.
- KK. Unit Price: Canopy Trees – 5"
1. Description: Purchase of materials, labor, and equipment associated with the installation of 5" Canopy Trees as specified in Section 329300 "Plantings".
 2. Unit of Measurement: Each.
- LL. Unit Price: Canopy Trees – 3-1/2"
1. Description: Purchase of materials, labor, and equipment associated with the installation of 3-1/2" Canopy Trees as specified in Section 329300 "Plantings".
 2. Unit of Measurement: Each.
- MM. Unit Price: Canopy Trees – 2-1/2" – 3"
1. Description: Purchase of materials, labor, and equipment associated with the installation of 2-1/2" – 3" Canopy Trees as specified in Section 329300 "Plantings".
 2. Unit of Measurement: Each.
- NN. Unit Price: Canopy Trees – 12'
1. Description: Purchase of materials, labor, and equipment associated with the installation of 12' Canopy Trees as specified in Section 329300 "Plantings".
 2. Unit of Measurement: Each.
- OO. Unit Price: Canopy Trees – 16'
1. Description: Purchase of materials, labor, and equipment associated with the installation of 16' Canopy Trees as specified in Section 329300 "Plantings".
 2. Unit of Measurement: Each.
- PP. Unit Price: Coniferous Trees – 12'
1. Description: Purchase of materials, labor, and equipment associated with the installation of 12' Coniferous Trees as specified in Section 329300 "Plantings".
 2. Unit of Measurement: Each.
- QQ. Unit Price: Coniferous Trees – 16'
1. Description: Purchase of materials, labor, and equipment associated with the installation of 12' Coniferous Trees as specified in Section 329300 "Plantings".
 2. Unit of Measurement: Each.

- RR. Unit Price: Ornamental Trees – 10’ - 12’ multi stem
1. Description: Purchase of materials, labor, and equipment associated with the installation of 10’ - 12’ multi stem Ornamental Trees as specified in Section 329300 “Plantings”.
 2. Unit of Measurement: Each.
- SS. Unit Price: Ornamental Trees – 3.5” cal.
1. Description: Purchase of materials, labor, and equipment associated with the installation of 3.5” cal. Ornamental Trees as specified in Section 329300 “Plantings”.
 2. Unit of Measurement: Each.
- TT. Unit Price: Live Cuttings
1. Description: Purchase of materials, labor, and equipment associated with the installation of live cuttings as specified in Section 329300 “Plantings”.
 2. Unit of Measurement: Each.
- UU. Unit Price: Bulbs
1. Description: Purchase of materials, labor, and equipment associated with the installation of bulbs as specified in Section 329300 “Plantings”.
 2. Unit of Measurement: Each.
- VV. Unit Price: CHOP Bridge Landing Area
1. Description: Construction of a new plaza area at the base of the CHOP pedestrian bridge, to include all labor, materials, equipment, and incidentals for the fully constructed plaza in accordance with SP-02 and the Landscape Drawings.
 2. Unit of Measurement: Lump Sum.
- WW. Unit Price: Miscellaneous Plantings (Site A)
1. Description: The complete site preparation and planting of Site “A” in accordance with SP-03 and the Sketch “Site A Planting” included as part of that provision.
 2. Unit of Measurement: Lump Sum.
- XX. Unit Price: Miscellaneous Plantings (Site B)
1. Description: The complete site preparation and planting of Site “B” in accordance with SP-04 and the Sketch “Site B Planting” included as part of that provision.
 2. Unit of Measurement: Lump Sum.
- YY. Unit Price: Miscellaneous Plantings (Site C)
1. Description: The complete site preparation and planting of Site “C” in accordance with SP-05 and the Sketch “Site C Planting” included as part of that provision.
 2. Unit of Measurement: Lump Sum.
- ZZ. Unit Price: Tree Trimming and Vine Removal
1. Description: The removal and offsite disposal of live and dead vines along existing tree lines between South and Christian from the right-of-way fence to the river bank in accordance with SP-06.
 2. Unit of Measurement: Crew Days.

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UNIT PRICES

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AAA. Unit Price: Bituminous Paving Adjustments

1. Description: The paving of small areas in the vicinity of Walnut/Locust Street to better accommodate turning vehicles in accordance with SP-07.
2. Unit of Measurement: Square Feet.

BBB. Unit Price: Boulders Along Trail

1. Description: The furnishing and installation of “sitting” boulders along the length of the trail in accordance with SP-08
2. Unit of Measurement: Each.

CCC. Unit Price: Bollard Painting

1. Description: The painting of existing bollards located adjacent to the South to Christian trail segment in accordance with SP-09.
2. Unit of Measurement: Each.

DDD. Unit Price: Railing Repair near Composting Toilets

1. Description: The repair of existing railing at the composting toilets near Walnut Street in accordance with SP-10.
2. Unit of Measurement: Lump Sum.

EEE. Unit Price: Concrete Pads for Benches

1. Description: The construction of concrete pads in front of existing benches in the vicinity of Walnut/Locust Street in accordance with SP-11.
2. Unit of Measurement: Square Foot.

FFF. Unit Price: South Overlook Bulkhead PennDOT (Type I) Repair

1. Description: Concrete repairs performed according to PennDOT Type I repair procedures with material and workmanship in accordance with Publication 408 and as specified in SP-12A. PennDOT standard BC-783M should be referenced for reinforced concrete repair.
2. Unit of Measurement: Square Feet.

GGG. Unit Price: South Overlook Bulkhead PennDOT (Type II) Repair

1. Description: Concrete repairs performed according to PennDOT Type II repair procedures with material and workmanship in accordance with Publication 408 and as specified in SP-12B. PennDOT standard BC-783M should be referenced for reinforced concrete repair.
2. Unit of Measurement: Square Feet.

HHH. Unit Price: South Overlook Top Coating

1. Description: The application of a uniform coating applied to the entire top of bulkhead from end to end and from knee wall to the river edge of the bulkhead in accordance with SP-12C.
2. Unit of Measurement: Square Feet.

III. Unit Price: Topdressing and Seeding

1. Description: The plugging, aeration, topdressing, and seeding of the lawn area between Locust Street and Chestnut Street during early Spring 2017 in accordance with SP-14.
2. Unit of Measurement: Square Yards.

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- JJJ. Unit Price: Locating and Marking Underground Utilities
1. Description: The determination of location and depth of existing underground utilities within the project area in accordance with SP-15.
 2. Unit of Measurement: Lump Sum.
- KKK. Unit Price: Installation of Water Irrigation Service Line
1. Description: The furnishing and installation of a water irrigation service line in accordance with SP-16.
 2. Unit of Measurement: Lump Sum.
- LLL. Unit Price: Weep Hole Drilling for Existing Railings
1. Description: Drilling of weep holes for bottom channels of Stainless Steel Railings with Infill Panels in accordance with SP-17.
 2. Unit of Measurement: Lump Sum.
- MMM. Unit Price: Irrigation Hotbox Electrical Terminations & Devices
1. Description: This installation of electric devices and terminations in the irrigation hotbox for outlets, pump, relay, and irrigation controls in accordance with SP-18.
 2. Unit of Measurement: Lump Sum.

END OF SECTION 012200

SECTION 012500

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for products selected under an allowance.
 - 2. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use CSI Form 13.1A facsimile of form provided in Project Manual.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

- a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - d. Samples, where applicable or requested.
 - e. Certificates and qualification data, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - i. 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.
3. Owner's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Owner will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Owner does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
1. Conditions: Owner will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Not allowed unless otherwise indicated.
- C. Substitutions for Convenience: Owner will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Owner.
1. Conditions: Owner will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Substitution request is fully documented and properly submitted.
 - e. Requested substitution will not adversely affect Contractor's construction schedule.
 - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - g. Requested substitution is compatible with other portions of the Work.

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- h. Requested substitution has been coordinated with other portions of the Work.
- i. Requested substitution provides specified warranty.
- j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 013100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. Requests for Information (RFIs).
 - 4. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
 - 1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. RFI: Request from Owner, Construction Manager, Design Engineer, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.

2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts

and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.
- E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance

requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

- B. Coordination Drawing Organization: Organize coordination drawings as follows:
 - 1. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
 - b. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
 - c. Location of pull boxes and junction boxes, dimensioned from column center lines.
 - 2. Review: Design Engineer will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
 - 3. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
 - 1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
 - 2. File Preparation Format: DWG, Version 2012 operating in Microsoft Windows operating system.
 - 3. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.

1.7 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - 1. Owner's Rep will return RFIs submitted to Owner's Rep by other entities controlled by Contractor with no response.
 - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Project number.
 - 3. Date.
 - 4. Name of Contractor.

5. Name of Design Engineer and Construction Manager.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Design Engineer.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Design Engineer's and Construction Manager's Action: Design Engineer and Construction Manager will review each RFI, determine action required, and respond. Allow seven working days for Design Engineer's response for each RFI. RFIs received by Design Engineer or Construction Manager after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Design Engineer and Construction Manager in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use CSI Log Form 13.2B. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Design Engineer and Construction Manager.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Design Engineer's and Construction Manager's response was received.

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

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.8 PROJECT MEETINGS

A. General: Held at SRDC Office, Scheduled by SRDC (Owner) meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Construction Manager, and Design Engineer, within three days of the meeting.

B. Preconstruction Conference: Construction Manager will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Design Engineer, but no later than 15 days after execution of the Agreement.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner, Construction Manager, Design Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.

- f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.
 - i. Procedures for processing Applications for Payment.
 - j. Distribution of the Contract Documents.
 - k. Submittal procedures.
 - l. Preparation of record documents.
 - m. Use of the premises.
 - n. Work restrictions.
 - o. Working hours.
 - p. Owner's occupancy requirements.
 - q. Responsibility for temporary facilities and controls.
 - r. Procedures for moisture and mold control.
 - s. Procedures for disruptions and shutdowns.
 - t. Construction waste management and recycling.
 - u. Parking availability.
 - v. Office, work, and storage areas.
 - w. Equipment deliveries and priorities.
 - x. First aid.
 - y. Security.
 - z. Progress cleaning.
4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Design Engineer, Construction Manager of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility requirements.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written instructions.
 - n. Warranty requirements.

- o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Construction Manager will schedule and conduct a project closeout conference, at a time convenient to Owner and Design Engineer, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for preparing operations and maintenance data.
 - e. Requirements for delivery of material samples, attic stock, and spare parts.
 - f. Requirements for demonstration and training.
 - g. Preparation of Contractor's punch list.
 - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - i. Submittal procedures.
 - j. Coordination of separate contracts.
 - k. Owner's partial occupancy requirements.
 - l. Installation of Owner's furniture, fixtures, and equipment.
 - m. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Construction Manager will conduct progress meetings at monthly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner , Construction Manager, and Design Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Resolution of BIM component conflicts.
 - 4) Status of submittals.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site utilization.
 - 9) Temporary facilities and controls.
 - 10) Progress cleaning.
 - 11) Quality and work standards.
 - 12) Status of correction of deficient items.
 - 13) Field observations.
 - 14) Status of RFIs.
 - 15) Status of proposal requests.
 - 16) Pending changes.
 - 17) Status of Change Orders.
 - 18) Pending claims and disputes.
 - 19) Documentation of information for payment requests.
 4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

- a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- F. Coordination Meetings: Construction Manager will conduct Project coordination meetings at monthly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
 1. Attendees: In addition to representatives of Owner , Construction Manager, and Design Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Resolution of BIM component conflicts.
 - 4) Status of submittals.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site utilization.
 - 9) Temporary facilities and controls.
 - 10) Work hours.
 - 11) Hazards and risks.
 - 12) Progress cleaning.
 - 13) Quality and work standards.
 - 14) Change Orders.
 3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1. Startup construction schedule.
2. Contractor's construction schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Special reports.

- B. Related Requirements:

1. Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

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

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

- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.

- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF electronic file.
 - 3. Two paper copies.
- B. Startup construction schedule.
 - 1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 3. Total Float Report: List of all activities sorted in ascending order of total float.
- F. Construction Schedule Updating Reports: Submit with Applications for Payment.
- G. Daily Construction Reports: Submit at weekly intervals.
- H. Material Location Reports: Submit at monthly intervals.
- I. Site Condition Reports: Submit at time of discovery of differing conditions.
- J. Special Reports: Submit at time of unusual event.
- K. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.
- B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
1. Review software limitations and content and format for reports.
 2. Verify availability of qualified personnel needed to develop and update schedule.
 3. Discuss constraints, including phasing work stages area separations and interim milestones.
 4. Review delivery dates for Owner-furnished products.
 5. Review schedule for work of Owner's separate contracts.
 6. Review submittal requirements and procedures.
 7. Review time required for review of submittals and resubmittals.
 8. Review requirements for tests and inspections by independent testing and inspecting agencies.
 9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
 10. Review and finalize list of construction activities to be included in schedule.
 11. Review procedures for updating schedule.

1.6 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 - 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, resubmittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 - 4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Design Engineer's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.
 - 6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Work under More Than One Contract: Include a separate activity for each contract.

3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 6. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Building flush-out.
 - m. Startup and placement into final use and operation.
 8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Completion of electrical installation.
 - c. Substantial Completion.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
 2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
 5. Pending modifications affecting the Work and Contract Time.
- F. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
- G. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
1. Use a schedule software capable of providing an electronic XER or PRX backup file

2.2 STARTUP CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.
 1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Design Engineer's approval of the schedule.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing.
 - j. Punch list and final completion.
 - k. Activities occurring following final completion.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.

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

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

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

2.4 REPORTS

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

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

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

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1. Material stored prior to previous report and remaining in storage.
 2. Material stored prior to previous report and since removed from storage and installed.
 3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.
1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
 2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.
- B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate final completion percentage for each activity.
- C. Distribution: Distribute copies of approved schedule to Design Engineer, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

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

END OF SECTION 013200

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
 - 1. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 2. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Design Engineer's and Construction Manager's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Design Engineer's and Construction Manager's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making

corrections or revisions to submittals noted by Design Engineer and Construction Manager and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Design Engineer's and Construction Manager's final release or approval.
 - g. Scheduled date of fabrication.
 - h. Scheduled dates for purchasing.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- 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.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Design Engineer and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- B. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Design Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 10 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Construction Manager will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in the same manner as the initial submittal.
 3. Resubmittal Review: Allow 10 working days for review of each resubmittal.
- C. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use Specification Section number followed by a hyphen and then a sequential number (e.g., 061000-01). Resubmittals shall include an alphabetic suffix after another hyphen (e.g., 061000-01-A).
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Design Engineer and Construction Manager.
 4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Design Engineer.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Names of subcontractor, manufacturer, and supplier.
 - h. Category and type of submittal.
 - i. Submittal purpose and description.
 - j. Specification Section number and title.
 - k. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Related physical samples submitted directly.
 - o. Indication of full or partial submittal.
 - p. Transmittal number.
 - q. Submittal and transmittal distribution record.
 - r. Other necessary identification.

- s. Remarks.
- 5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
 - a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
- D. Options: Identify options requiring selection by Design Engineer.
- E. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Design Engineer and Construction Manager on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- F. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Design Engineer's and Construction Manager's action stamp.
- G. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- H. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Design Engineer's and Construction Manager's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Submit electronic submittals via email as PDF electronic files to the Construction Manager.
 - a. Design Engineer, through Construction Manager, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Certificates and Certification Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- 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 published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. Submit Product Data before or concurrent with Samples.
 5. Submit Product Data in the following format:
 - a. PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.

2. 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 34 by 22 inches.
 3. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record in addition to the physical sample.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Design Engineer, through Construction Manager, will return submittal with options selected.
 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

- a. Number of Samples: Submit two sets of Samples. Design Engineer and Construction Manager will retain one Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- F. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- G. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- H. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Design Engineers and owners, and other information specified.
- I. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- J. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- K. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- L. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- M. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- N. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- O. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on

evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

- P. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
 2. Date of evaluation.
 3. Time period when report is in effect.
 4. Product and manufacturers' names.
 5. Description of product.
 6. Test procedures and results.
 7. Limitations of use.
- Q. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- R. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- S. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- T. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Design Engineer.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

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

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Construction Manager.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 DESIGN ENGINEER'S AND CONSTRUCTION MANAGER'S ACTION

- A. Action Submittals: Design Engineer and Construction Manager will review each submittal, make marks to indicate corrections or revisions required, and return it. Design Engineer and Construction Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- C. Submittals not required by the Contract Documents may be returned by the Design Engineer without action.

END OF SECTION 013300

SECTION 014000

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Design Engineer, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
 - 4. Specific test and inspection requirements are not specified in this Section.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Design Engineer.
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to

show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.
 2. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
 3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

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

1.5 ACTION SUBMITTALS

- A. Shop Drawings: For integrated exterior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
 - 1. Indicate manufacturer and model number of individual components.
 - 2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Owner's Rep. Identify personnel, procedures, controls, instructions, tests, records, and forms to

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be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 - 1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 - 1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
 - 2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
 - 3. Owner-performed tests and inspections indicated in the Contract Documents.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Design Engineer has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.8 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.

10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.9 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

- c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.
2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Design Engineer, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.10 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
 3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

- C. **Manufacturer's Field Services:** Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- D. **Manufacturer's Technical Services:** Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. **Retesting/Reinspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- F. **Testing Agency Responsibilities:** Cooperate with Design Engineer, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Design Engineer, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- G. **Associated Services:** Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

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1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
1. Distribution: Distribute schedule to Owner, Design Engineer, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in Statement of Special Inspections attached to this Section, and as follows:
- B. Special Tests and Inspections: Conducted by a qualified special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections and in Statement of Special Inspections attached to this Section, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Design Engineer, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Design Engineer through Construction Manager, with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 ACCEPTABLE TESTING AGENCIES

- A. A Licensed Professional or their assigned designee.

3.2 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Architect.
 - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Design Engineer's and Construction Manager's reference during normal working hours.

3.3 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200

REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if

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bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
 - 1. AABC - Associated Air Balance Council; www.aabc.com.
 - 2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
 - 3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
 - 4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
 - 5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
 - 6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
 - 7. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
 - 8. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
 - 9. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
 - 10. AF&PA - American Forest & Paper Association; www.afandpa.org.
 - 11. AGA - American Gas Association; www.aga.org.
 - 12. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
 - 13. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
 - 14. AI - Asphalt Institute; www.asphaltinstitute.org.
 - 15. AIA - American Institute of Architects (The); www.aia.org.
 - 16. AISC - American Institute of Steel Construction; www.aisc.org.
 - 17. AISI - American Iron and Steel Institute; www.steel.org.
 - 18. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
 - 19. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
 - 20. ANSI - American National Standards Institute; www.ansi.org.
 - 21. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
 - 22. APA - APA - The Engineered Wood Association; www.apawood.org.
 - 23. APA - Architectural Precast Association; www.archprecast.org.

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24. API - American Petroleum Institute; www.api.org.
25. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
26. ARI - American Refrigeration Institute; (See AHRI).
27. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
28. ASCE - American Society of Civil Engineers; www.asce.org.
29. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
30. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
31. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
32. ASSE - American Society of Safety Engineers (The); www.asse.org.
33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34. ASTM - ASTM International; (American Society for Testing and Materials International); www.astm.org.
35. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
36. AWEA - American Wind Energy Association; www.awea.org.
37. AWI - Architectural Woodwork Institute; www.awinet.org.
38. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
39. AWPA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
40. AWS - American Welding Society; www.aws.org.
41. AWWA - American Water Works Association; www.awwa.org.
42. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
43. BIA - Brick Industry Association (The); www.gobrick.com.
44. BICSI - BICSI, Inc.; www.bicsi.org.
45. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
46. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
47. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bwfbadminton.org.
48. CDA - Copper Development Association; www.copper.org.
49. CEA - Canadian Electricity Association; www.electricity.ca.
50. CEA - Consumer Electronics Association; www.ce.org.
51. CFFA - Chemical Fabrics & Film Association, Inc.; www.chemicalfabricsandfilm.com.
52. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
53. CGA - Compressed Gas Association; www.cganet.com.
54. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
55. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
56. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
57. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
58. CPA - Composite Panel Association; www.pbmdf.com.
59. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
60. CRRC - Cool Roof Rating Council; www.coolroofs.org.
61. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
62. CSA - Canadian Standards Association; www.csa.ca.
63. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
64. CSI - Construction Specifications Institute (The); www.csinet.org.

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65. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
66. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
67. CWC - Composite Wood Council; (See CPA).
68. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
69. DHI - Door and Hardware Institute; www.dhi.org.
70. ECA - Electronic Components Association; (See ECIA).
71. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
72. ECIA ? Electronic Components Industry Association; www.eciaonline.org
73. EIA - Electronic Industries Alliance; (See TIA).
74. EIMA - EIFS Industry Members Association; www.eima.com.
75. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
76. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
77. ESTA - Entertainment Services and Technology Association; (See PLASA).
78. EVO - Efficiency Valuation Organization; www.evo-world.org.
79. FIBA - F?d?ration Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
80. FIVB - F?d?ration Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
81. FM Approvals - FM Approvals LLC; www.fmglobal.com.
82. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
83. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridarroof.com.
84. FSA - Fluid Sealing Association; www.fluidsealing.com.
85. FSC - Forest Stewardship Council U.S.; www.fscus.org.
86. GA - Gypsum Association; www.gypsum.org.
87. GANA - Glass Association of North America; www.glasswebsite.com.
88. GS - Green Seal; www.greenseal.org.
89. HI - Hydraulic Institute; www.pumps.org.
90. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
91. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
92. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
93. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
94. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
95. IAS - International Accreditation Service; www.iasonline.org.
96. IAS - International Approval Services; (See CSA).
97. ICBO - International Conference of Building Officials; (See ICC).
98. ICC - International Code Council; www.iccsafe.org.
99. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
100. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
101. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
102. IEC - International Electrotechnical Commission; www.iec.ch.
103. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
104. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
105. IESNA - Illuminating Engineering Society of North America; (See IES).
106. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
107. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
108. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
109. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.

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110. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
111. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
112. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
113. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
114. ISO - International Organization for Standardization; www.iso.org.
115. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
116. ITU - International Telecommunication Union; www.itu.int/home.
117. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
118. LMA - Laminating Materials Association; (See CPA).
119. LPI - Lightning Protection Institute; www.lightning.org.
120. MBMA - Metal Building Manufacturers Association; www.mbma.com.
121. MCA - Metal Construction Association; www.metalconstruction.org.
122. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
123. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
124. MHIA - Material Handling Industry of America; www.mhia.org.
125. MIA - Marble Institute of America; www.marble-institute.com.
126. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); www.wmmpa.com.
127. MPI - Master Painters Institute; www.paintinfo.com.
128. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
129. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
130. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
131. NADCA - National Air Duct Cleaners Association; www.nadca.com.
132. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
133. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
134. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
135. NCMA - National Concrete Masonry Association; www.ncma.org.
136. NEBB - National Environmental Balancing Bureau; www.nebb.org.
137. NECA - National Electrical Contractors Association; www.necanet.org.
138. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
139. NEMA - National Electrical Manufacturers Association; www.nema.org.
140. NETA - InterNational Electrical Testing Association; www.netaworld.org.
141. NFHS - National Federation of State High School Associations; www.nfhs.org.
142. NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
143. NFPA - NFPA International; (See NFPA).
144. NFRC - National Fenestration Rating Council; www.nfrc.org.
145. NHLA - National Hardwood Lumber Association; www.nhla.com.
146. NLGA - National Lumber Grades Authority; www.nlga.org.
147. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
148. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
149. NRCA - National Roofing Contractors Association; www.nrca.net.
150. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
151. NSF - NSF International; (National Sanitation Foundation International); www.nsf.org.
152. NSPE - National Society of Professional Engineers; www.nspe.org.

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153. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
154. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
155. NWFA - National Wood Flooring Association; www.nwfa.org.
156. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
157. PDI - Plumbing & Drainage Institute; www.pdionline.org.
158. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
159. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
160. RFCI - Resilient Floor Covering Institute; www.rfci.com.
161. RIS - Redwood Inspection Service; www.redwoodinspection.com.
162. SAE - SAE International; (Society of Automotive Engineers); www.sae.org.
163. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
164. SDI - Steel Deck Institute; www.sdi.org.
165. SDI - Steel Door Institute; www.steeldoor.org.
166. SEFA - Scientific Equipment and Furniture Association; www.sefalabs.com.
167. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
168. SIA - Security Industry Association; www.siaonline.org.
169. SJI - Steel Joist Institute; www.steeljoist.org.
170. SMA - Screen Manufacturers Association; www.smainfo.org.
171. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
172. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
173. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
174. SPIB - Southern Pine Inspection Bureau; www.spib.org.
175. SPRI - Single Ply Roofing Industry; www.spri.org.
176. SRCC - Solar Rating and Certification Corporation; www.solar-rating.org.
177. SSINA - Specialty Steel Industry of North America; www.ssina.com.
178. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
179. STI - Steel Tank Institute; www.steeltank.com.
180. SWI - Steel Window Institute; www.steelwindows.com.
181. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
182. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
183. TCNA - Tile Council of North America, Inc.; (Formerly: Tile Council of America); www.tileusa.com.
184. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
185. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
186. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
187. TMS - The Masonry Society; www.masonrysociety.org.
188. TPI - Truss Plate Institute; www.tpinst.org.
189. TPI - Turfgrass Producers International; www.turfgrassod.org.
190. TRI - Tile Roofing Institute; (Formerly: National Tile Roofing Manufacturing Association); www.tilerroofing.org.
191. UBC - Uniform Building Code; (See ICC).
192. UL - Underwriters Laboratories Inc.; www.ul.com.
193. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
194. USAV - USA Volleyball; www.usavolleyball.org.

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195. USGBC - U.S. Green Building Council; www.usgbc.org.
196. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
197. WASTEC - Waste Equipment Technology Association; www.wastec.org.
198. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
199. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
200. WDMA - Window & Door Manufacturers Association; www.wdma.com.
201. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); www.wicnet.org.
202. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
203. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
204. WPA - Western Wood Products Association; www.wppa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut für Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up-to-date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; <http://dodssp.daps.dla.mil>.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; <http://eetd.lbl.gov>.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeia; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

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E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; <http://dodssp.daps.dla.mil>.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from Department of Defense Single Stock Point; <http://dodssp.daps.dla.mil>.
 - a. Available from Defense Standardization Program; www.dsp.dla.mil.
 - b. Available from General Services Administration; www.gsa.gov.
 - c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7. TFS; Texas Forest Service; Forest Resource Development and Sustainable Forestry; <http://txforests-service.tamu.edu>.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 014500

POLLUTION PREVENTION AND ENVIRONMENTAL REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section provides for specific and general pollution prevention actions by the Contractor during the performance of the work. It also identifies general environmental requirements applicable for the work.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Schuylkill River Development Corporation, Supplemental Provisions to Standard Contract Requirements, Special Provisions and Division 1 Specification Sections, and PADEP and USEPA standards apply to this Section.
- B. The Erosion and Sedimentation (E&S) Control Plan Narrative and Plan as approved by the Philadelphia Water Department (PWD) are a material part of this contract and are included by reference. The Contractor shall base his/her bid on the E&S Control Plans in the bid package.
- C. Commonwealth of Pennsylvania Department of Environmental Protection (PADEP) Erosion and Sediment Pollution Control Manual, April 2000.
- D. 2014 Urban Engineers, Inc. Soil and Waste Management Plan for Schuylkill River Trail Extension – South Street to Christian Street.

1.3 QUALITY ASSURANCE

- A. The Contractor is responsible for quality and control, and meeting requirements of the related documents. The Contractor is also responsible for the payment of any fines or penalties that may be imposed by regulatory agencies as a result of environmental non-compliance resulting from the Contractor's work or failure to comply with the contract documents.

1.4 SUBMITTALS

- A. Materials Source: Submit name of materials supplier.
- B. Product Data: Submit data on products.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide erosion and sediment control measures as specified on the approved Erosion and Sedimentation Control Plans and Details.

PART 3 - EXECUTION

- 3.1 The Contractor will observe the following general procedures, during the contract life:
- A. The Owner has secured the required PWD Stormwater Management Plan Approval, including approval of the Erosion and Sedimentation Control Plans. The Contractor is responsible for fully complying with all approval conditions and regulatory requirements that may be established within approvals/permits. Where permit conditions or approvals refer to actions by the Owner/Permittee, it is clearly understood to be a condition placed upon the Contractor and an action solely required to be performed by the Contractor.
 - B. The Contractor is solely responsible for the Preparation, Submission and Securing of Amendments to the acquired approvals, if needed, because of his/her specific means and methods used for the performance of the work.
 - C. The Contractor shall conduct operations to comply with the approved Erosion and Sedimentation Control Plan. If the approved plan(s) cannot be followed, the Contractor shall obtain written approval of Alternative Erosion and Sedimentation Controls by the appropriate regulatory agency. At no time shall water containing sediments or pollutants be discharged into drainage ditches, stormwater pipes or watercourses.
 - D. In preparing for and setting up the work areas, follow the requirements regarding Borrow, Waste and Staging Areas.
 - 1. Separate water(s) originating outside of the project (Clean Water) or clean surface runoff from those originating within (Dirty Water). Direct dirty water away from project construction areas and into an appropriate erosion and sedimentation control device.
 - E. If the Contractor proposes to use, store, process or dispose of chemicals, solvents, or other hazardous wastes (including fuel oils and gasoline), then in accordance with 25 Pa. Code § 101.3, the Contractor shall prepare, implement, and maintain a Preparedness, Prevention, and Contingency (PPC) Plan for all operations (including subcontractor operations) that may discharge into stormwater or site runoff. The PPC Plan must be prepared prior to bringing any hazardous materials on to the project site. The PPC Plan must be maintained on-site at all times and be implemented prior to the start of construction.
 - F. Do not enter ditches or water courses, construct rock crossings, causeways or cofferdams unless authorized by provisions of a Pennsylvania Department of Environmental Protection Water Obstruction and Encroachment Permit.
 - G. Control grading areas by placing erosion and sedimentation control devices in advance of performing earth disturbance activities. Do not place stabilization devices “after-the- fact” or as earth disturbance activity(s) progress.
 - H. If and when dewatering of the site is required, control the dewatering operation to limit impacts on adjacent non-work areas and control the discharge from the pumping operation outlet(s). Each groundwater discharge outlet and pumped water outlet protection control is to have a properly sized RipRap Apron Outlet Protection and other appropriate erosion and sedimentation controls.

- I. Seed or stabilize all disturbed areas, ditches and outlet channel banks immediately upon completion of both rough and final grading. All disturbed areas shall be stabilized by seeding and mulching them on a weekly basis unless other coverings are shown or area has obtained 80% growth. As an alternative the contract may cover disturbed areas with 4 inches of a non-erodible aggregate. Areas shall not be left bare.
 - J. If excavated material is to be stockpiled, each stockpile is to be surrounded by filter fabric fence or other appropriate device to control the migration of sediments and include a rock construction entrance. If stockpiled for more than twenty (20) days, take additional stabilization measures (such as temporary seeding) to minimize erosion of the stockpile slopes and fugitive dust.
 - K. The Contractor shall be responsible for the daily maintenance and/or replacement of erosion and sedimentation control devices.
 - L. The Contractor shall inspect all erosion and sedimentation control devices weekly, before any anticipated precipitation event, and after all precipitation events. The Contractor shall provide a description of inspection procedures and schedules.
 - M. The Contractor shall clearly identify the contractor(s) or subcontractor(s) responsible for implementation of each pollution control measure.
 - N. The Contractor shall be solely responsible for the coordination of his work and the work of his subcontractors, with other site personnel, and is solely responsible for the protection of persons having access to the site. The Contractor shall inform the Owner and other contractors/personnel of any hazards that may exist on the site or be encountered during performance of the work. The Contractor shall also implement a Hazard Communication Program, complying with OSHA standards, and provide the CCD and other contractors/personnel with copies of Safety Data Sheets (SDS) for all products brought to the site. The Contractor must comply with the supplemental provision regarding approvals for use of Environmentally Sensitive Materials.
 - O. The Contractor is hereby designated as the project's Safety Compliance Manager and shall be solely responsible for providing all OSHA required site training and for the monitoring of the work site impacted by his or her operations including sub-contractors and vendors.
- 3.2 Alternate Erosion and Sedimentation Control(s)
- A. The Owner has obtained a PWD Stormwater Management Plan Approval for the project. This approval is issued based upon an approved Erosion and Sedimentation Control Plan Narrative and Drawings/Plans that are herein included by reference as part of the scope of this contract. The plan includes a specific sequencing and staging of operations that must be strictly followed.
 - B. Where the Contractor cannot comply with the provisions in the approved Erosion and Sedimentation Control Plan(s), or must modify the sequencing or staging of the work, the Contractor must comply with the following requirements when submitting an alternate plan to the PWD for accomplishing equal or better temporary and permanent erosion and water pollution control(s):

1. Do not start work until the alternate erosion and sedimentation control plan, amendments/modifications, schedule and operation methods have been approved by the PWD.
2. Apply for any earth disturbance permits or permit amendments not included in the proposal documents that are required because of the nature of the contemplated construction procedures.
3. Prepare and furnish, with the applications, plans and documents that are required by the PWD.
4. Provide simultaneously to Owner a copy of all plans and documents that affect the construction requirements.
5. Provide immediately to Owner any modifications that are made to the plans and documents that are required by the PWD.
6. Obtain approvals of Owner and from the PWD prior to beginning any work. A permit may be required if fill is proposed in a wetland area or near a watercourse, for any earth disturbance activities other than those specifically shown on the plans, or near wildlife habitat including both animal and plant species.
7. If alternate erosion and sedimentation controls require the use of property or areas outside of the designated/approved work area, then the Contractor shall acquire those areas at no cost to the Owner.

3.3 Borrow, Waste and Staging Areas

- A. In the process of locating borrow, waste, and staging areas, including access and haul roads the Contractor must consult with the appropriate state agencies to acquire available information on the presence of cultural resources, hazardous waste sites, wetlands, sensitive environmental features, on-site utilities and the applicable regulatory requirements for using such areas.
- B. When cultural resources, hazardous waste sites, wetlands, sensitive environmental features, or on-site utilities will be affected by such staging areas, the Contractor shall conduct the engineering, environmental analysis, subsurface investigations and prepare the necessary documents and permit(s) applications while consulting with the Owner. All necessary environmental approvals and/or permits shall be obtained by the Contractor prior to start of work in areas of affected features. Two (2) copies of each approval and permit shall be submitted to the Owner.

3.4 Subsurface and Ground Water Conditions

- A. The Contractor is solely responsible for managing his/her activities (and the activities of his/her subcontractors/vendors) so as to provide full compliance with all federal and state health and safety standards. Appropriate personnel protective procedures and equipment, including those necessary to protect worker health/safety and comply with OSHA and railroad regulations, must be provided by the Contractor to all site personnel, including the Owner and Regulatory Department Representatives.
- B. The Contractor shall prepare a Site Specific Health and Safety Plan covering all work conducted at the site. This safety plan shall be available on site for review by regulatory department personnel.
- C. The Contractor is also solely responsible for determining the disposal method for any municipal, demolition or residual wastes that may be encountered or generated during the

project. Such wastes must be disposed of in accordance with all local, state and federal standards. Disposal of such wastes is incidental to the work and shall be performed at no additional cost to the Owner.

- D. If subsurface material(s) or ground water contamination is identified, or other waste material(s) are found, the Contractor shall implement all appropriate actions to contain the contamination/wastes and to avoid the cross-contamination of the site and its surrounding areas. The Contractor shall then notify the Owner and request direction before proceeding with the work.

3.5 Approvals for use of Environmentally Sensitive Materials

- A. The Contractor and its sub-contractors shall provide a Hazardous Waste Management Plan to the Owner for review and approval prior to commencement of any action. If environmentally sensitive materials or substances are to be utilized by or on behalf of the Contractor, the Contractor shall provide copies of Safety Data Sheets to the Owner and other contractors/personnel on the site. If required by federal, state or local law, apply for and obtain on behalf of the Owner, a temporary Resource Conservation and Recovery Act (RCRA) generator identification number and RCRA hazardous waste permit or its Pennsylvania equivalent, which permits shall be limited to generation and transportation. The Contractor shall not, under any circumstances, allow any hazardous wastes to remain on or about the premises for any period in excess of ninety (90) days from the date of initial finding. Any violation of these requirements shall be deemed a material breach of this contract.

3.6 Cleaning of Construction Equipment and Cement Truck Wastes

- A. The Contractor shall not allow cleaning of construction equipment, subcontractor or vendor equipment, worker vehicles, and/or the cleaning of cement truck wastes on any property at the project site without the prior written approval of the Owner. If approved, such activities shall only be allowed at designated locations and the Contractor shall be responsible for providing measures to ensure that wash waters are properly treated prior to discharge. Cement wastes are particularly harmful to wildlife and shall never be discharged into drainage ditches or drainage pipes, waterways, wetland areas or wildlife habitat. The Contractor shall also secure all necessary local and state Permits for the discharge of such wash waters at no cost to the Owner.

3.7 Dust Control

- A. Prepare, submit, and obtain approval of, and implement a Fugitive Dust Control Plan meeting the standards of the City of Philadelphia's Department of Health - Air Management Service Unit.
- B. Employ construction methods and means that will keep flying dust to the minimum. Provide for the laying of water on the project, and on roads, streets, and other areas immediately adjacent to the project limits, wherever traffic, or buildings that are occupied or in use, are affected by such dust caused by hauling or other operations.
- C. Provide for prompt removal from existing pavements of all dirt and other materials that have been spilled, washed, tracked or otherwise deposited thereon by hauling and other operations whenever the accumulation is sufficient to cause the formation of mud, interfere with drainage, damage pavement or create a traffic hazard.

3.8 Rock Construction Entrance

- A. Rock Construction Entrance(s) (tire cleaning pads) shall be constructed as indicated on the approved Erosion and Sedimentation Control Plan Details. The pad shall be in place prior to any excavation or earthmoving operations. In the event that the pad becomes clogged with soil, it shall either be replaced or supplemental stone added. At the completion of construction, the cleaning pad shall be removed and the area restored to its original condition that may include full-depth pavement and/or top soiled and seeded according to the location.

3.9 Dewatering of the Construction Site

- A. Subject to approval by the Philadelphia Water Department's Industrial Waste Unit, the Contractor may discharge pumped stormwater and/or ground water to the local sanitary sewer lines. If the Contractor chooses this as an option, they will be required to apply for a Stormwater Discharge Permit and/or a Groundwater Discharge Permit.
 - 1. Application shall be submitted to: Industrial Waste Unit, 1101 Market Street, 3rd Floor, Philadelphia, PA 19107. Phone: 215-685-6236.
- B. At the start and completion of the work, the Contractor shall inspect all sanitary sewers, drainage and storm pipes (in and around the work site), and submit a report of their finding to the Owner. Upon completion of the work, the Contractor shall flush and power clean all sanitary sewers, drainage and storm water pipes in the area so that they are restored to their original condition.

END OF SECTION 014500

SECTION 015000

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities. Use of temporary facilities is at the sole discretion of the contractor and is not required by the owner, but must follow this specification if used. This work also includes obtaining the required permits, insurance, bonds, and any other initial items required for the start of the work.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.
 - 2. Section 312319 "Dewatering" for disposal of ground water at Project site.
 - 3. Section 321216 "Asphalt Paving" for construction and maintenance of asphalt pavement for temporary roads and paved areas.

1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to Owner's construction forces, testing agencies, and authorities having jurisdiction.
- B. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- C. Dust Plan: Submit coordination drawing and narrative that indicates the dust control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
 - 1. Locations of dust-control partitions at each phase of work.
 - 2. Waste handling procedures.
 - 3. Other dust-control measures.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails, with galvanized barbed-wire top strand.
- B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete bases for supporting posts.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- C. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - 1. Install electric power service underground unless otherwise indicated.
 - 2. Connect temporary service to Owner's existing power source, as directed by Owner.
- D. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS

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TEMPORARY FACILITIES AND CONTROLS

December 7, 2016

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
2. Install lighting for Project identification sign.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Design Engineer schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 312000 "Earth Moving."
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Section 321216 "Asphalt Paving."

D. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.

E. Parking: Provide temporary parking areas for construction personnel.

F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.

2. Remove snow and ice as required to minimize accumulations.
- G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 3. Maintain and touchup signs so they are legible at all times.
- H. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- I. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."
- J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- K. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
1. Comply with work restrictions specified in Section 011000 "Summary."
- C. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 311000 "Site Clearing."

- D. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
 4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- E. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- F. Tree and Plant Protection: Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection."
- G. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- H. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- I. Site Enclosure Fence: Prior to commencing earthwork, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
1. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- J. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- K. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- L. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

- M. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- N. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 - 1. Prohibit smoking in construction areas.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.
- D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 - 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and

other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.

3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

3.6 MEASUREMENT AND PAYMENT (FOR MOBILIZATION ONLY)

- A. Lump sum
- B. The Owner will pay for mobilization according to the following schedule:
 - a) Twenty percent (20%) of the contract lump sum amount bid for mobilization will be released with the first estimate payable.
 - b) Thereafter, additional payments will be released as follows:

<u>Amount of Total Contract Completed based on Percent of Total Bid</u>	<u>Additional Amount of Mobilization to be Released</u>
10%	10%
20%	10%
30%	10%
40%	10%
50%	10%
60%	10%
70%	10%
80%	10%
Total payable at 80% completion	100%

To clarify, if an approved estimate brings the total contract costs to the 45% level, the cumulative percentage of the mobilization item that will be released is 60%; at the 65% level, 80%.

END OF SECTION 015000

SECTION 015639

TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.
- B. Related Requirements:
 - 1. Section 015000 "Temporary Facilities and Controls" for temporary site fencing.
 - 2. Section 311000 "Site Clearing" for removing existing trees and shrubs.

1.3 DEFINITIONS

- A. Caliper: Diameter of a trunk measured by a diameter tape or the average of the smallest and largest diameters at a height 6 inches above the ground for trees up to and including 4-inch size at this height and as measured at a height of 12 inches above the ground for trees larger than 4-inch size.
- B. Caliper (DBH): Diameter breast height; diameter of a trunk as measured by a diameter tape or the average of the smallest and largest diameters at a height 54 inches above the ground line for trees with caliper of 8 inches or greater as measured at a height of 12 inches above the ground.
- C. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.
- E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:
 - a. Tree-service firm's personnel, and equipment needed to make progress and avoid delays.
 - b. Arborist's responsibilities.
 - c. Quality-control program.
 - d. Coordination of Work and equipment movement with the locations of protection zones.
 - e. Trenching by hand or with air spade within protection zones.
 - f. Field quality control.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 1. Include plans, elevations, sections, and locations of protection-zone fencing and signage, showing relation of equipment-movement routes and material storage locations with protection zones.
 2. Detail fabrication and assembly of protection-zone fencing and signage.
 3. Indicate extent of trenching by hand or with air spade within protection zones.
- C. Samples: For each type of the following:
 1. Organic Mulch: 1-quart volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
 2. Protection-Zone Fencing: Assembled Samples of manufacturer's standard size made from full-size components.
 3. Protection-Zone Signage: Full-size Samples of each size and text, ready for installation.
- D. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
 1. Species and size of tree.
 2. Location on site plan. Include unique identifier for each.
 3. Reason for pruning.
 4. Description of pruning to be performed.
 5. Description of maintenance following pruning.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For arborist and tree service firm.
- B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

- C. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.
- D. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
 - 1. Use sufficiently detailed photographs or video recordings.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
- E. Quality-control program.

1.7 QUALITY ASSURANCE

- A. Arborist Qualifications: Certified Arborist successfully passing the International Society of Arboriculture (ISA) Certified Arborist examination possessing current and valid certification.
- B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.
- C. Quality-Control Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work without damaging trees and plantings. Include dimensioned diagrams for placement of protection zone fencing and signage, the arborist's and tree-service firm's responsibilities, instructions given to workers on the use and care of protection zones, and enforcement of requirements for protection zones.

1.8 FIELD CONDITIONS

- A. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Moving or parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- B. Do not direct vehicle or equipment exhaust toward protection zones.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Backfill Soil: Stockpiled soil, salvaged from the Project Site, of suitable moisture content and granular texture for raising of subgrades in landscape areas only; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.
- B. Topsoil: A native mineral soil taken from the O and A Horizons of a well-drained site, having a USDA soil texture classification of Loam or Sandy Loam and be a loamy, friable mineral soil essentially free from heavy or stiff clay lumps, stones, cinders, concrete, brick, roots, sticks brush, litter, plastics, metals, refuse or other deleterious materials in accordance with ASTM D 5286-92. as specified in Section 329100 "Planting Soil", and for use in producing an approved Planting Soil.
 - 1. Topsoil shall undergo all required laboratory testing and conform to all requirements as specified in Section 329100 "Planting Soil".
- C. Protection-Zone Fencing: Fencing fixed in position and meeting one of the following requirements: Previously used materials may be used when approved by Design Engineer.
 - 1. Chain-Link Protection-Zone Fencing: Polymer-coated steel fencing fabricated from minimum 2-inch opening, 0.148-inch- diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch- OD line posts, and 2-7/8-inch- OD corner and pull posts; with 1-5/8-inch- OD top rails and 0.177-inch- diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.
 - a. Height: 72 inches.
 - b. Polymer-Coating Color: Black.
 - 2. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb/ft.; remaining flexible from minus 60 to plus 200 deg F; inert to most chemicals and acids; minimum tensile yield strength of 2000 psi and ultimate tensile strength of 2680 psi; secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 96 inches apart.
 - a. Height: 48 inches.
 - b. Color: High-visibility orange, nonfading.
 - 3. Gates: Single swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones; leaf width 36 inches.
- D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering and as follows:
 - 1. Size and Text: As shown on Drawings.
 - 2. Lettering: 3-inch-high minimum, black characters on white background.

SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS

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TEMPORARY TREE AND PLANT PROTECTION

December 7, 2016

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- B. Prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

- A. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Tie a 1-inch blue vinyl tape around each tree trunk at 54 inches above the ground.
- B. 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.
- C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.
 - 1. Apply 2-inch uniform thickness of organic, hardwood bark mulch unless otherwise indicated. Do not place mulch within 6 inches of tree trunks.

3.3 PROTECTION ZONES

- A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people and animals from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
 - 1. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
 - 2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Design Engineer.
 - 3. Access Gates: Install[where indicated; adjust to operate smoothly, easily, and quietly; free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

- B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Design Engineer. Install one sign spaced approximately every 50 feet on protection-zone fencing, but no fewer than two signs with each facing a different direction.
- C. Maintain protection zones free of weeds and trash.
- D. Maintain protection-zone fencing and signage in good condition as acceptable to Design Engineer and remove when construction operations are complete and equipment has been removed from the site.
 - 1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
 - 2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.4 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312000 "Earth Moving" unless otherwise indicated.
- B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.
- C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches back from new construction and as required for root pruning.
- D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.5 ROOT PRUNING

- A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows and in accordance to the most recent version of ANSI 300 Part I "Tree, Shrub and Other Woody Plant Management – Standard Practices (Pruning)": Root pruning shall be conducted by or in the presence of and under supervision of a Certified Arborist.
 - 2. Root Pruning outside the limits of the Protection Zone.

- a. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
3. Root Pruning at Edge of Protection Zone: Prune tree roots 6 inches inside of the protection zone by cleanly cutting all roots to the depth of the required excavation.
 - a. Clear and excavate by air spade to the depth of the required excavation to minimize damage to tree root systems.
4. Root Pruning within Protection Zone: Perform only as necessary and when unavoidable, when work will impede on tree protection zone.
 - a. Clear and excavate by air spade to the depth of the required excavation to minimize damage to tree root systems.
5. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
6. Cover exposed roots with burlap and water regularly.
7. Backfill as soon as possible according to requirements in Section 312000 "Earth Moving."
8. Cleanly cut roots as close to excavation as possible.
9. Return any disturbance to Protection Zone fencing or other materials to original state immediately after root pruning is complete and at end of each work day.

3.6 CROWN PRUNING

- A. Prune branches that are affected by temporary and permanent construction. Prune branches in accordance to the most recent version of ANSI 300 Part I "Tree, Shrub and Other Woody Plant Management – Standard Practices (Pruning)":
 1. Pruning shall be conducted by or in the presence of and under supervision of a Certified Arborist.,
 2. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless directed by Certified Arborist and approved by Owner's Representative.
 3. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
- B. Perform the following types of Pruning for all new and existing trees to remain on Project Site, in accordance to the most recent version of ANSI 300 Part I "Tree, Shrub and Other Woody Plant Management – Standard Practices (Pruning)" for the specific types of pruning:
 1. Cleaning: selective pruning of all new and existing trees and shrubs to on the Project Site to remove dead, diseased, and/or broken branches.
 2. Raising: selective pruning of lower limbs of new and existing trees to remain on the Project Site to provide a vertical clearance as follows:
 - a. Seven-feet six-inches from finished grade in areas of pedestrian access, or where crown of tree overhangs area of pedestrian access including but not limited to lawns, paths, and paved areas.

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- b. Five feet from finished grade in areas limited to pedestrian access to preserve clear lines of site through trees. Such areas include but are not limited to trees in meadows, landscape beds, or along river's edge.
- 3. Reducing and Thinning: Selective pruning to decrease height and/or spread of tree crown, or to reduce density of branching shall not be permitted unless directed by Certified Arborist and approved by Owner's Representative.
- C. Unless otherwise directed by arborist and acceptable to Owner's Representative, do not cut tree leaders.
- D. Cut branches with sharp pruning instruments; do not break or chop.
- E. Do not paint or apply sealants to wounds.
- F. Provide subsequent maintenance pruning during Contract period as recommended by arborist.
- G. Chip removed branches and dispose of off-site.

3.7 REGRADING

- A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- B. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

3.8 FIELD QUALITY CONTROL

- A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.9 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by the Owner's Representative.
 - 1. Submit details of proposed pruning and repairs.
 - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to Certified Arborist's written instructions.
 - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Design Engineer.
- B. Trees: Remove and replace trees indicated to remain that are more than 25 percent dead or in an unhealthy condition or are damaged during construction operations that the Owner's Representative determines are incapable of restoring to normal growth pattern.

1. Small Trees: Provide new trees of same size and species as those being replaced for each tree that measures 6 inches or smaller in caliper size.
 2. Large Trees: Provide the quantity required of new tree(s) of 4-inch caliper size or larger that equals the caliper size of the tree being replaced, for each tree being replaced that measures more than 6 inches in caliper size.
 - a. Species: As selected by Owner's Representative.
 3. Plant and maintain new trees as specified in Section 329300 "Plants."
- C. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 4-inch uniform thickness to remain.

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 015639

SECTION 016000

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for products selected under an allowance.
 - 2. Section 012500 "Substitution Procedures" for requests for substitutions.
 - 3. Section 014200 "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other

characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - 2. Design Engineer's Action: If necessary, Design Engineer will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Design Engineer will notify Contractor through Construction Manager of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
 - b. Use product specified if Design Engineer does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
5. Protect stored products from damage and liquids from freezing.
6. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 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:** Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. **Special Warranty:** Written warranty required by the Contract Documents to provide specific rights for Owner.

B. **Special Warranties:** Prepare a written document that contains appropriate terms and identification, ready for 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 indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. **Submittal Time:** Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and 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.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Design Engineer will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
 4. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.

- b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
- 5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Design Engineer's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Design Engineer from manufacturer's full range" or similar phrase, select a product that complies with requirements. Design Engineer will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Design Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Design Engineer may return requests without action, except to record noncompliance with these requirements:
 - 1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 - 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - 3. Evidence that proposed product provides specified warranty.
 - 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 - 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300

EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.

- B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor and professional engineer.

- B. Certificates: Submit certificate signed by land surveyor and professional engineer certifying that location and elevation of improvements comply with requirements.
- C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
 - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 - 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
- D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- E. Certified Surveys: Submit two copies signed by land surveyor or professional engineer.
- F. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Design Engineer of locations and details of cutting and await directions from Design Engineer before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
 - a. Light Posts
 - b. Retaining Wall / Bulkhead
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in

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increased maintenance or decreased operational life or safety. Operational elements include the following:

- a. Electrical wiring systems.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
 - a. Water, moisture, or vapor barriers.
 - b. Equipment supports.
 - c. Piping, ductwork, vessels, and equipment.
- C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
 - D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Design Engineer for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 1. Before construction, verify the location and invert elevation at points of connection of storm sewer; underground electrical services, and other utilities.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Examine roughing-in for electrical conduit to verify actual locations of connections before equipment and fixture installation.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
1. Description of the Work.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Design Engineer and Construction Manager promptly.

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- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.
 - 6. Notify Design Engineer and Construction Manager when deviations from required lines and levels exceed allowable tolerances.
 - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Design Engineer and Construction Manager.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Design Engineer or Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Design Engineer and Construction Manager before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

- D. Certified Survey: On completion of retaining wall, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 - 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."
- F. Existing Utility Services: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - 5. Proceed with patching after construction operations requiring cutting are complete.
- H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.

- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 - 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 - 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls." Section 017419 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
 - 1. Section 311000 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:

1. Demolition Waste:

- a. Asphalt paving.
- b. Concrete.
- c. Concrete reinforcing steel.
- d. Brick.
- e. Concrete masonry units.
- f. Wood studs.
- g. Wood joists.
- h. Plywood and oriented strand board.
- i. Wood paneling.
- j. Wood trim.
- k. Structural and miscellaneous steel.
- l. Rough hardware.
- m. Equipment.
- n. Piping.
- o. Valves.
- p. Electrical conduit.
- q. Copper wiring.
- r. Lighting fixtures.
- s. Lamps.
- t. Ballasts.
- u. Electrical devices.

2. Construction Waste:

- a. Masonry and CMU.
- b. Lumber.
- c. Metals.
- d. Piping.
- e. Electrical conduit.
- f. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Plastic pails.

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1.5 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 7 days of date established for commencement of the Work.

1.6 INFORMATIONAL SUBMITTALS

- A. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- B. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

1.8 WASTE MANAGEMENT PLAN

- A. Comply with the following:
 - 1. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - 2. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - 1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until installation.
 4. Protect items from damage during transport and storage.
 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Sale and Donation: Not permitted on Project site.
- C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.
- D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
- E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- F. Plumbing Fixtures: Separate by type and size.
- G. Lighting Fixtures: Separate lamps by type and protect from breakage.

- H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 4. Store components off the ground and protect from the weather.
 - 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

- A. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
 - 1. Pulverize concrete to maximum 4-inch size.
 - 2. Crush concrete and screen to comply with requirements in Section 312000 "Earth Moving" for use as satisfactory soil for fill or subbase.
- B. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
 - 1. Pulverize masonry to maximum 1-inch size.
 - 2. Clean and stack undamaged, whole masonry units on wood pallets.
- C. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

- D. Metals: Separate metals by type.
 - 1. Structural Steel: Stack members according to size, type of member, and length.
 - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- E. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- F. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
 - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

3.6 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017419

SECTION 017700
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
- B. Related Requirements:
 - 1. Section 017300 "Execution" for progress cleaning of Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Construction Manager. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Construction Manager's signature for receipt of submittals.
 - 5. Submit test/adjust/balance records.
 - 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 3. Complete startup and testing of systems and equipment.
 - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 - 5. Advise Owner of changeover in heat and other utilities.

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6. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 8. Complete final cleaning requirements, including touchup painting.
 9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Design Engineer and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Design Engineer and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization 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. Use CSI Form 14.1A.
1. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 2. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Design Engineer and Construction Manager.
 - d. Name of Contractor.
 - e. Page number.
 3. Submit list of incomplete items in the following format:
 - a. MS Excel electronic file. Design Engineer, through Construction Manager, will return annotated file.
 - b. PDF electronic file. Design Engineer, through Construction Manager, will return annotated file.
 - c. Three paper copies. Design Engineer, through Construction Manager, will return two copies.

1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Design Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
1. Bind warranties and bonds in heavy-duty, three-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.

4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform 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: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building 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 designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access.
 - f. Clean exposed exterior finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

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- g. Remove labels that are not permanent.
 - h. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - i. Clean light fixtures to function with full efficiency.
 - j. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls." Section 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 2. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

END OF SECTION 017700

SECTION 017839

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
1. Record Drawings.
 2. Record Specifications.
 3. Record Product Data.
 4. Miscellaneous record submittals.
- B. Related Requirements:
1. Section 017300 "Execution" for final property survey.
 2. Section 017700 "Closeout Procedures" for general closeout procedures.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
1. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit PDF electronic files of scanned record prints and one of file prints.
 - 2) Design Engineer will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit PDF electronic files of scanned record prints and three set(s) of prints.
 - 2) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit one paper copy annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

- C. Record Product Data: Submit one paper copy annotated PDF electronic files and directories of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
 - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
 - 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Locations and depths of underground utilities.
 - d. Revisions to routing of piping and conduits.
 - e. Revisions to electrical circuitry.
 - f. Actual equipment locations.
 - g. Duct size and routing.
 - h. Changes made by Change Order or Construction Work Change Directive.
 - i. Changes made following Owner's written orders.
 - j. Details not on the original Contract Drawings.
 - k. Field records for variable and concealed conditions.

1. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Design Engineer and Construction Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 3. Refer instances of uncertainty to Design Engineer through Construction Manager for resolution.
 4. Owner will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
 - a. See Section 013300 "Submittal Procedures" for requirements related to use of Design Engineer's digital data files.
 - b. Design Engineer will provide data file layer information. Record markups in separate layers.
- C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 2. Consult Design Engineer and Construction Manager for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- D. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Design Engineer and Construction Manager.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
 5. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Submit record Specifications as annotated PDF electronic, file paper copy and scanned PDF electronic file(s) of marked-up paper copy of Specifications.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as annotated PDF electronic, file paper copy and scanned PDF electronic file(s) of marked-up paper copy of Product Data.
 1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file, paper copy and scanned PDF electronic file(s) of marked-up miscellaneous record submittals.
 - 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Design Engineer's and Construction Manager's reference during normal working hours.

END OF SECTION 017839

**TECHNICAL
SPECIFICATIONS**

SECTION 024116

STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of buildings and site improvements.
2. Abandoning in-place below-grade construction.
3. Disconnecting, capping or sealing, and abandoning in-place site utilities.
4. Salvaging items for reuse by Owner.
5. Resetting existing manholes in areas where existing grades will be revised.

B. Related Sections:

1. Section 011000 "Summary" for use of the premises and phasing requirements.
2. Section 013200 "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
3. Section 024119 "Selective Demolition" for partial demolition of buildings, structures, and site improvements.
4. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse. Include fasteners or brackets needed for reattachment elsewhere.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit informational report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection , for dust control and , for noise control. Indicate proposed locations and construction of barriers.
- B. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.
- C. Predemolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before the Work begins.
- D. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

1.7 PROJECT CONDITIONS

- A. Owner assumes no responsibility for buildings and structures to be demolished.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- B. Hazardous Materials: Hazardous materials are present in buildings and structures to be demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
 - 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

- C. On-site storage or sale of removed items or materials is not permitted.

PART 2 - PRODUCTS (Not Used)

2.1 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Section 312000 "Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations. Comply with Section 013233 "Photographic Documentation."
- D. Perform an engineering survey of condition of building/structures (if encountered) to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.
- E. Verify that hazardous materials have been remediated before proceeding with operations.

3.2 PREPARATION

- A. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.
 - 2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
 - 3. Cut off pipe or conduit a minimum of 24 inches (610 mm) below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
- B. Existing Utilities: See plumbing and electrical Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.
- C. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

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1. Strengthen or add new supports when required during progress of demolition.

D. Salvaged Items: Comply with the following:

1. Clean salvaged items of dirt and demolition debris.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to storage area designated by Owner.
5. Protect items from damage during transport and storage.

3.3 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.

B. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.

C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "Temporary Facilities and Controls."

1. Protect adjacent buildings and facilities from damage due to demolition activities.
2. Protect existing site improvements, appurtenances, and landscaping to remain.
3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.

D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.4 DEMOLITION, GENERAL

A. General: Demolish indicated buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
2. Maintain fire watch during and for at least 2 hours after flame cutting operations.
3. Maintain adequate ventilation when using cutting torches.

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STRUCTURE DEMOLITION

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4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- C. Explosives: Use of explosives is not permitted.

3.5 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.
- B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.
- C. Salvage: Items to be removed and salvaged are indicated on Drawings.
- D. Below-Grade Construction: Abandon foundation walls and other below-grade construction. Cut below-grade construction flush with grade.
- E. Existing Utilities: Abandon existing utilities and below-grade utility structures. Cut utilities 1 foot below proposed grade.
- F. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.

3.6 SITE RESTORATION

- A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.
- B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.7 REPAIRS

- A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill acceptable to authorities having jurisdiction. See Section 017419 "Construction Waste Management and Disposal" for recycling and disposal of demolition waste.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Do not burn demolished materials.

3.9 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.
 - 1. Clean roadways of debris caused by debris transport.

END OF SECTION 024116

SECTION 024119

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of selected site elements, including the removal of extraneous metal from top surface of the southern-most bulkhead (adjacent to the South Overlook)
- B. Related Requirements:
 - 1. Section 011000 "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
 - 2. Section 015639 "Temporary Tree and Plant Protection" for temporary protection of existing trees and plants that are affected by selective demolition.
 - 3. Section 017300 "Execution" for cutting and patching procedures.
 - 4. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

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- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

- 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.

- 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property , for environmental protection , for dust control and , for noise control. Indicate proposed locations and construction of barriers.
- B. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.
- C. Predemolition Photographs: Submit before Work begins.
- D. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.
- B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.8 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

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SELECTIVE DEMOLITION

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- C. Notify Owner of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: Hazardous materials are present on site to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
 - 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.
- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Owner.

- E. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
 - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
- F. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs.
 - 1. Comply with requirements specified in Section 013233 "Photographic Documentation."
 - 2. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
 - 3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
 - 1. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary."
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.
 - 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 3. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 5. Maintain adequate ventilation when using cutting torches.
 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."
- B. Removed and Salvaged Items:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.

3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.
- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 026113

EXCAVATION OF CONTAMINATED MATERIALS HANDLING

PART 1 - GENERAL

1.1 REFERENCE

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only:
 - 1. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
 - a. ANSI A10.6 Safety Requirements for Demolition Operations
 - 2. CODE OF FEDERAL REGULATIONS (CFR)
 - a. 40 CFR Parts 260-268, Hazardous Waste Regulations
 - b. 40 CFR 761, Toxic Substance Control Act, Manufacture and Process of Polychlorinated Biphenyls

1.2 RELATED DOCUMENTS

- A. The City of Philadelphia, PADEP, USEPA and OSHA Waste Management and Safety Standards.
- B. PADEP Title 25 Chapter 261 Subchapters A-D regarding classification of Hazardous Waste.
- C. PADEP Title 25 Chapter 287 regarding classification of Municipal and Residual Wastes.
- D. PADEP Management of Fill Policy (Document Number 258-2182-773 Dated 8/7/2010).
- E. 2014 Urban Engineers, Inc. Soil and Waste Management Plan for Schuylkill River Trail Extension – South Street to Christian Street.

1.3 DESCRIPTION

- A. This specification covers the handling and disposal of contaminated material and unanticipated contaminated material that may be encountered during the course of work.
- B. The Contractor shall also follow the Soil Management Plan and Erosion and Sediment (E&S) Control Plan prepared by Urban Engineers, Inc. for the implementation of contaminated soil handling and management procedures.
- C. Urban prepared a Phase I Environmental Site Assessment (ESA) for the subject site simultaneously with a Phase II ESA in August 2012. Based on the historical maps and record search, Urban determined that the site has been vacant and/or used for railroad-related operations since the early 1900s. The surrounding properties were previously used for industrial and commercial purposes. The Phase II ESA consisted of the collection and analyzes of soil samples from 10 soil borings completed on July 26, 2012. Two soil samples were collected from each borehole; the first at approximately 1 foot below grade and the second at approximately 4 feet below grade.

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EXC. OF CONTAMINATED MATERIALS

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- D. Soil and water encountered during excavations shall be assumed to be regulated material (with the exceptions of the hot-spots noted in the Soil Management Plan) unless visual, olfactory, or field instrumentation indicates the potential for contaminated material to be present.
- E. According to the PADEP Bureau of Waste Management's Management of Fill Policy (258-2182-773), excavation, movement or reuse of fill material within a project area or right-of-way of a project is not an activity that requires a Solid Waste Management Act permit. This applies to all site soils that meet the regulated fill standards (PADEP Tables GP-1a and GP-1b). Based on this policy, soils that meet the regulated fill standards will remain onsite and be managed in accordance with this plan and the project E&S and SMP plan drawings (Erosion and Sediment Control Plans 1-3, Sheets 13-16).
- F. All work under this item shall be conducted in strict conformance to all Federal, State, and Local codes, ordinances, regulations, rules and statutes. Materials will be kept segregated from each other to prevent cross-contamination.
- G. This project involves above and below grade work along a rail line. As such, the contractor will encounter a number of materials that must be handled, stored and/or disposed in accordance with proper city, state and federal waste disposal requirements. It is anticipated that the following types of materials may be encountered:
 - 1. Clean Fill as that term is defined in the Pennsylvania Management of Fill Policy. Document Number 258-2182-773 Dated 8/7/2010.
 - 2. Historically contaminated soils, which with PADEP's approval, can be managed and reused onsite. This material is also referred to as Impacted Soil/Material.
 - 3. Unanticipated Subsurface Hazardous Waste - the term Hazardous Waste is defined in the Pennsylvania Hazardous Waste regulations.
 - 4. Residual Waste – the term Residual Waste is defined in the PADEP Codes Title 25 Chapter 287 and includes excavated materials/soils taken off-site.
 - 5. Impacted Groundwater – groundwater in excavations that has been impacted by historical site contaminants.
- H. If contaminated materials are encountered, other than those noted in the Soil Management Plan, the Contractor shall conduct sampling to determine the concentrations of suspected contaminants within soils such that the material can be appropriately managed. At a minimum, the sampling program shall provide for the analysis of soils and materials as required by the disposal site. Handling, storage, reuse "on-site" with the Owner's permission, and/or off-site disposal of all excavated materials/soil and other waste products shall be the responsibility of the Contractor.
- I. Excavation, Stockpiling, Loading, Transportation, and Disposal of Contaminated Waste Materials:
 - 1. This work includes the excavation, stockpiling, on-site loading, transportation, and off-site disposal of contaminated wastes (material exceeds regulated fill standards) from the work site to an approved and permitted waste disposal facility.
 - 2. The Contractor shall follow the 2014 Soil Management Plan prepared by Urban Engineers, Inc.
 - 3. The on-site excavation and loading of contaminated waste materials is to be conducted in such a manner as to minimize the generation of fugitive dust and prevent the contamination of surface waters and surface areas. All wastes are to be properly contained, labeled and covered during processing, storage and transportation.
 - 4. So that the Owner may track the disposal of such materials, the Contractor shall provide weigh slips from a local weigh station for all materials prior to shipping.

- J. Excavation and Temporary Storage of Unanticipated Subsurface Hazardous Wastes.
 - 1. Hazardous waste is not anticipated, but may be encountered during the course of work. The Contractor shall furnish all labor, materials, and equipment required for the demolition and removal of hazardous wastes as specified under this bid document. Prior to the handling of any hazardous waste, including but not limited to Unanticipated Subsurface Hazardous Waste, the Contractor shall contact Owner.

1.4 SUBMITTALS

- A. Section 013300 – Submittal Procedures: Requirements for submittals.
- B. Statements:
 - 1. Site Specific Health and Safety Plan
 - 2. Preparedness, Prevention and Contingency (PPC) Plan
 - 3. Excavation and Contaminated Material Handling Plan, including material sampling and test program
 - 4. Hazardous Waste Management Plan
 - 5. Field Sampling and Laboratory Testing Plan
 - 6. Copies of any requests for on-site recycling of materials and appropriate PADEP/City approvals
 - 7. Copies of Notification Letters to regulatory agencies and city departments
 - 8. Copies of Permits obtained by Contractor
 - 9. Copies of Correspondence with Agencies
- C. Required Data:
 - 1. Site Specific Health and Safety Plan
 - a. The Contractor shall develop a site specific health and safety plan (HASP) in accordance with 29 CFR 1910.120 including a personal protection program. This HASP must be submitted to Owner at least ten (10) days prior to the start of work. In addition, the HASP must be kept on site during all phases of work conducted in this area. Refer to the Soil Management Plan for additional Health and Safety Procedures.
 - 2. Preparedness, Prevention and Contingency (PPC) Plan
 - a. If the Contractor or any subcontractor/vendor proposes to use, store, process or dispose of chemicals, solvents, or other hazardous wastes (including fuel oils and gasoline), then a Preparedness, Prevention and Contingency (PPC) Plan must be prepared, implemented and maintained by the Contractor.
 - 3. Excavation and Contaminated Material Management Plan
 - a. Describe methods, means, equipment, sequence of operations and schedule to be employed in excavation, loading, transport, handling, and stockpiling of soil during soil excavation. At least ten (10) days before beginning work, submit to Owner for prior approval a material handling and sampling plan that describes methods and protocols for dealing with the potentially contaminated soil and water as it relates to the proposed work, including methods of excavating, a material management plan for the contaminated materials, a sampling program, safety precautions and requirements, and dewatering procedures (including disposal).
 - b. Excavation and contaminated material handling plan shall include procedures for coordination with other work in progress, a disconnection schedule of utility services, a detailed description of methods and equipment to be used for each operation and of the sequence of operations. Personnel and equipment decontamination procedures shall also be indicated. Contractor will provide Owner

with all appropriate correspondence, copies of documentation submitted to agencies for review, and permits/approvals for removal/disposal activities herein.

- c. On-site bituminous pavement, unused bricks, and concrete shall be washed to remove contaminants such that these materials can be reused on-site to the extent practicable. Materials that will be reused as “structural fill” must meet the engineering and soils compaction technical and size gradation requirements for the intended usage. This would exclude the use of organic or other unacceptable materials. Backfill shall be in accordance with the specifications.
 - d. The Contractor is obligated to backfill and grade the site to the final elevations shown on the plans whether or not such on-site materials are available in the quantities required.
 - e. If the Contractor elects to dispose of such materials off-site, the Contractor shall provide documentation from the disposal site regarding the need for washing and removal of contaminants prior to transportation and disposal.
 - f. The Contractor shall develop, implement, and maintain a comprehensive spill and discharge control plan. The plan shall provide contingency measures for potential spills and discharges from handling and transportation of impacted soils, water and wastes, or from accidental spills from their equipment or refueling vehicles.
4. Hazardous Waste Management Plan
- a. Identification of hazardous wastes, other than historically contaminated soils, associated with the work.
 - b. Estimated quantities of wastes to be encountered and disposed.
 - c. Names and qualifications of each subcontractor/vendor that will be transporting, storing, treating, and disposing of the wastes. Include the facility location and a 24-hour point of contact. Furnish two copies of EPA and state hazardous waste permits and EPA Identification numbers.
 - d. Names and qualifications (experience and training) of personnel who will be working on-site with hazardous wastes.
 - e. List of waste handling equipment to be used in performing the work.
 - f. Spill prevention, containment, and contingency measures to be implemented.
 - g. Work plan and schedule for waste containment, removal and disposal. Wastes shall be cleaned up and containerized daily.
 - h. Cost for hazardous waste disposal according to this plan.
 - i. The hazardous waste plan shall be submitted to Owner for approval at least ten (10) days prior to the start of the work.
5. Field Sampling and Laboratory Testing Plan (Include in Excavation and Contaminated Material Handling Plan)
- a. The Contractor will be responsible for field sampling and laboratory analysis as required by the disposal facility.

D. Records

1. Submit copies of all records prior to start of work or monthly for disposal activities.
 - a.
 - b. Waste disposal documentation.
 - c. Organic Vapor Analyzer (OVA) calibration records and test results from field sampling.
 - d. Laboratory records for all analytical results.

E. Reports

1. Submit copies of all reports monthly.
 - a. Results of excavations, including location of soil excavated and the associated Organic Vapor Analyzer (OVA) reading, sampling and test results.

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EXC. OF CONTAMINATED MATERIALS

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- b. If directed to excavate soils, the Contractor shall maintain a log indicating the cumulative quantities of soil excavated, beginning with start date for each excavated areas.
- c. Maps and sketches showing the location of temporary storage areas and the ultimate disposal sites for all on site materials by type and mix. Where appropriate, maps should be matched to material logs.

1.5 AREAS OF CONTAMINATION

- A. The Contractor shall follow the Soil Management Plan.
- B. If the Contractor discovers unanticipated contamination, the Contractor shall notify the owner and store the materials appropriately in accordance with federal, state and local requirements. Temporary stockpiles of suspect materials shall be covered with plastic sheeting or stored in lined and sealed containers as necessary to complete the demolition work, until testing results have been returned and disposal plans developed.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials that will be reused as “structural fill” must meet the engineering and soils compaction technical and size gradation requirements for the intended usage. This would exclude the use of organic or other unacceptable materials. Backfill shall be in accordance with specifications. Additionally, the Contractor shall provide materials needed for containment and storage of all excavated materials, and for the segregation of materials for reuse or disposal.
- B. Plastic sheeting for soil and waste stockpiles shall be per ASTM D4397 and placed on existing ground to control leaching and to be used as cover to prevent exposure to weather and cross-contamination of other areas. This sheeting may also be used to protect and cover roll-off containers.

PART 3 - EXECUTION

3.1 HEALTH AND SAFETY PLAN (HASP)

- A. The Contractor is required to implement measures to protect the health and safety of workers in this area. The Contractor shall develop and implement a site specific health and safety plan (HASP) in accordance with 29 CFR 1910.120 including a personal protection program. The excavation subcontractor personnel shall be trained in the proper use of personnel protective equipment (PPE). Refer to the Soil Management Plan for additional Health and Safety Procedures.
- B. **SITE SAFETY AND HEALTH OFFICER (SSHO)**
 - 1. The Contractor shall identify an individual to serve as the Site Safety and Health Officer (SSHO). The SSHO shall report problems and concerns regarding health and safety to the Owner. The SSHO shall have a working knowledge of local and Federal occupational safety and health regulations, and shall provide training as required to Contractor employees in air monitoring practices and techniques. The SSHO shall also provide day-to-day industrial hygiene support, including air monitoring, training, and daily site safety inspections as required. The SSHO shall be trained in the use of the monitoring and sampling equipment, interpretation of data required to implement the HASP, and to

administer the elements of the HASP. The SSHO shall be both 40-hour OSHA “HAZWOPER” and 8 Hours “Supervisor” trained and meet the supervisor criteria. The SSHO shall remain on site during project operations and may be assigned other duties, such as project foreman or quality control manager.

3.2 EXCAVATION AND STAGING

- A. The Contractor will identify suspected contaminated soil and other material based upon a review of previous investigations conducted by the Owner or others, visual inspection and instrument monitoring by the Contractor. All such excavated materials shall be stockpiled in the proper manner per PADEP requirements, segregating clean fill, impacted materials such as contaminated soil, and hazardous wastes. The stockpiles shall be maintained, with proper erosion and sedimentation controls and protective liners and covers, until confirmatory sampling and testing is complete and the material is removed from the storage area for proper disposal or on-site reuse.
1. Excavation and Staging Procedure
 - a. Notify Owner at least ten (10) days prior to start of work. Operations should be staged to minimize the time that excavations are open and the time that excavated materials are exposed to the weather. Provide protection measures around excavation areas to prevent storm water run-on and run-off, to contain the soil and building materials within the excavation areas, and to prevent accidental falls or driving hazards. Protective barricades, and other pedestrian/traffic control devices shall be used until the work area is restored to the specified final grades and lines, the surface areas are stabilized, and Owner has given written approval for their removal.
 - b. Excavate to the limits specified to minimize excavation of soils. Place soil removed from the excavations in a temporary storage and containment area approved by Owner. Soil identified by the Contractor to be potentially contaminated (e.g., heavy staining, elevated OVA readings, odors, etc.) shall be segregated and placed into lined and sealed containers, or a lined and covered containment area, as necessary to complete excavation operations. The Owner shall be notified of the potentially contaminated material and the Owner’s Representative will be available to inspect potentially contaminated soils.
 - c. The Contractor shall continuously monitor soils/materials that are excavated with an OVA capable of detecting volatile organic vapors to a minimum of one PPM. At least one OVA shall be provided for each excavation crew. Potentially impacted soils with OVA readings greater than background shall be segregated as specified herein.
 - d. The location of containment areas and storage containers shall be approved by Owner’s Representative and located by the Contractor so as not to impact future construction activities.
 - e. Material that becomes contaminated as a result of the Contractor’s operations shall be removed, disposed of, and replaced at no additional cost to the Owner.

3.3 SAMPLING AND TESTING

- A. For materials/soils that cannot be reused on-site, a soil disposal characterization analytical program shall be implemented by the Contractor. The extent of the analytical requirements for disposal will be the responsibility of the Contractor based upon the disposal facility requirements and the PADEP Management of Fill Policy. The Contractor will provide a listing of the disposal facility’s analytical requirements and acceptance criteria.

3.4 DUST AND DEBRIS CONTROL

- A. Contractor shall prevent the spread of dust and debris, and avoid the creation of a nuisance or hazard in the surrounding area. Contractor shall not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution. Refer to Section 007353 "Pollution Prevention and Environmental Requirements" for other requirements.

3.5 DISPOSITION OF MATERIAL

- A. Title to materials resulting from materials and equipment to be removed from the site is vested in the Contractor. If manifests or bills of lading are required for the removal or disposal of materials, the Contractor shall perform required sampling and tests, and prepare the manifests for Owner's signature. If the Owner has not obtained a US EPA Hazardous Waste Generator's Identification (ID) Number, then the Contractor shall secure a Temporary ID Number on the Owner's behalf, if necessary.
- B. The Contractor shall notify the Owner prior to disposal of contaminated materials. Based on the sampling results PADEP may allow for the material to be reused onsite under capped structures. Contaminated materials/soil approved for offsite disposal shall be disposed at a permitted facility approved, in advance of disposal, by the Owner. Copies of all sampling results and disposal records shall be furnished to the Owner. The Contractor shall be responsible for transport of all materials.

3.6 CLEANUP

- A. Debris and Rubbish
 - 1. Contractor shall remove, stockpile and transport debris, and rubbish in a manner that will prevent cross-contamination and spillage on adjacent areas or roadways.
- B. Wash Waters
 - 1. Liquids may be produced during sampling, testing, decontamination and/or disposal during the Contractor's work. The Contractor is solely responsible for such wastes and shall properly dispose of all such fluids.

3.7 PREPAREDNESS, PREVENTION, AND CONTINGENCY (PPC) PLAN

- A. A Preparedness, Prevention and Contingency (PPC) Plan must be prepared, implemented and maintained by the Contractor.

3.8 CONTRACTOR'S QUALITY CONTROL

- A. Conform to all applicable Federal, State and local requirements, prior and during demolition, and the requirements of Section 014000 "Quality Requirements".

3.9 MEASUREMENT

- A. Preparation and implementation of the various plans required by this Section will be incidental to the demolition and construction work and there will be no measurements.
- B. Known Contamination and Special Handling Residual Wastes. No measurement will be made for the following activities, as the work is incidental to the demolition and construction work:

Clean fill, Construction and Demolition Waste, Embankment and Stockpiles, Special Handling Residual Waste, Recyclable Materials, and Municipal Waste.

- C. Compliance with the general requirements of this section. No measurement will be made of clean fill, historically contaminated soils, impacted non-hazardous soils handled or removed, or the other general requirements of this section. No payment will be provided for such activities or the removal and disposal of such materials.
- D. The quantity of Unanticipated Subsurface Hazardous Waste removed and placed in specified roll-off containers and containment areas is to be measured on a cubic yardage basis as determined by the Engineer. Cubic yardage shall be measured in its original position.

3.10 PAYMENT

- A. Payment for preparation, implementation and enforcement of the various of Plans will be incidental to the demolition work lump sum price and shall include full compensation for furnishing all material, equipment, tools, sampling, testing and analysis, and for all labor and incidentals necessary to complete the prescribed work.
- B. Clean fill, municipal waste, and construction and demolition waste are incidental to construction work and no addition compensation will be made.
- C. The removal, storage, and disposal of Unanticipated Residual Waste in sealed containers shall be paid on a Unit Price Basis and shall include the cost of providing lined and sealed roll-off containers for a period of up to 90-days. The cost of sampling such materials for disposal is part of the contractor's sampling program.
- D. The removal, storage, and disposal of Unanticipated Subsurface Hazardous Waste in sealed containers shall be paid on a Unit Price Basis and shall include the cost of providing lined and sealed roll-off containers for a period of up to 90-days. The cost of sampling such materials for disposal is part of the contractor's sampling program.

END OF SECTION 026113

SECTION 033001

CONCRETE FORMWORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Special Provisions, Supplementary Conditions, and Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. Provisions of this section include installation and removal of formwork necessary to form cast-in-place concrete.

1.3 REFERENCES

- A. ACI 318 – Building Code Requirements for Reinforced Concrete
- B. ACI 347 – Guide To Formwork For Concrete
- C. ACI 305 – Hot Weather Concreting
- D. ACI 306 – Cold Weather Concreting

PART 2 PRODUCTS

2.1 GENERAL.

- A. The Contractor shall be responsible for the design, construction and safety of all formwork, in accordance with ACI 347.

2.2 FORM COATINGS.

- A. Form surfaces which will be in contact with concrete must be treated with an effective bond-breaking form coating, in accordance with ACI 347.

2.3 TIES.

- A. The form ties used shall have waterstops designed for the liquid pressure to be retained. They shall not be pulled completely out of the wall. The ends of the tie metal after breaking shall be at least 1.5 inches from the face of the wall.

PART 3 EXECUTION

3.1 INSTALLATION

- A. In hot (greater than 90 °F), dry (less than 30% relative humidity) climates, wood forms remaining in place shall not be considered adequate for curing, but shall be removed or loosened so that the concrete surfaces can be kept moist by soaking with weeper hoses or coated with a curing membrane. In cold weather, removal of formwork shall be deferred or formwork shall be replaced with insulation blankets, to avoid thermal shock and consequent crazing of the concrete surface.
- B. Suggestions for good formwork, curing, and finishing practices are found in ACI 302, ACI 306, ACI 347, ACI 318, ACI 605 and ACI Committee 308.
- C. Large horizontal concrete sections shall be poured in an approved sequence to reduce shrinkage stresses.
- D. Approved bar chairs shall be used where required. The use of large aggregate or brick will not be permitted to provide clearance between the formwork and reinforcing steel.
- E. Formwork must be anchored to the shores below so that movement of any part of the formwork system will be prevented during concreting.
- F. Formwork shall be designed to support the poured concrete and achieve the correct dimensions within established tolerances..

3.2 SURFACE PREPARATION

- A. Prior to placing concrete, forms will be inspected for cleanliness and accuracy of alignment. Form surfaces which will be in contact with concrete must be treated with an effective bond-breaking form coating, in accordance with ACI 347. Re-shoring shall be done in accordance with ACI 301.

3.3 REMOVAL OF FORMS

- A. Formwork shall not be removed before the concrete has developed at least 70 percent of its design strength, unless approved by the Engineer.
- B. No formwork shall be removed prior to 12 hours after concrete has been poured.
- C. Forms shall be removed in a manner such that no damage to the concrete occurs.

PART 4 CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements".

END OF SECTION 033001

SECTION 033053

MISCELLANEOUS CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes for:
 - 1. Concrete pads for benches
 - 2. Concrete foundations for rail posts
- B. Related Requirements:
 - 1. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture.

1.4 QUALITY ASSURANCE

- A. Ready-Mix-Concrete 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.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. Comply with the following sections of ACI 301 unless modified by requirements in the Contract Documents:
 - 1. "General Requirements."
 - 2. "Formwork and Formwork Accessories."

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3. "Reinforcement and Reinforcement Supports."
4. "Concrete Mixtures."
5. "Handling, Placing, and Constructing."
6. "Lightweight Concrete."

B. Comply with ACI 117.

2.2 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.
- C. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- D. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

2.3 CONCRETE MATERIALS

- A. Regional Materials: Concrete shall be manufactured within 500 miles of Project site from aggregates and cementitious materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. 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.
- C. Cementitious Materials:
 1. Portland Cement: ASTM C 150/C 150M, Type I.
 2. Fly Ash: ASTM C 618, Class C or F.
 3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
 4. Blended Hydraulic Cement: ASTM C 595/C 595M, Type IP, portland-pozzolan cement.
- D. Normal-Weight Aggregate: ASTM C 33/C 33M, 1-1/2-inch nominal maximum aggregate size.
- E. Lightweight Aggregate: ASTM C 330/C 330M, 1-inch nominal maximum aggregate size.
- F. Air-Entraining Admixture: ASTM C 260/C 260M.
- G. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do 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.

H. Water: ASTM C 94/C 94M.

2.4 FIBER REINFORCEMENT

- A. Synthetic Micro-Fiber: Monofilament polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.

2.5 RELATED MATERIALS

- A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

2.6 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
1. VOC Content: 200 g/L or less.

2.7 CONCRETE MIXTURES

- A. Comply with ACI 301.
- B. Normal-Weight Concrete:
1. Minimum Compressive Strength: 3000 psi at 28 days.
 2. Maximum W/C Ratio: 0.40.
 3. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
 4. Slump Limit: 4 inches, plus or minus 1 inch.

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5. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of trowel-finished floor slabs to exceed 3 percent.
- C. Structural Lightweight Concrete Mix: ASTM C 330/C 330M, proportioned to produce concrete with a minimum compressive strength of 3000 psi at 28 days and a calculated equilibrium unit weight of 110 lb/cu. ft. plus or minus 3 lb/cu. ft., as determined by ASTM C 567/C 567M. Concrete slump at point of placement shall be the minimum necessary for efficient mixing, placing, and finishing.
 1. Limit slump to 5 inches for troweled slabs and 4 inches for other slabs.
- D. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than a rate of 1.0 lb/cu. yd..

2.8 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 above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. 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.
 1. For mixer capacity 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.
 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, construct, erect, brace, and maintain formwork according to ACI 301.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 STEEL REINFORCEMENT INSTALLATION

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.4 CONCRETE PLACEMENT

- A. Comply with ACI 301 for placing concrete.
- B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- C. Do not add water to concrete during delivery, at Project site, or during placement.
- D. Consolidate concrete with mechanical vibrating equipment according to ACI 301.
- E. Equipment Bases and Foundations:
 - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 - 2. Construct concrete bases 4 inches high unless otherwise indicated; and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 - 3. Minimum Compressive Strength: 3000 psi at 28 days.
 - 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor them into structural concrete substrate.
 - 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.5 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 exceeding 1/2 inch.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch.
 - 1. Apply to concrete surfaces exposed to public view,.

- C. Rubbed Finish: Apply the following rubbed finish, defined in ACI 301, to smooth-formed-finished as-cast concrete where indicated:
 - 1. Smooth-rubbed finish.
 - 2. Grout-cleaned finish.
 - 3. Cork-floated finish.
- D. Related Unformed Surfaces: At tops of walls, 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.

3.6 FINISHING UNFORMED SURFACES

- A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
 - 1. Do not further disturb surfaces before starting finishing operations.
- C. Scratch Finish: Apply scratch finish to surfaces indicated and surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes unless otherwise indicated.
- D. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, fluid-applied or direct-to-deck-applied membrane roofing, or sand-bed terrazzo.
- E. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.
- F. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset methods. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
- G. Slip-Resistive Broom Finish: Apply a slip-resistive finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.7 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 with ACI 301 for hot-weather protection during curing.
- B. 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.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure formed and unformed concrete for at least seven days 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:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. 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. Cure for not less than seven days. 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.
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a 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. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a PENNDOT qualified testing agency to perform tests and inspections.
- B. Tests: Perform according to ACI 301.

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

END OF SECTION 033053

SECTION 055213

PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Steel pipe and tube railings.

- B. Related Requirements:

- 1. Section 033053 "Miscellaneous Cast-in-Place Concrete" for cast-in-place concrete and post footings.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:

- 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Railing brackets.
 - 3. Grout, anchoring cement, and paint products.

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

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- C. Samples: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 - 2. Fittings and brackets.
 - 3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
 - a. Show method of connecting and finishing members at intersections.
- D. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- E. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
- F. Evaluation Reports: For post-installed anchors , from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

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1.9 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
 - b. Infill load and other loads need not be assumed to act concurrently.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient.

1.10 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
 - 1. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

1.11 STEEL AND IRON

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Tubing: ASTM A 500 (cold formed) or ASTM A 513.
- C. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish for exterior installations and where indicated.
- D. Plates, Shapes, and Bars: ASTM A 36/A 36M.

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1.12 FASTENERS

A. General: Provide the following:

1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.
2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
3. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

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

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
3. Provide flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 Group 2 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

1.13 MISCELLANEOUS MATERIALS

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

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

B. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

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- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Shop Primers: Provide primers that comply with Section 099600 "High-Performance Coatings."
- F. 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.
- G. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- H. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- I. Intermediate Coats and Topcoats: Provide products that comply with Section 099600 "High-Performance Coatings".
- J. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.
- K. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.
- L. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- M. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- N. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - 1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

1.14 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

- C. 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.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 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 flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- J. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- K. Form Changes in Direction as Follows:
 - 1. As detailed.
 - 2. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.
- L. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- M. Close exposed ends of railing members with prefabricated end fittings.
- N. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- O. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- P. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- Q. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.
- R. For removable railing posts, fabricate slip-fit sockets from steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
 1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.
- S. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

1.15 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
 2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
 3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
 4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
- D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, galvanize anchors to be embedded in exterior concrete or masonry.
- E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." SSPC-SP 3, "Power Tool Cleaning." requirements indicated below:

1. Exterior Railings: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 2. Railings Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 3. Railings Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 4. Other Railings: SSPC-SP 3, "Power Tool Cleaning."
- F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
1. Shop prime uncoated railings with primers specified in Section 099600 "High-Performance Coatings" are indicated.
 2. Do not apply primer to galvanized surfaces.
- G. Shop-Painted Finish: Comply with Section 099600 "High-Performance Coatings."
1. Color: Match Design Engineer's sample.
- H. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.
1. Color: Match Design Engineer's sample.

1.16 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines, or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. 180-Grit Polished Finish: Oil-ground, uniform, directionally textured finish.
- D. 320-Grit Polished Finish: Oil-ground, uniform, fine, directionally textured finish.
- E. Polished and Buffed Finish: Oil-ground, 180-grit finish followed by buffing.
- F. Directional Satin Finish: No. 4.
- G. Dull Satin Finish: No. 6.
- H. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 2 - EXECUTION

2.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

2.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 - 1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

2.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

2.4 ANCHORING POSTS

- A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.
- D. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.
- E. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For aluminum pipe railings, attach posts using fittings designed and engineered for this purpose.
 - 2. For stainless-steel pipe railings, weld flanges to post and bolt to supporting surfaces.
 - 3. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.
- F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

2.5 ADJUSTING AND CLEANING

- A. Clean steel by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099600 "High-Performance Coatings."
- D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

2.6 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 055213

SECTION 071800

TRAFFIC COATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This specification describes the application of a seamless waterproofing membrane resistant to specified traffic wear exposures. The specified products shall meet or exceed requirements of ASTM C957, High-Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with Integral Wearing Surface.

1.2 QUALITY ASSURANCE

- A. Manufacturing qualifications: The manufacturer of the specified product shall be ISO 9001/9002 certified and have in existence a recognized ongoing quality assurance program independently audited on a regular basis.
- B. Contractor qualifications: Contractor shall be qualified in the field of concrete repair and protection with a successful track record of 5 years or more. Contractor shall maintain qualified personnel who have received product training by a manufacturer's representative.
- C. Install materials in accordance with all safety and weather conditions required by manufacturer or as modified by applicable rules and regulations of local, state and federal authorities having jurisdiction. Consult Material Safety Data Sheets for complete handling recommendations.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. All materials must be delivered in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers. Damaged material must be removed from the site immediately.
- B. Store all materials off the ground and protect from rain, freezing or excessive heat until ready for use.
- C. Condition the specified product as recommended by the manufacturer.

1.4 JOB CONDITIONS

- A. Environmental Conditions: Do not apply material if it is raining or snowing or if such conditions appear to be imminent. Minimum application temperature 40°F (5°C) and rising.
- B. Protection: Precautions should be taken to avoid damage to any surface near the work zone due to mixing and handling of the specified coating.

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1.5 SUBMITTALS

- A. Submit two copies of manufacturer's literature, to include: Product Data Sheet, and appropriate Material Safety Data Sheets (MSDS).

1.6 WARRANTY

- A. Provide a written warranty from the manufacturer against defects of materials for a period of one (1) year, beginning with date of substantial completion of the project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. To define requirements for traffic bearing deck surfacing this specification lists specific products manufactured by Sika Corporation. Subject to compliance with requirements, equivalent products by other manufacturers listed below may be provided.
 - 1. Neogard Corporation
 - 2. Tremco Manufacturing Co.
 - 3. Crossfield Products Corp.
 - 4. 3M Contractor Products
- B. Any materials required for repair prior to installation shall be manufactured by the same supplier of the proposed traffic coating system.
- C. Materials specified herein are cited as minimum standard of quality that will be acceptable and shall not preclude consideration of equivalent or superior materials. Suggested substitutions by manufacturers other than acceptable manufacturers listed above shall be submitted to Architect for consideration in compliance with substitution procedures in Section 012500.

2.2 MATERIALS

- A. Sikalastic 710/715 Traffic System is a complete system of compatible materials comprised of the following:
 - 1. Sikafloor FTP water-based epoxy primer or other primer recommended by manufacturer
 - 2. Sikalastic 710 Base one-component aromatic polyurethane base coat
 - 3. Sikalastic 715 Top one-component aromatic polyurethane top coat
 - 4. Sikalastic 700 ACL accelerator (optional)
 - 5. Sikalastic 735 AL, 736 AL Lo-VOC and 748 PA optional aliphatic top coats
- B. Total dry film thickness exclusive of aggregate shall be 33 mils for pedestrian traffic, 43 mils for heavy pedestrian and light vehicular traffic, and 55 mils for heavy vehicular traffic. See data sheet System Guide for coverage rates and application methods.

- C. Aggregate shall be clean, rounded, oven dried quartz sand with a minimum gradation of 16-30 mesh for vehicular traffic and 20-40 mesh for pedestrian traffic, and a minimum hardness of 6.5 per the Moh's scale. Aggregate shall be supplied in pre-packaged bags and free of metallic or other impurities.

2.3 PERFORMANCE CRITERIA

- A. Properties of standard Sikalastic base and top coats:

	710 Base	715 Top
Viscosity	6500 +/- 3000 cps	1500 +/- 500 cps
Total Volume Solids (ASTM D2697)	71%	72%
VOC Content (ASTM D2369-81)	240 g/l	243 g/l
Tensile Strength (ASTM D412)	800 +/- 100 psi	3200 +/- 300 psi
Elongation at Break (ASTM D412)	500 +/- 50%	500 +/- 50%
Tear Resistance (Die C, ASTM D624)	250 +/- 25 pli	350 +/- 50 pli
Hardness (ASTM D2240)	55 +/- 5 Shore A	85 +/- 5 Shore A

- B. Properties of optional Sikalastic aliphatic top coats

	735 AL	736 AL Lo-VOC	748 PA
Viscosity	2500 +/- 700 cps	3500 +/- 700 cps	200 +/- 50 cps
Total Volume Solids (ASTM D2697)	74%	83%	78%
VOC Content (ASTM D2369-81)	225 g/l	99 g/l	100 g/l
Tensile Strength (ASTM D412)	4200 +/- 300 psi	4000 +/- 300 psi	2500 +/- 200 psi
Elongation at Break (ASTM D412)	230 +/- 50%	250 +/- 50%	100 +/- 25%
Tear Resistance (Die C, ASTM D624)	400 +/- 50 pli	400 +/- 50 pli	300 +/- 50 pli
Hardness (ASTM D2240)	90 +/- 5 Shore A	90 +/- 5 Shore A	50 +/- 5 Shore D

Note: Tests were performed with material and curing conditions at 75F and 50% relative humidity.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. The substrate must be clean, dry, sound and free of surface contaminants. Remove all traces of dust, laitance, grease, oils, curing compounds, form release agents and foreign particles by mechanical means, i.e. – milling, scarifying, shotblasting, etc., as approved by the engineer. Blow surface free of dust using compressed air line equipped with an oil trap. Surface Preparation Surface must be clean, dry and sound with an open texture. Remove dust, laitance, grease, curing. All projections, rough spots, etc. should be dressed off to achieve a level surface prior to the application.
- B. Concrete should be cleaned and prepared to achieve a laitance and contaminant free, open textured surface by blast cleaning or equivalent mechanical means (CSP 3-4 per ICRI guidelines).

- C. Plywood should be clean and smooth, APA and exterior grade, not less than 1/2" thick, and spaced and supported according to APA guidelines. Seams should be sealed with Sikflex 2c or 1a and detailed and may need imbedded fabric reinforcement.
- D. Metal should be thoroughly cleaned by grinding or blast cleaning.

3.2 PRIMING

- A. Concrete and plywood – Apply Sikafloor FTP primer at 300 sf/gal. with a flat squeegee or roller and work well into the substrate to insure adequate penetration and sealing and puddles are avoided. Refer to data sheet for more detailed information, or consult Sika for other primer options.
- B. Premix both components. Sikafloor FTP, Part "H" is dark olive green in color and may appear black in the container. Sikafloor FTP, Part "R" is light amber in color. Add the 1 gallon of Sikafloor FTP, Part "R" to the 1.25 gallons of Part "H" in the short filled Part "H" pail. Mix thoroughly with a mechanical mixer (Jiffy) for 3 minutes. This mixture will appear as a light olive green color. Slowly add 1.25 gallons of potable water to the mixture under agitation. Mix for an additional 2 minutes until the mixture is fully dispersed. Fully dispersed material will appear as light green in color. Allow primer to cure a minimum of 3-4 hours at 70°F and 50% RH or until tack free before applying base coat.
- C. Metal – Consult Sika regarding primer.

3.3 DETAILING

- A. Non-structural cracks up to 1/16 inch – Apply a detail coat of Sikalastic 710 Base at 32 mils wet, 4" wide, centered over the crack. Allow to become tack free before overcoating.
- B. Cracks and joints over 1/16 inch up to 1 inch – Route and seal with Sikaflex 2c or 1a sealant and allow to cure. Apply a detail coat of Sikalastic 710 Base at 32 mils wet, 4" wide, centered over crack. Allow to become tack free before overcoating.
- C. Joints over 1 inch – Should be treated as expansion joints and brought up through the Sikalastic Traffic System and sealed with Sikaflex 2c or 1a sealant.

3.4 BASE COAT

- A. Thoroughly mix Sikalastic 710 Base using a mechanical mixer (Jiffy) at slow speeds until a homogenous mixture and color is obtained. Use care not to allow the entrapment of air into the mixture. Apply at the recommended coverage rate (see System Guide) using a notched squeegee or trowel and backroll using a phenolic resin core roller. Extend base coat over entire area including previously detailed cracks and control joints. Allow coating to cure a minimum of 16 hours at 70°F and 50% RH or until tack free before top coating.

3.5 TOP COATS

- A. Thoroughly mix Sikalastic 715 Top or optional using a mechanical mixer (Jiffy) at slow speeds until a homogenous mixture and color is obtained. Use care not to allow the entrapment of air into the mixture. Apply at the recommended coverage rate (see System Guide) using a flat or notched squeegee and backroll using a phenolic resin core roller. Apply aggregate evenly distributed at the appropriate rate immediately into wet coating and backroll if required (see System Guide). Allow coating to cure a minimum of 16 hours at 70°F and 50% RH or until tack free between coats, and a minimum of 72 hours before opening to vehicular traffic.
- B. Refer to mixing and application instructions in separate data sheet for optional Sikalastic 735 AL, 736 AL Lo-VOC and 748 PA aliphatic top coat substitutions.

3.6 ACCELERATOR

- A. Sikalastic 700 ACL may be added to Sikalastic 710 Base, 715 Top or optional single component aliphatic top coats in order to accelerate cure time, particularly in cold weather conditions. Maximum amount that may be added is 1:20 ratio (1 quart to 5 gallons). Apply only to material that will be applied within 2-3 hours.

3.7 MOCK-UP

- A. A job site mock-up should always be completed to confirm acceptability of workmanship, material coverage rates and aesthetics.

3.8 CLEANING

- A. Uncured materials can be removed from tools or other surfaces with an approved solvent. Cured materials can only be removed by mechanical means.
- B. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

END OF SECTION 071800

SECTION 099113
EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Bollards / Mooring Posts.

1.3 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches square.

2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
3. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 10 percent, but not less than 1 gallon of each material and color applied.

1.6 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. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 2 sq. in.
 - b. Other Items: 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 Architect at no added cost to Owner.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:
 1. Rust-oleum
 2. Sherwin-Williams
 3. Benjamin Moore
 4. M.A.B. Paints

2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
 1. Provide materials for use within each paint system that are 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, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.
- D. Colors: Match below colors:
 1. Gloss Dark Gray
 2. Navy Gray
 3. Natural Aluminum Finish

2.3 PRIMERS/SEALERS

- A. Primer, Bonding, Water Based, as recommended by topcoat manufacturer MPI #17.
 - 1. Rust-oleum
 - 2. Sherwin-Williams
 - 3. Benjamin Moore
 - 4. M.A.B. Paints

2.4 WATER-BASED PAINTS

- A. Light Industrial Coating, Exterior, Water Based, Semi-Gloss (Gloss Level 5): MPI #163
 - 1. Rust-oleum
 - 2. Sherwin-Williams
 - 3. Benjamin Moore
 - 4. M.A.B. Paints

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- B. 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 Manual" applicable to substrates and paint systems indicated.
- B. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- C. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.
 - 1. SSPC-SP 2, "Hand Tool Cleaning."

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
- B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- C. 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 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. 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 Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

- A. Steel Substrates:
 - 1. Water-Based Light Industrial Coating System:
 - a. Prime Coat: Primer for metal, MPI #17.

- b. Topcoat: Light industrial coating, exterior, water based, semi-gloss (Gloss Level 5), MPI #163.

END OF SECTION 099113

SECTION 129300
SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Bench
 - 2. Bike Rack
 - 3. Trash Receptacle
- B. Related requirements:
 - 1. Section 017419 "Construction Waste Management and Disposal"
 - 2. Section 033053 "Miscellaneous Cast-In-Place Concrete"

1.3 REFERENCES

- A. The following apply to work in this Section:
 - 1. ASTM: Specifications of the American Society for Testing and Materials latest editions. Modifications specified herein shall govern where conflicts with ASTM standards occur.

1.4 SUBMITTALS

- A. Product Data: Submit product literature or tear sheets with name of product and manufacturer for each material and product used.
 - 1. Trash Receptacle
 - 2. Bike Rack
 - 3. Bench
- B. Shop Drawings: Show fabrication and installation details of custom metal fabrications used in lieu of a manufacturer's standard product.
 - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
 - 2. Submit Shop Drawings, signed and sealed. Indicate profiles, sizes and connection attachments. Indicate materials of each item. Indicate welded connections using standard AWS A2.0 welding symbols.

- C. Samples for Verification:
 - 1. For type and finish of custom metal fabrications used in lieu of manufacturer's standard products:
 - a. Provide sample approximately six inches in length, including welded connection of vertical and horizontal elements, indicating material and finish.
 - 2. For all products, submit finish color samples from manufacturer's full range of standard colors.

1.5 QUALITY ASSURANCE

- A. Contractor shall have had experience with at least two (2) other projects of similar scope and complexity and shall perform work with personnel totally familiar with furnishings installation and construction techniques under the supervision of an experienced foreperson.
- B. Manufacturer: An experience company specializing in the manufacture of products specified in this Section with a record of successful in-service performance.
- C. Source Limitations: Obtain each product specified from a single source with resources to provide components of consistent quality in appearance and physical properties.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, handle and protect all materials from damage.

1.7 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Follow accepted industry standards when placing concrete footings in extreme cold weather.

PART 2 - PRODUCTS

2.1 BENCH

- A. Bench, with Back (Schuylkill Banks Standard 4' Bench): powder-coat color to match existing benches of Schuylkill Banks as determined by submitted samples, and as provided by the following manufacturer:
 - 1. Model # PA-121-48-EM provided by BRP by Bison (BRP Enterprises), Lincoln, NE, phone: 1-888-438-5311, email: specify@BRPonline.com, website: www.BRPonline.com
- B. Bench, Backless (Schuylkill Banks Standard 4' Bench, Backless): powder-coat color to match existing benches of Schuylkill Banks as determined by submitted samples, and as provided by the following manufacturer:
 - 1. Model # PA-122-48-EM provided by BRP by Bison (BRP Enterprises), Lincoln, NE, phone: 1-888-438-5311, email: specify@BRPonline.com, website: www.BRPonline.com

2.2 BIKE RACK

- A. "High Wheeler" Bike Racks to be picked up at Boelsom Cottage in Fairmount Park, Philadelphia. Contact Josh Nims at SRDC to arrange for pickup.
- B. City of Philadelphia Standard Bike Rack, as detailed in the Drawings:
 - 1. Custom fabricated by facilities carrying certifications required by city and state for metal fabrication and powder-coating.
 - 2. Or as provided as standard products from one the following manufacturer's:
 - a. "UX Bike Rack" Product # UX190-IG-G, 2.375" OD Tubing, surface-mount, by Madrax (mfr), Wunakee, Wisconsin 53597, (phone) 800-448-7931, www.madrax.com
 - b. "WU-20" series by Creative Pipe Inc (mfr), Rancho Mirage, California 92270-1087, (800) 644-8467, www.creativepipe.com
 - c. Or equal as approved by the Owner's Representative.

2.3 TRASH RECEPTACLE

- A. Schuylkill Banks Standard Trash Receptacle, powder-coated to match existing trash receptacles of Schuylkill Banks as determined by submitted samples, and as provided by the following manufacturer:
 - 1. "Petoskey" series, 30 gallon, tube support, embedded mount, , by Landscape Forms (mfr.), 431 Lawndale Ave., Kalamazoo, MI, phone: 1-800-521-5426

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

- A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Section 017419 "Construction Waste Management and Disposal."

3.2 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION, GENERAL

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

- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored, complete with all fittings and accessories, as indicated on Drawings and according to manufacturer's instructions.

3.4 CLEANING

- A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

END OF SECTION 129300

SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Alcan Products Corporation; Alcan Cable Division.
 - 2. Alpha Wire.
 - 3. Belden Inc.
 - 4. Encore Wire Corporation.
 - 5. General Cable Technologies Corporation.
 - 6. Southwire Incorporated.
- B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

- C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2.

2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Gardner Bender.
 - 3. Hubbell Power Systems, Inc.
 - 4. Ideal Industries, Inc.
 - 5. IlSCO; a branch of Bardes Corporation.
 - 6. NSi Industries LLC.
 - 7. O-Z/Gedney; a brand of the EGS Electrical Group.
 - 8. 3M; Electrical Markets Division.
 - 9. Tyco Electronics.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-2-THWN-2, single conductors in raceway.
- B. Branch Circuits: Type THHN-2-THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and branch conductors for compliance with requirements.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and

larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

- a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
- b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

B. Test and Inspection Reports: Prepare a written report to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 260519

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Grounding systems and equipment.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
 - 1. Ground rods.
- B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals. Include the following:
 - 1. Instructions for periodic testing and inspection of grounding features at ground rods based on NFPA 70B.
 - a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
 - b. Include recommended testing intervals.

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.2 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch in diameter by 10 feet in length.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors.
 - 3. Connections to Ground Rods: Welded connectors.
 - 4. Connections to Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
- C. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. For grounding electrode system, install at least two rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

3.4 LABELING

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for instruction signs. The label or its text shall be green.
- B. Install labels at the grounding electrode conductor where exposed.
 1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
 4. Prepare dimensioned Drawings locating each ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

- E. Report measured ground resistances that exceed the following values:
 - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
- F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.
 - 3. Equipment supports.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways these supports with single-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 5. To Light Steel: Sheet metal screws.
 - 6. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Boxes, enclosures, and cabinets.

B. Related Requirements:

1. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

1.3 DEFINITIONS

- A. GRC: Galvanized rigid steel conduit.

1.4 ACTION SUBMITTALS

- A. Product Data: For raceways, wireways and fittings, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

- A. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
 2. Allied Tube & Conduit; a Tyco International Ltd. Co.
 3. Anamet Electrical, Inc.
 4. Electri-Flex Company.
 5. O-Z/Gedney; a brand of EGS Electrical Group.
 6. Picoma Industries, a subsidiary of Mueller Water Products, Inc.
 7. Republic Conduit.
 8. Robroy Industries.
 9. Southwire Company.
 10. Thomas & Betts Corporation.
 11. Western Tube and Conduit Corporation.
 12. Wheatland Tube Company; a division of John Maneely Company.
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. EMT: Comply with ANSI C80.3 and UL 797.
- E. FMC: Comply with UL 1; zinc-coated steel or aluminum.
- F. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 2. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: compression.
 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
 4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- H. Joint Compound for GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
 2. Anamet Electrical, Inc.
 3. Arnco Corporation.
 4. CANTEX Inc.
 5. CertainTeed Corp.
 6. Condux International, Inc.
 7. Electri-Flex Company.
 8. Kraloy.
 9. Lamson & Sessions; Carlon Electrical Products.
 10. Niedax-Kleinhuis USA, Inc.
 11. RACO; a Hubbell company.
 12. Thomas & Betts Corporation.
- B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

2.3 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Adalet.
 2. Cooper Technologies Company; Cooper Crouse-Hinds.
 3. EGS/Appleton Electric.
 4. Erickson Electrical Equipment Company.
 5. FSR Inc.
 6. Hoffman; a Pentair company.
 7. Hubbell Incorporated; Killark Division.
 8. Kraloy.
 9. Milbank Manufacturing Co.
 10. Mono-Systems, Inc.
 11. O-Z/Gedney; a brand of EGS Electrical Group.
 12. RACO; a Hubbell Company.
 13. Robroy Industries.
 14. Spring City Electrical Manufacturing Company.
 15. Stahlin Non-Metallic Enclosures; a division of Robroy Industries.
 16. Thomas & Betts Corporation.
 17. Wiremold / Legrand.

- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- F. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.
- G. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 4X with continuous-hinge cover with flush latch unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed Conduit: GRC.
 - 2. Concealed Conduit, Aboveground: EMT.
 - 3. Underground Conduit: RNC, Type EPC-40-PVC.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 4X.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage: EMT.
 - 2. Exposed, Not Subject to Severe Physical Damage: EMT.
 - 3. Exposed and Subject to Severe Physical Damage: GRC.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 - 5. Damp or Wet Locations: GRC.
 - 6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4X stainless steel in damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
 3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Complete raceway installation before starting conductor installation.
- C. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- D. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- E. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- F. Install conduits parallel or perpendicular to building lines.
- G. Support conduit within 12 inches of enclosures to which attached.
- H. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- I. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- K. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- L. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

- M. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- N. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- O. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- P. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- Q. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where an underground service raceway enters a building or structure.
 - 2. Where otherwise required by NFPA 70.
- R. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- S. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
 - 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 - 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

- T. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations subject to severe physical damage.
 - 2. Use LFMC in damp or wet locations not subject to severe physical damage.
- U. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to bottom of box unless otherwise indicated.
- V. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification for conductors.
 - 3. Underground-line warning tape.
 - 4. Warning labels and signs.
 - 5. Instruction signs.
 - 6. Equipment identification labels.
 - 7. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's

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wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway it identifies and to stay in place by gripping action.

2.2 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.
- B. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.

2.3 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
 - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical utility lines.
 - 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
 - 1. Comply with ANSI Z535.1 through ANSI Z535.5.
 - 2. Inscriptions for Red-Colored Tapes: CAUTION ELECTRIC LINE BELOW

C. Details:

1. Reinforced, detectable three-layer laminate, consisting of a printed pigmented woven scrim, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Overall Thickness: 8 mils (0.2 mm).
3. Foil Core Thickness: 0.35 mil (0.00889 mm).
4. Weight: 34 lb/1000 sq. ft. (16.6 kg/100 sq. m).
5. 3-Inch (75-mm)Tensile According to ASTM D 882: 300 lbf (1334 N), and 12,500 psi (86.1 MPa).

2.4 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Warning label and sign shall include, but are not limited to, the following legends:
 1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.5 INSTRUCTION SIGNS

- A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.6 EQUIPMENT IDENTIFICATION LABELS

- A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. Attach plastic raceway labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.
- G. System Identification Color-Coding Bands for Raceways: Each color-coding band shall completely encircle conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- H. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 12 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways, 600 V or Less, for Service, Feeder, and Branch Circuits: Identify with self-adhesive vinyl tape applied in bands. Install labels at 10-foot maximum intervals.
- B. Accessible Raceways: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Lighting.
 - 2. Power.
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in pull and junction boxes and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.

- a. Color shall be factory applied.
- D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- E. Locations of Underground Lines: Identify with underground-line warning tape for power, and lighting.
- F. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
 - 1. Comply with 29 CFR 1910.145.
 - 2. Identify system voltage with black letters on an orange background.
 - 3. Apply to exterior of door, cover, or other access.
- G. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- H. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to equipment.
 - 1. Labeling Instructions:
 - a. Indoor Equipment: Adhesive film label with clear protective overlay. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
 - 2. Equipment to Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved, laminated acrylic or melamine label.
 - b. Enclosures and electrical cabinets.
 - c. Contactors.
 - d. Receptacles

END OF SECTION 260553

SECTION 262726
WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Receptacles with integral GFCI, and associated device plates.
 - 2. Weather-resistant receptacles.

1.3 DEFINITIONS

- A. GFCI: Ground-fault circuit interrupter.
- B. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 3. Leviton Mfg. Company Inc. (Leviton).
 - 4. Pass & Seymour/Legrand (Pass & Seymour).
- B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

2.3 GFCI RECEPTACLES

- A. General Description:
 - 1. Straight blade, non-feed-through type.
 - 2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
 - 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

2.4 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
 - 3. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, thermoplastic with lockable cover.

2.5 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Owner unless otherwise indicated or required by NFPA 70 or device listing.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes.
2. Keep outlet boxes free of dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install wiring devices after all other preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 10 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.

9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down.

F. Arrangement of Devices: Unless otherwise indicated, mount with long dimension vertical and with grounding terminal of receptacles on top.

3.2 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

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

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 10-A Load: A value of 3 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 262726

SECTION 311000

SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation
3. Removing four trees as indicated on the Landscape Drawings
4. Clearing and grubbing.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.
7. Disconnecting, capping or sealing, and removing site utilities abandoning site utilities in place.
8. Temporary erosion and sedimentation control.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.
2. Section 015639 "Temporary Tree & Plant Protection" for temporary tree and plant protection measures.

1.3 DEFINITIONS

- A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.

- D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally 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 larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.
- E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings Section 015639 "Temporary Tree and Plant Protection."
- G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 MATERIAL OWNERSHIP

- A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.6 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or video recordings.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.
- B. Topsoil stripping and stockpiling program.
- C. Rock stockpiling program.
- D. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.
- E. Burning: Documentation of compliance with burning requirements and permitting of authorities having jurisdiction. Identify location(s) and conditions under which burning will be performed.

1.7 QUALITY ASSURANCE

- A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.
- B. Rock Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

1.8 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Design Engineer.
- C. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- D. Utility Locator Service: Notify One Call for area where Project is located before site clearing.
- E. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.
- F. Tree- and Plant-Protection Zones: Protect according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- G. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

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PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- C. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

- A. Protect trees and plants remaining on-site according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.4 EXISTING UTILITIES

- A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.
 - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

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- B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
 - 1. Arrange with utility companies to shut off indicated utilities.
 - 2. Owner will arrange to shut off indicated utilities when requested by Contractor.
- C. Locate, identify, and disconnect utilities indicated to be abandoned in place.
- D. 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 Design Engineer not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Design Engineer's written permission.
- E. Excavate for and remove underground utilities indicated to be removed.
- F. Removal of underground utilities is included in earthwork sections.

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Remove four (4) trees as indicated on the Landscape Drawings, which have the following calipers:
 - a. 2 @ +/- 24" Caliper
 - b. 1 @ +/- 12" Caliper
 - c. 1 @ +/- 4" Caliper
 - 3. Grind down stumps and remove roots larger than 2 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
 - 4. Use only hand methods or air spade for grubbing within protection zones.
 - 5. Chip removed tree branches and dispose of off-site.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 STOCKPILING ROCK

- A. Remove from construction area naturally formed rocks that measure more than 1 foot across in least dimension.

1. Separate or wash off non-rock materials from rocks, including soil, clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- B. Stockpile rock where indicated on Drawings without intermixing with other materials. Cover to prevent windblown debris from accumulating among rocks.
1. Limit height of rock stockpiles to 36 inches.
 2. Do not stockpile rock within protection zones.
 3. Dispose of surplus rock. Surplus rock is that which exceeds quantity indicated to be stockpiled or reused.
 4. Stockpile surplus rock to allow later use by the Owner.

3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
 2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Burning tree, shrub, and other vegetation waste is permitted according to burning requirements and permitting of authorities having jurisdiction. Control such burning to produce the least smoke or air pollutants and minimum annoyance to surrounding properties. Burning of other waste and debris is prohibited.
- C. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 312000

EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for walks pavements turf and grasses and plants.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Subbase course and base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.
8. Excavating well hole to accommodate elevator-cylinder assembly.

B. Related Requirements:

1. Section 013200 "Construction Progress Documentation" for recording preexcavation and earth-moving progress.
2. Section 033053 "Miscellaneous Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
3. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
4. Section 312319 "Dewatering" for lowering and disposing of ground water during construction.
5. Section 329200 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
6. Section 329300 "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.

- C. This section includes the excavation of earth and all appurtenant shoring and bracing. It does not include excavation required for dredging, pre-drilling or jetting of pile foundations. Shoring and bracing for any excavation shall be sufficient to resist all external pressures while preventing settlement of adjacent buildings and underground structures.

- D. This section covers excavation, disposal, stockpiling, placement, and compaction of all materials within the limits of the work required to construct the proposed paved and turf areas,

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structures, foundations, utilities and other items in accordance with these specifications and in conformity to the dimensions and sections shown the plans.

- E. Selective grading and backfilling will be required for minor embankment construction and backfilling of holes and excavations due to demolition.
- F. The Contractor shall legally dispose of all excess excavated material off SRDC property. The Contractor shall include all costs for hauling and disposal of the excavated material.
- G. The Contractor shall keep the grade well drained at all times. Well points, dewatering wells, sumps, pump systems, and other methods will be required to dewater the project site during construction. All dewatering shall comply with Section 312319 Dewatering.

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices for earth moving specified in Section 012200 "Unit Prices."
- B. Quantity allowances for earth moving are included in Section 012100 "Allowances."
- C. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following. Unit prices for rock excavation include replacement with approved materials.
 - 1. 24 inches outside of concrete forms other than at footings.
 - 2. 12 inches outside of concrete forms at footings.
 - 3. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - 4. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - 5. 6 inches beneath bottom of concrete slabs-on-grade.
 - 6. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

1.4 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also 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 Design Engineer. 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 elevations or beyond indicated lines and dimensions without direction by Design Engineer. Unauthorized excavation, as well as remedial work directed by Design Engineer, 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- maximum-width, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with 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: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- J. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- L. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct preexcavation conference at Project site.
 - 1. Review methods and procedures related to earthmoving, including, but not limited to, the following:
 - a. Personnel and equipment needed to make progress and avoid delays.
 - b. Coordination of Work with utility locator service.
 - c. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.
 - d. Extent of trenching by hand or with air spade.
 - e. Field quality control.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
 - 1. Geotextiles.
 - 2. Controlled low-strength material, including design mixture.
 - 3. Warning tapes.
- B. Samples for Verification: For the following products, in sizes indicated below:
 - 1. Geotextile: 12 by 12 inches.
 - 2. Warning Tape: 12 inches long; of each color.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
 - 1. Classification according to ASTM D 2487.
 - 2. Laboratory compaction curve according to ASTM D 1557.
- C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.8 QUALITY ASSURANCE

- A. ASTM E 329 and ASTM D 3740 for testing indicated.
- B. Codes and Regulations: Comply with the following codes and regulations:
 - 1. International Building Code (IBC)

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2. City of Philadelphia Building Code
 3. Occupational Safety and Health Administration (OSHA) – As required by the state and federal regulations.
 4. Philadelphia Water Department (PWD) Standard Specifications for Excavation, Refilling, Grading, Landscaping and Repaving
- C. Additionally comply with all local, state, and Federal laws, codes, and regulations applicable to the work specified in this Section including, but not limited to, the Federal Occupational Safety and Health Act and the Construction Safety Act.
- D. The more stringent provisions shall govern where provisions of pertinent codes and standards conflict with these specifications.
- E. Engineer or Owner’s Representative Approval: The Engineer or Owner’s Representative will approve subgrades and fills based on Testing Laboratory reports and field observations.
- F. Applicable Publications: The publications listed below form a part of this Specification to the extent referenced:

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

C 136	Sieve Analysis of Fine and Coarse Aggregates
D 422	Method for Particle-Size Analysis of Soils
D 698	Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb (2.49-kg) Rammer and 12-in. (304.8-mm) Drop
D 1140	Test Method for Amount of Material in Soils finer than the No. 200 (75-mm) Sieve
D 1556	Test Method for Density of Soil In-Place by the Sand-Cone Method
D 2419	Test Method for Sand Equivalent Value of Soils and Fine Aggregate
D 2487	Classification of Soils for Engineering Purposes
D 2922	Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D 3017	Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D 4253	Maximum index Density of Soils Using a Vibratory Table
D 4254	Minimum Index Density of Soils and Calculation of Relative Density

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2. Pennsylvania Department of Transportation (PennDOT) Publication 408 (current version).
 3. Standard Specifications and Standard Details of the Philadelphia Water Department.
- G. Do not construct any work on indicated subgrades and fills before required work has been approved by the Engineer or Owner's Representative.
- H. Work constructed in violation of this requirement will be rejected, and shall be removed and replaced at no additional cost to the Owner.

1.9 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
1. Do not proceed with work on adjoining property until directed by Design Engineer.
- C. Utility Locator Service: Notify "One Call" for area where Project is located before beginning earth-moving operations.
- D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 015000 "Temporary Facilities and Controls" and Section 311000 "Site Clearing" are in place.
- E. Do not commence earth-moving operations until plant-protection measures specified in Section 015639 "Temporary Tree and Plant Protection" are in place.
- F. The following practices are prohibited within protection zones:
1. Storage of construction materials, debris, or excavated material.
 2. Parking vehicles or equipment.
 3. Foot traffic.
 4. Erection of sheds or structures.
 5. Impoundment of water.
 6. Excavation or other digging unless otherwise indicated.

- 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
 - G. Do not direct vehicle or equipment exhaust towards protection zones.
 - H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones
- 1.10 Storage and Handling
- A. Storage and Handling: Materials shall be stored and handled in a manner so as to ensure the preservation of their quality and fitness for the work. Materials shall be stored and located so as to facilitate their prompt inspection.
 - 1. Gravel fill and subbase material which is suitable for use as fill under exterior slabs, under paving, and for backfill be separated from material which is only suitable for general grading.
 - B. Unacceptable Materials: Materials that do not conform to the Specifications shall be considered unacceptable. All such materials, whether in place or not, will be rejected and shall be removed from the Project Site and replaced with acceptable materials or their deficiencies shall be corrected.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
 - 1. Liquid Limit: 40.
 - 2. Plasticity Index: 10.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294/D 2940M 0; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Drainage Course: Narrowly graded mixture of washed 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 zero to 5 percent passing a No. 8 sieve.
- I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.
- J. Stone Bedding Material: Permeable systems' joint-fill and setting bed aggregates (ASTM D448). No. 89 Stone approximate size: 3/8 in. to No. 16.
- K. Sand: ASTM C 33/C 33M; fine aggregate.
- L. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.
- M. Unclassified Excavation
 - 1. Unclassified excavation shall consist of the excavation and disposal of all material, regardless of its nature,
- N. Borrow Excavation
 - 1. Borrow excavation shall consist of approved material required for the construction of embankment, backfilling, or for other portions of the work from excavations on the site, or from off-site locations that are approved by the Engineer prior to hauling and placement on the site.
 - 2. Satisfactory Soils: ASTM D2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. The contractor shall perform up to 5 tests of existing soil bank materials proposed for use as borrow excavation.
 - 3. The Contractor shall submit test data for proposed borrow excavation materials.
- O. Unsuitable Excavation

1. Any material containing vegetable or organic matter such as muck, peat, organic silt or sod shall be considered unsuitable for use in embankment construction. Excavated unsuitable material may be used as topsoil, when approved by the Engineer or Owner's Representative. All clay or soft and yielding material shall be considered unsuitable for use in embankment construction.

P. Bedding Course for Utilities

1. Materials for bedding of utilities shall be as shown on the details.
2. Where material is not specified, AASHTO #57 Stone may be placed meeting the requirements of this section.

Q. Backfill for Utilities

1. Materials for backfill of utilities shall be as shown on the details.
2. Where material is not specified, borrow excavation material may be placed meeting the requirements of this section.

2.2 GEOTEXTILES

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

1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:
 - a. Grab Tensile Strength: ≥ 120 lbf; ASTM D 4632.
 - b. Mullen Burst Strength: ≥ 225 psi ASTM D 3786.
 - c. Flow Rate (ASTM-D4491) ≥ 95 Gal/Min/FT²
 - d. UV Resistance after 500 hrs (ASTM-0355) $\geq 70\%$
 - e. Tear Strength: 56 lbf; ASTM D 4533.
 - f. Heat-Set or Heat-Calendared Fabrics are not permitted
3. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
4. Permittivity: 0.2 per second, minimum; ASTM D 4491.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:
 - a. Grab Tensile Strength: ≥ 120 lbf; ASTM D 4632.
 - b. Mullen Burst Strength: ≥ 225 psi ASTM D 3786.
 - c. Flow Rate (ASTM-D4491) ≥ 95 Gal/Min/FT²
 - d. UV Resistance after 500 hrs (ASTM-0355) $\geq 70\%$
 - e. Tear Strength: 56 lbf; ASTM D 4533.

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3. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
4. Permittivity: 0.02 per second, minimum; ASTM D 4491.

2.3 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
 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.
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
 1. Red: Electric.
 2. Yellow: Gas, oil, steam, and dangerous materials.
 3. Orange: Telephone and other communications.
 4. Blue: Water systems.
 5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PRE-CONSTRUCTION, GENERAL

- A. A pre-construction meeting addressing the excavation and backfill shall be held as required in PART 4, "CONTRACTOR QUALITY CONTROL".

3.2 PREPARATION

- A. Protect structures, utilities, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Preparation of the surface for earthwork operations, including removal of vegetation, top soil, debris, obstructions, and deleterious materials from the ground surface is specified in Specification Section "Site Clearing".
- C. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

- D. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways in accordance with the requirements of Specification Section “Stormwater Pollution Prevention”.

3.3 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.

3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
 - 2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. 24 inches outside of concrete forms other than at footings.
 - b. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - c. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or 42 inches wide.
- B. 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 Engineer. 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; and soil, boulders, and other materials not classified as rock or unauthorized excavation.
 - a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
 - 2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:

- a. 24 inches outside of concrete forms other than at footings.
 - b. 12 inches outside of concrete forms at footings.
 - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - e. 6 inches beneath bottom of concrete slabs-on-grade.
 - f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or 42 inches wide.
- C. No excavation shall be started until the Contractor has staked out the work and the Contractor has submitted elevations and measurements of the ground surface to the Engineer or Owner's Representative for verification and acceptance. All suitable excavated material may be used in the formation of embankment, subgrade, or for other purposes shown on the plans. All excess excavation shall be legally disposed of off-site. All unsuitable material and topsoil shall be legally disposed of off-site. Combustible debris shall be removed from the site daily.
- D. All man-made materials encountered, such as concrete, shall be removed and legally disposed of off-site, in accordance with all applicable Local, State & Federal Rules & Regulations.
- E. All excavation shall be made to the lines and grades indicated on the drawings or as specified herein.
- F. The Contractor shall be required to process and compact the existing subgrade as required in this section. The properties of the existing subgrade can be improved by compaction at proper moisture content.
- G. The Contractor shall immediately notify the Engineer or Owner's Representative if a release of a hazardous material occurs or if a hazardous material is detected in the presence of any soil.
- H. The grade shall be maintained so that the surface is well drained at all times. When necessary, temporary drains and drainage ditches shall be installed to intercept or divert surface water which may affect the work. Pumping shall also be used to maintain the subgrade in a dry condition if the use of temporary ditches or drains do not adequately drain the subgrade.
- I. After completion of excavation work, and prior to commencement of work on the structures, fill or backfill, the excavation shall be inspected by the Contractor to ensure that suitable foundation elevations have been reached and the surfaces have been properly prepared. The excavation shall be protected from wash by tide, storm, and surface run-off.
- J. Shoring and Bracing: The Contractor shall provide all shoring, bracing, and sheeting of excavations required to properly and safely complete the work as shown on the drawings and in accordance with current OSHA guidelines. Shoring and bracing shall be placed up to the cutoff line, two feet below finished grade. If required, shoring, bracing, and sheeting shall be removed as the excavations are backfilled in a manner to prevent caving, once the backfill has reached an elevation of one foot below the cutoff line. All shoring materials that are installed and removed shall remain the property of the Contractor and shall be removed from the site upon the completion of the work, unless otherwise noted on the Contract Drawings. Dikes shall be employed to prevent surface run off from entering the excavation.

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- K. Over Excavation: Over excavation shall be corrected by placing and compacting suitable backfill material to a density of 95% of maximum density at optimum moisture content as determined by the Modified Proctor Test, ASTM-D1557 or by placing lean concrete of a mix approved by the Engineer. In Permeable Paver areas, subgrade is to be placed without compaction to appropriate elevation. Scarify the subgrade to promote infiltration.
- L. Make excavations to such angles of repose as may be required by OSHA guidelines and to keep the base area of excavations free from sliding or falling debris, as required for the safety of personnel working within the excavation as permitted by prior consent of the Owner.
- M. Do not stockpile backfill in any area which shall prevent the free runoff of surface water, or slope excavation to prevent free runoff, and provide embankments, as shall be required to prevent the entry of surface water into any excavation.
- N. Keep the excavations free of standing or running water, and provide all equipment and perform all work to permit the work to be carried on therein. Take care that removed water does not cause washing or injury to the work.
- O. The contractor shall excavate utility trenches as necessary to install utilities to the alignments, depths and elevations detailed on the plans and profiles.
 - 1. Utility trenches shall be excavated to a uniform width for each utility to provide clearance on each side of pipe, conduit or duct bank to be installed. Excavate trench walls vertically from the trench bottom as shown on the details for each utility proposed for the project. See utility details for width of trench excavation limits.
 - 2. Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Excavate trenches to allow for bedding course. See utility details for depth of bedding and trench excavation limits.
- P. After the stripping and over excavation operations have been completed, the subgrade shall be compacted as required. Rolling operations shall continue until the maximum density attainable has been reached. If the maximum density is less than the specified percent of maximum density, the Contractor shall either dry the soil or sprinkle the soil with water, as necessary to reach the required moisture content. The Contractor shall then continue recompacting the soil until the maximum density attainable has been reached. If this is less than the specified percent of maximum density, this process shall be repeated until the Contractor has made at least three attempts to compact the soil to the specified percent of maximum density. If after three attempts the specified percent of maximum density cannot be obtained, the Contractor shall undercut as required.
- Q. ALL subgrade shall be compacted to the following depths and densities. In cut areas, the subgrade shall be compacted to a minimum depth of 6 inches and to a density of not less than 95% for cohesive soils, and 100% for noncohesive soils, of the maximum density at optimum moisture as determined by ASTM D 1557. Any unsuitable materials encountered shall be removed, refilled and compacted. Laboratory densities and supporting test data shall be provided by the Contractor to the Engineer or Owner's Representative.

1. The in-place field density shall be determined in accordance with ASTM D1556, ASTM D2167 or ASTM D2922. Stones or rock fragments larger than 4 inches in their greatest dimension will not be permitted in the top 6 inches of the subgrade.
2. All cut-and-fill slopes shall be uniformly dressed to the slope, cross section, and alignment shown on the plans or as directed by the Engineer or Owner's Representative

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

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

3.6 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 1. Excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
 1. Clearance: 12 inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
 3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
 4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- E. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.7 SUBGRADE INSPECTION

- F. Notify Engineer when excavations have reached required subgrade.
- G. If Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- H. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons 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. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Design Engineer, and replace with compacted backfill or fill as directed.
- I. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- J. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Design Engineer, without additional compensation.

3.7 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 to prevent windblown dust.
 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.8 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 Record Documents.
 3. Testing and inspecting underground utilities.
 4. Removing concrete formwork.

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5. Removing trash and debris.
6. Removing temporary shoring, 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.

3.9 UTILITY TRENCH BEDDING

A. Place bedding material in trenches free of mud, frost, snow, ice or frozen material.

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

3.10 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 building 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.

3.11 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.

3.12 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 1557:
 - 1. Under pavement, 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 92 percent.
 - 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
 - 4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.13 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 Rough Grading: Slope grades to direct water away from trail and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
 - 1. Turf or Unpaved Areas: Plus or minus 1 inch.
 - 2. Walks: Plus or minus 1/2 inch.
 - 3. Pavements: Plus or minus 1/2 inch.

3.14 SUBSURFACE DRAINAGE

- A. Subdrainage Pipe: Specified in Section 334600 "Subdrainage."
- B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
 - 1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698.
- C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage

backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698.
2. Place and compact impervious fill over drainage backfill in 6-inch- thick compacted layers to final subgrade.

3.15 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
 1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
 2. Place base course material over subbase course under hot-mix asphalt pavement.
 3. Shape subbase course and base course to required crown elevations and cross-slope grades.
 4. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
 5. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.16 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
 2. Determine that fill material classification and maximum lift thickness comply with requirements.
 3. Determine during placement and compaction that in-place density of compacted fill complies with requirements.
- B. Testing Agency: Contractor will engage a qualified PENNDOT geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

- D. 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 Design Engineer.
- E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:
 - 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab but in no case fewer than three tests.
- F. 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 materials to depth required; recompact and retest until specified compaction is obtained.

3.17 PROTECTION

- A. Protecting Graded Areas: Protect newly graded 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 depth as directed by Design Engineer; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove 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.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.
- B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Design Engineer.
 - 1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

3.19 TOLERANCES

- A. In those areas upon which a subbase or base course is to be placed, the top of the subgrade shall be of such smoothness that, when tested with a 10-foot straightedge applied parallel and at right angles to the centerline, it shall not show any deviation in excess of 1/2-inch, or shall not be more than 0.05-foot from true grade as established by grade hubs or pins. Any deviation in excess of these amounts shall be corrected by loosening, adding, or removing materials; reshaping; and recompacting by sprinkling and rolling.
- B. In turf areas, grading shall provide for the placement of a minimum of 6 inches of topsoil such that the surface of the topsoil shall conform to the final elevations.
- C. On turf areas, the surface shall be of such smoothness that it will not vary more than 0.10 foot from true grade as established by grade hubs. Any deviation in excess of this amount shall be corrected by the Contractor.
- D. In the below grade levels of excavation and deep excavation areas, the surface shall not vary by more than 0.20 feet from true grade, as shown on the plans.

3.20 EROSION CONTROL

- A. Minimization of Soil Erosion: Provide erosion control methods in accordance with the plans and specifications. Erosion and sedimentation controls shall be placed as specified in Specification Section "Pollution Prevention and Environmental Requirements".

PART 4 CONTRACTOR'S QUALITY CONTROL PROGRAM

4.1 FIELD QUALITY CONTROL

- A. Conform to all applicable provisions of Division 01 section, "Quality Requirements".
- B. The Contractor or the Contractor's quality control testing service shall take all samples and perform all tests required for quality control sampling and testing to be performed by the Contractor or the testing service and all quality assurance samples to be tested by the Owner's Representative. All costs for all quality control and quality assurance sampling and quality control testing shall be included in the Contractor's cost for the project. Unless otherwise noted, the number of samples for quality control testing and sampling shall be the same for quality assurance testing.
- C. All of the Contractor's or testing agency test results shall be provided to the Owner or Owner's Representative.

END OF SECTION 312000

SECTION 312319

DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes construction dewatering.
- B. Related Requirements:
 - 1. Section 312000 "Earth Moving" for excavating, backfilling, site grading, and controlling surface-water runoff and ponding.
 - 2. Section 334600 "Subdrainage" for retaining wall foundation

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review condition of site to be dewatered including coordination with temporary erosion-control measures and temporary controls and protections.
 - 3. Review geotechnical report.
 - 4. Review proposed site clearing and excavations.
 - 5. Review existing utilities and subsurface conditions.
 - 6. Review observation and monitoring of dewatering system.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: For dewatering system, prepared by or under the supervision of a qualified professional engineer.
 - 1. Include plans, elevations, sections, and details.
 - 2. Show arrangement, locations, and details filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and professional engineer.
- B. Field quality-control reports.
- C. Existing Conditions: Using photographs, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.

1.7 FIELD CONDITIONS

- A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.
- B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
 - 1. Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer.
 - 2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
 - 3. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
 - 5. Remove dewatering system when no longer required for construction.

- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.
 - 1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
 - 2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Provide temporary grading to facilitate dewatering and control of surface water.
- D. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 015000 "Temporary Facilities and Controls," Section 311000 "Site Clearing," during dewatering operations.

3.2 INSTALLATION

- A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
 - 1. Space well points or wells at intervals required to provide sufficient dewatering.
 - 2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
- B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.
- C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

- D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

- A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.
- B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
 - 1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
 - 2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
 - 3. Maintain piezometric water level a minimum of 24 inches below bottom of excavation.
- C. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.
- D. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

3.4 FIELD QUALITY CONTROL

- A. Survey-Work Benchmarks: Resurvey benchmarks regularly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.
- B. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.
- C. Prepare reports of observations.

3.5 PROTECTION

- A. Protect and maintain dewatering system during dewatering operations.
- B. Promptly repair damages to adjacent facilities caused by dewatering.

END OF SECTION 312319

SECTION 321123

AGGREGATE MATERIALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Special Provisions, Supplementary Conditions, and Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This item consists of a bedding, backfill, and base courses composed of open graded and crushed aggregates constructed on a prepared subbase for bituminous, concrete or sidewalk pavements in accordance with these specifications and in conformity to the dimensions and typical cross sections shown on the plans.
- B. This item may be used for utility trench backfill.

1.3 TESTING REQUIREMENTS

- A. ASTM C 29 Unit Weight of Aggregate
- B. ASTM C 88 Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
- C. ASTM C 117 Materials Finer than 75um (No. 200) Sieve in Mineral Aggregates by Washing
- D. ASTM C 131 Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine
- E. ASTM C 136 Sieve or Screen Analysis of Fine and Coarse Aggregate
- F. ASTM D 75 Sampling Aggregate
- G. ASTM D 693 Crushed Stone, Crushed Slag, and Crushed Gravel for Dry-or Water-Bound Macadam Base Courses and Bituminous Macadam Base and Surface Courses of Pavements.
- H. ASTM D 1556 Density of Soil in Place by the Sand - Cone Method
- I. ASTM D 1557 Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.5kg) Rammer and 18 in (457 mm) Drop
- J. ASTM D 2419 Sand Equivalent Value of Soils and Fine Aggregate
- K. ASTM D 2922 Density of Soil and Soil-Aggregate in Place by Nuclear Methods

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- L. ASTM D 3017 Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods
- M. ASTM D 3665 Random Sampling of Paving Materials
- N. ASTM D 4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.4 SUBMITTALS

- A. Materials Source: Submit names of materials suppliers.
- B. Submit material data on the following:
 - 1. Aggregate material source
 - 2. Aggregate material data and test reports
 - 3. Gradation analysis

PART 2 - PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

- A. Conforming to PennDOT Pub 408, Section 703, Type A Coarse Aggregate
 - 1. General Backfill: PennDOT No. OGS (gravel),
 - 2. Roadway, pavement, sidewalk or other base course: PennDOT No. 2A
 - 3. Bedding or Drainage course: PennDOT No. 57 Stone.
 - 4. Slag is not permitted as a coarse aggregate.

1.2 FINE AGGREGATE MATERIALS

- A. Conforming to PennDOT Pub 408, Section 703, Type A Fine Aggregate.
 - 1. Slag is not permitted as a fine aggregate.

PART 3 - EXECUTION

3.1 PREPARING UNDERLYING COURSE

- A. The underlying course shall be checked and accepted by the Engineer or Owner's Representative before placing and spreading operations are started. Any ruts or soft yielding places caused by improper drainage conditions, hauling, or any other cause shall be corrected at the Contractor's expense before the base course is placed thereon. Material shall not be placed on frozen subgrade.

3.2 MIXING

- A. The aggregate shall be uniformly blended during crushing operations or mixed in a plant. The plant shall blend and mix the materials to meet the specifications and to secure the proper moisture content for compaction.

3.3 PLACING

- A. The crushed aggregate base material shall be placed on the moistened subgrade in layers of uniform thickness with a mechanical spreader.
- B. The maximum depth of a compacted layer shall be 6 inches. If the total depth of the compacted material is more than 6 inches, it shall be constructed in two or more layers. In multi-layer construction, the base course shall be placed in approximately equal-depth layers.
- C. The previously constructed layer should be cleaned of loose and foreign material prior to placing the next layer. The surface of the compacted material shall be kept moist until covered with the next layer.

3.4 COMPACTION

- A. Immediately upon completion of the spreading operations, the crushed aggregate shall be thoroughly compacted. The number, type, and weight of rollers shall be sufficient to compact the material to the required density specified or shown on the details.
- B. The moisture content of the material during placing operations shall not be below, nor more than 1-1/2 percentage points above, the optimum moisture content as determined by ASTM D 1557.

3.5 ACCEPTANCE SAMPLING AND TESTING FOR DENSITY

- A. All quality control and quality assurance testing and sampling will be paid for by the contractor.
- B. Aggregate base course shall be accepted for density on a lot basis. A lot will consist of one day's production where it is not expected to exceed 2400 square yards. A lot will consist of one-half day's production where a day's production is expected to consist of between 2400 and 4800 square yards.
- C. Each lot shall be divided into two equal sublots. One test shall be made for each subplot. Sampling locations will be determined by the Engineer on a random basis in accordance with statistical procedures contained in ASTM D 3665.
- D. Each lot will be accepted for density when the field density is at least 98 percent of the maximum density of laboratory specimens prepared from samples of the base course material delivered to the job site. The specimens shall be compacted and tested in accordance with ASTM D 1557. The in-place field density shall be determined in accordance with ASTM D 1556 or D 2922. If the specified density is not attained, the entire lot shall be reworked and/or recompacted and two additional random tests made. This procedure shall be followed until the specified density is reached.
- E. In lieu of the core method of field density determination, acceptance testing may be accomplished using a nuclear gage in accordance with ASTM D 2922. The gage should be field calibrated in accordance with paragraph 4 of ASTM D 2922. Calibration tests shall be conducted on the first lot of material placed that meets the density requirements.

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- F. Use of ASTM D 2922 results in a wet unit weight, and when using this method, ASTM D 3017 shall be used to determine the moisture content of the material. The calibration curve furnished with the moisture gages shall be checked as described in paragraph 7 of ASTM D 3017. The calibration checks of both the density and moisture gages shall be made at the beginning of a job and at intervals as determined by the Engineer.
- G. If a nuclear gage is used for density determination, two random readings shall be made for each subplot.

3.6 FINISHING

- A. The surface of the aggregate base course shall be finished by blading or with automated equipment especially designed for this purpose.
- B. In no case will the addition of thin layers of material be added to the top layer of base course to meet grade. If the elevation of the top layer is 1/2 inch or more below grade, the top layer of base shall be scarified to a depth of at least 3 inches, new material added, and the layer shall be blended and recompact to bring it to grade. If the finished surface is above plan grade, it shall be cut back to grade and rerolled.

3.7 SURFACE TOLERANCES

- A. The finished surface shall not vary more than 3/8 inch when tested with a 16-foot straightedge applied parallel with or at right angles to the centerline. Any deviation of this amount shall be corrected by the Contractor at the Contractor's expense.

3.8 THICKNESS CONTROL

- A. The completed thickness of the base course shall be within 1/2 inch of the design thickness. Four determinations of thickness shall be made for each lot of material placed. The lot size shall be consistent with that specified in paragraph 3.5. Each lot shall be divided into four equal sublots. One test shall be made for each subplot. Sampling locations will be determined by the Engineer on a random basis in accordance with procedures contained in ASTM D 3665. Where the thickness is deficient by more than 1/2 inch, the Contractor shall correct such areas at no additional cost by excavating to the required depth and replacing with new material. Additional test holes may be required to identify the limits of deficient areas.

3.9 MAINTENANCE

- A. The base course shall be maintained in a condition that will meet all specification requirements until the work is accepted. Equipment used in the construction of an adjoining section may be routed over completed portions of the base course, provided no damage results and provided that the equipment is routed over the full width of the base course to avoid rutting or uneven compaction.

PART 4 - QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

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- A. Conform to all applicable provisions of Division 01 section, "Quality Requirements".
- B. All testing shall be performed in accordance with PennDOT Pub 408 for the placement and compaction of the aggregate as bedding, base course, or foundation.
- C. When tests indicate materials do not meet specified requirements, removal and replacement will be required.
- D. The Contractor or the Contractor's quality control testing service shall take all samples and perform all tests required for quality control sampling and testing to be performed by the Contractor or the testing service and all quality assurance samples to be tested by the Owner's Representative. All costs for all quality control and quality assurance sampling and quality control testing shall be included in the Contractor's cost for the project. Unless otherwise noted, the number of samples for quality control testing and sampling shall be the same for quality assurance testing.
- E. All of the Contractor's or testing agency test results shall be provided to the Owner or Owner's Representative.

END OF SECTION 321123

SECTION 321216

ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Cold milling of existing asphalt pavement.
- 2. Hot-mix asphalt patching.
- 3. Hot-mix asphalt paving.
- 4. Hot-mix asphalt overlay.
- 5. Asphalt traffic-calming devices.
- 6. Asphalt surface treatments.

- B. Related Requirements:

- 1. Section 312000 "Earth Moving" for subgrade preparation, fill material, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.
- 2. Section 321443 "Porous Unit Paving" for bituminous setting bed for pavers.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

- 1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
 - a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
 - b. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

1.4 ACTION SUBMITTALS

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

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1. Include technical data and tested physical and performance properties.
 2. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
 3. Job-Mix Designs: For each job mix proposed for the Work.
- B. Samples for Verification: For the following product, in manufacturer's standard sizes unless otherwise indicated:
1. Paving Fabric: 12 by 12 inches minimum.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and testing agency.
- B. Material Certificates: For each paving material. Include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.
- C. Material Test Reports: For each paving material, by a qualified testing agency.
- D. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located.
- B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.
- C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of SRDC Standard and PennDOT of for asphalt paving work.
 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
 1. Prime Coat: Minimum surface temperature of 60 deg F.
 2. Tack Coat: Minimum surface temperature of 60 deg F.
 3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
 4. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
 5. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: ASTM D 692/D 692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.
- C. Fine Aggregate: ASTM D 1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
 - 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: ASTM D 242/D 242M or AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO M 320, PG 64-22.
- B. Asphalt Cement: ASTM D 3381/D 3381M for viscosity-graded material.
- C. Cutback Prime Coat: ASTM D 2027, medium-curing cutback asphalt, MC-30 or MC-70.
- D. Emulsified Asphalt Prime Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- E. Tack Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- F. Fog Seal: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.
- G. Water: Potable.
- H. Undersealing Asphalt: ASTM D 3141/D 3141M; pumping consistency.

2.3 AUXILIARY MATERIALS

- A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and recycled tires asphalt shingles or glass from sources and gradations that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.

- B. Herbicide: Commercial chemical for weed control, registered by the EPA, and not classified as "restricted use" for locations and conditions of application. Provide in granular, liquid, or wettable powder form.
- C. Sand: AASHTO M 29, Grade No. 2 or No. 3.
- D. Paving Geotextile: AASHTO M 288 paving fabric; nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.
- E. Joint Sealant: AASHTO M 324, Type II or III, hot-applied, single-component, polymer-modified bituminous sealant.

2.4 MIXES

- A. Recycled Content of Hot-Mix Asphalt: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent or more than 50-percent by weight.
 - 1. Surface Course Limit: Recycled content no more than 10 percent by weight.
- B. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and complying with the following requirements:
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 - 2. Base Course: PG-64-22.
 - 3. Surface Course: PG-64-22.
- C. Emulsified-Asphalt Slurry: ASTM D 3910, Type 1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
 - 2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
 - 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PATCHING

- A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseal concrete pieces firmly.
 - 1. Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseal pieces firmly.
 - 2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.
- C. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd..
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- D. Placing Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.
- E. Placing Patch Material: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.3 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
 - 1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.
 - 1. Clean cracks and joints in existing hot-mix asphalt pavement.
 - 2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.
 - 3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3.4 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. 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.
 - 1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.
- C. Cutback Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd.. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.
 - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
 - 2. Protect primed substrate from damage until ready to receive paving.
- D. Emulsified Asphalt Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.10 to 0.30 gal./sq. yd. per inch depth. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.
 - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
 - 2. Protect primed substrate from damage until ready to receive paving.
- E. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd..
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.5 PAVING GEOTEXTILE INSTALLATION

- A. Place paving geotextile promptly according to manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches and transverse joints 6 inches.
- B. Protect paving geotextile from traffic and other damage, and place hot-mix asphalt overlay the same day.

3.6 PLACING HOT-MIX ASPHALT

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in 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. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
 - 2. Place hot-mix asphalt surface course in single lift.
 - 3. Spread mix at a minimum temperature of 250 deg F.
 - 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
 - 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
 - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches from strip to strip to ensure proper compaction of mix along longitudinal joints.
 - 2. Complete a section of asphalt base course before placing asphalt surface course.
- 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.

3.7 JOINTS

- A. Construct joints to ensure a 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 to joints.
 - 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 at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
 - 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.

3.8 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 with vibratory-plate compactors in areas inaccessible to rollers.

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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: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent or greater than 100 percent.
 2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent or greater than 96 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 asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.9 INSTALLATION TOLERANCES

- A. Pavement 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. Pavement 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. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

- C. Asphalt Traffic-Calming Devices: Compact and form asphalt to produce the contour indicated and within a tolerance of plus or minus 1/8 inch of height indicated above pavement surface.

3.10 SURFACE TREATMENTS

- A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. to existing asphalt pavement and allow to cure. With fine sand, lightly dust areas receiving excess fog seal.
- B. Slurry Seals: Apply slurry coat in a uniform thickness according to ASTM D 3910 and allow to cure.
 - 1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a PENNDOT qualified testing agency to perform tests and inspections.
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to AASHTO T 168.
 - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
 - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than three cores taken.
 - b. 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.
- E. Replace and compact hot-mix asphalt where core tests were taken.
- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.12 WASTE HANDLING

- A. General: Handle asphalt-paving waste according to approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."

END OF SECTION 321216

SECTION 321443

POROUS UNIT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Brick permeable pavers with aggregate fill.
- 2. Aggregate setting bed for pavers.
- 3. Edge restraints.
- 4. Non-woven geotextile fabric.

B. Related Requirements:

- 1. Section 312000 "Earth Moving" for excavation and compacted subgrade.
- 2. Section 033053 "Miscellaneous Cast in Place Concrete" for cast-in-place concrete curbs that serve as edge restraints for porous paving.
- 3. Section 329300 "Plants" for planting ground cover in porous paving.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For materials other than aggregates.

B. Product Data: For the following:

- 1. Pavers.
- 2. Edge restraints.
- 3. Geotextiles.

- C. Sieve Analyses: For aggregate materials, according to ASTM C 136.

D. Samples:

1. Full-size units of each type of unit paver indicated.
2. Aggregate fill.
3. Aggregate setting bed materials.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For unit pavers. Include statements of material properties indicating compliance with requirements, including compliance with standards. Provide for each type and size of unit.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for unit pavers, indicating compliance with requirements.
 1. For grid paving units, include durability test data based on testing according to proven field performance requirements of ASTM C 1319 performed on units subjected to three years' exposure to same general type of environment, temperature range, and traffic volume as Project.
 2. For solid interlocking paving units, include test data for freezing and thawing according to ASTM C 67.

1.6 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.
- B. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

1.8 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace pavers that do not comply with performance and other requirements specified in this Section, including settlement of pavers, within the specified warranty period.
 1. Warranty Period: 12 months from date of Substantial Completion
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish pavers to repair or replace pavers that do not comply with performance and other requirements specified in this Section within the specified warranty period.

1. Warranty Period: 12 months from date of Substantial Completion

PART 2 - PRODUCTS

2.1 AGGREGATE SETTING-BED MATERIALS

- A. Regional Materials: Aggregate and soil shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Graded Aggregate for Sub-base: Sound crushed stone or gravel complying with ASTM D 448 for Size No. 57 requirements in Section 312000 "Earth Moving" for sub-base material.
- C. Graded Aggregate for Base Course: Sound crushed stone or gravel complying with ASTM D 448 for Size No. 57 requirements in Section 312000 "Earth Moving" for base-course material.
- D. Bedding Course: Joint-fill and setting bed aggregates (ASTM D448). No. 89 Stone approximate size: 3/8 in. to No. 16.
- E. Graded Aggregate for Bedding Course: Sound crushed stone or gravel complying with ASTM D 448 for Size No. 9.
- F. 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 according to test methods referenced:
 1. Survivability: Class 2; AASHTO M 288.
 2. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
 3. Permittivity: 0.02 per second, minimum; ASTM D 4491.
 4. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
- G. 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 according to test methods referenced:
 1. Grab Tensile Strength (ASTM-D4632) \geq 120 lbs
 2. Mullen Burst Strength (ASTM-D3786) \geq 225 psi
 3. Flow Rate(ASTM-D4491) \geq 95 gal/min/ft²
 4. UV Resistance after 500 hours' exposure; (ASTM D 4355) \geq 70%
 5. Heat-set or heat-calendared fabrics are not permitted

2.2 FILL MATERIALS

- A. Aggregate Fill for Porous Paving: Graded, sound, crushed stone or gravel complying with ASTM D 448 for Size No. 9.

2.3 PERMEABLE PAVING

- A. The basis of design for the permeable pavers is as follows:
 - 1. Manufacturer: Whitacre Greer
 - 2. Website: <http://wgpaver.com>
 - 3. Unit Paver: Permeable Boardwalk Pavers (2 ¼" x 9" x 3" deep)
 - 4. Pattern: Basket weave, as shown on the Landscape Drawings
 - 5. Colors: The following three (3) complementary colors are to be alternated as shown on the Landscape Drawings:
 - a. UP-A: Permeable Unit Paving, Medium Blend (#53)
 - b. UP-B: Permeable Unit Paving, Dark Blend (#54)
 - c. UP-C: Permeable Unit Paving, Accent (#50)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Proof-roll prepared subgrade according to requirements in Section 312000 "Earth Moving" to identify soft pockets and areas of excess yielding. Proceed with porous paver installation only after deficient subgrades have been corrected and are ready to receive sub-base and base course for porous paving.

3.2 INSTALLATION, GENERAL

- A. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be structurally unsound or visible in finished work.
- B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- C. Cut unit pavers with motor-driven masonry saw equipment or a block splitter to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
- D. Tolerances:
 - 1. Variation in Plane between Adjacent Units (Lipping): Do not exceed 1/16-inch unit-to-unit offset from flush.
 - 2. Variation from Level or Indicated Slope: Do not exceed 1/8 inch in 24 inches and 1/4 inch in 10 feet or a maximum of 1/2 inch.
- E. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.
 - 1. Install concrete curb at permeable paver edges restraints, comply with manufacturer's written instructions.

3.3 SETTING-BED INSTALLATION

- A. Scarify subgrade uniformly to a flat surface.
- B. Proof-roll prepared subgrade to identify soft pockets and areas of excess yielding. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Design Engineer, and replace with compacted backfill or fill as directed.
- C. Place drainage geotextile over prepared subgrade, overlapping ends and edges at least 12 inches.
- D. Place aggregate sub-base and base.
- E. Place drainage geotextile over sub-base, overlapping ends and edges at least 12 inches.
- F. Place drainage geotextile over base course, overlapping ends and edges at least 12 inches.
- G. Place bedding course, and screed to a thickness of 1 to 1-1/2 inches, taking care that moisture content remains constant and density is loose and constant until pavers are set and compacted.

3.4 PAVER INSTALLATION

- A. Set unit pavers on bedding course, being careful not to disturb bedding base. If pavers have lugs or spacer bars to control spacing, place pavers hand tight against lugs or spacer bars. If pavers do not have lugs or spacer bars, place pavers with a 1/16-inch- minimum and 1/8-inch- maximum joint width. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch with pieces cut to fit from full-size pavers.
 - 1. When installation is performed with mechanical equipment, use only unit pavers with lugs or spacer bars on sides of each unit.
- B. Compact pavers into bedding course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf compaction force at 80 to 90 Hz. Use vibrator with neoprene mat on face of plate or other means as needed to prevent cracking and chipping of pavers. Perform at least three passes across paving with vibrator.
 - 1. Compact pavers when there is sufficient surface to accommodate operation of vibrator, leaving at least 36 inches of uncompacted pavers adjacent to temporary edges.
 - 2. Before ending each day's work, compact installed concrete pavers except for 36-inch width of uncompacted pavers adjacent to temporary edges (laying faces).
 - 3. As work progresses to perimeter of installation, compact installed pavers that are adjacent to permanent edges unless they are within 36 inches of laying face.
 - 4. Before ending each day's work and when rain interrupts work, cover pavers that have not been compacted and bedding course on which pavers have not been placed with non-staining plastic sheets to protect them from rain.
- C. Place soil fill as follows, immediately after vibrating pavers into bedding course. Spread and screed soil fill level with tops of pavers. Vibrate pavers and add soil fill until porous paving is filled to about 3/4 inch from top surface; remove excess soil fill if any.

1. Before ending each day's work, place soil fill in installed porous paving except for 42-inch width of unfilled paving adjacent to temporary edges (laying faces).
 2. As work progresses to perimeter of installation, place soil fill in installed paving that is adjacent to permanent edges unless it is within 42 inches of laying face.
 3. Before ending each day's work and when rain interrupts work, cover paving that has not been filled with non-staining plastic sheets to protect it from rain.
- D. After filling pavers with soil, sow seed according to Section 329200 "Turf and Grasses," except sow seed at half the rate specified for seeding lawns. Sweep seed from surfaces of pavers into voids and water with fine spray.
1. Within 24 hours after sowing seed, spread an additional 3/16 inch of uncompacted soil fill over seed and soak with water.
- E. Place graded aggregate fill immediately after vibrating pavers into bedding course. Spread and screed aggregate fill level with tops of pavers.
1. Before ending each day's work, place aggregate fill in installed porous paving except for 42-inch width of unfilled paving adjacent to temporary edges (laying faces).
 2. As work progresses to perimeter of installation, place aggregate fill in installed paving that is adjacent to permanent edges unless it is within 42 inches of laying face.
 3. Before ending each day's work and when rain interrupts work, cover paving that has not been filled with non-staining plastic sheets to protect it from rain.
- F. As work progresses, remove and replace pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

3.5 MAINTENANCE AND PROTECTION

- A. Water newly planted grass and keep moist until grass is established. Maintain grass that is planted in paving to comply with requirements in Section 329200 "Turf and Grasses."

END OF SECTION 321443

SECTION 321723

PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes painted markings applied to asphalt pavement.
- B. Related Requirements:
 - 1. Section 099113 "Exterior Painting" for painting exterior concrete surfaces other than pavement.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to marking pavement including, but not limited to, the following:
 - a. Pavement aging period before application of pavement markings.
 - b. Review requirements for protecting pavement markings, including restriction of traffic during installation period.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include technical data and tested physical and performance properties.
- B. Shop Drawings: For pavement markings.
 - 1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
 - 2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

- C. Samples: For each exposed product and for each color and texture specified; on rigid backing, 8 inches square.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Publication 408 of PENNDOT for pavement-marking work.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for alkyd materials 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 PAVEMENT-MARKING PAINT

- A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248, Type F; colors complying with FS TT-P-1952.
 - 1. Color: White & Yellow As indicated.
- B. Pavement-Marking Paint: MPI #32, alkyd traffic-marking paint.
 - 1. Color: White & Yellow As indicated.
- C. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes.
 - 1. Color: White & Yellow As indicated.
- D. Pavement-Marking Paint: MPI #97, latex traffic-marking paint.
 - 1. Color: White & Yellow As indicated.
- E. Glass Beads: AASHTO M 247, Type 1 made of 100 percent recycled glass.
 - 1. Roundness: Minimum 80 percent true spheres by weight.
- F. VOC Content: Pavement markings used on building interior shall have a VOC content of 150 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement is dry and in suitable condition to begin pavement marking according to manufacturer's written instructions.
- B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.2 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Design Engineer.
- B. Allow paving to age for a minimum of 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
 - 1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to pavement. Mask an extended area beyond edges of each stencil to prevent paint application beyond the stencil. Apply paint so that it cannot run beneath the stencil.
 - 2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal..

3.3 PROTECTING AND CLEANING

- A. Protect pavement markings from damage and wear during remainder of construction period.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 321723

SECTION 323113
CHAIN LINK FENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Chain-link fences.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Inspect and discuss electrical roughing-in, equipment bases, and other preparatory work specified elsewhere.
 - 2. Review coordination of interlocked equipment specified in this Section and elsewhere.
 - 3. Review required testing, inspecting, and certifying procedures.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Fence and gate posts, rails, and fittings.
 - b. Chain-link fabric, reinforcements, and attachments.
 - c. Gates and hardware.
- B. Shop Drawings: For each type of fence and gate assembly.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Include accessories, hardware, gate operation, and operational clearances.
- C. Samples for Initial Selection: For each type of factory-applied finish.

- D. Samples for Verification: For each type of component with factory-applied finish, prepared on Samples of size indicated below:
 - 1. Polymer-Coated Components: In 6-inch lengths for components and on full-sized units for accessories.
- E. Delegated-Design Submittal: For structural performance of chain-link fence and gate frameworks, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer factory-authorized service representative.
- B. Product Certificates: For each type of chain-link fence, operator, and gate.
- C. Product Test Reports: For framework strength according to ASTM F 1043, for tests performed by a qualified testing agency.
- D. Field quality-control reports.
- E. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gate operators to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing fence grounding; member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.
- B. Emergency Access Requirements: According to requirements of authorities having jurisdiction for gates with automatic gate operators serving as a required means of access.
- C. Mockups: Build mockups to set quality standards for fabrication and installation.
 - 1. Build mockup for typical chain-link fence and gate, including accessories.
 - a. Size: 10-foot length of fence.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design chain-link fence and gate frameworks.
- B. Structural Performance: Chain-link fence and gate frameworks shall withstand the design wind loads and stresses for fence height(s) and under exposure conditions indicated according to ASCE/SEI 7.
 - 1. Design Wind Load: As indicated on Drawings 30,000 psi yield.
 - a. Minimum Post Size: Determine according to ASTM F 1043 for post spacing not to exceed 10 feet for Material Group IA, ASTM F 1043, Schedule 40 steel pipe.
 - b. Minimum Post Size and Maximum Spacing: Determine according to CLFMI WLG 2445, based on mesh size and pattern specified.

2.2 CHAIN-LINK FENCE FABRIC

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:
 - 1. Fabric Height: As indicated on Drawings.
 - 2. Steel Wire for Fabric: Wire diameter of 0.148 inch.
 - a. Mesh Size: 1 inch.
 - b. Galvanized
 - 3. Selvage: Knuckled at both selvages.

2.3 FENCE FRAMEWORK

- A. Posts and Rails Sheet 28: ASTM F 1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 or ASTM F 1083 based on the following:
 - 1. Fence Height: 72 inches As indicated on Drawings .

2. Heavy-Industrial-Strength Material: Group IA, round steel pipe, Schedule 40.
 - a. Line Post: 2.0 inches in diameter.
 - b. End, Corner, and Pull Posts: 2.5 inches in diameter .
3. Horizontal Framework Members: Intermediate top and bottom rails according to ASTM F 1043.
 - a. Top Rail: 1.5 inches.
4. Brace Rails: ASTM F 1043.
5. Polymer coating over metallic coating.
 - a. Color: Black, according to ASTM F 934.

2.4 TENSION WIRE

- A. Metallic-Coated Steel Wire: 0.177-inch- diameter, marcelled tension wire according to ASTM A 817 or ASTM A 824, with the following metallic coating:
 1. Type I: Aluminum coated (aluminized).
 2. Type II: Zinc coated (galvanized) by electrolytic] process, with the following minimum coating weight:
 - a. Class 3: Not less than 0.8 oz./sq. ft. of uncoated wire surface.
 - b. Class 4: Not less than 1.2 oz./sq. ft. of uncoated wire surface.
 - c. Class 5: Not less than 2 oz./sq. ft. of uncoated wire surface.
 - d. Matching chain-link fabric coating weight.
 3. Type III: Zn-5-Al-MM alloy with the following minimum coating weight:
 - a. Class 60: Not less than 0.6 oz./sq. ft. of uncoated wire surface.
 - b. Class 100: Not less than 1 oz./sq. ft. of uncoated wire surface.
 - c. Matching chain-link fabric coating weight.
- B. Polymer-Coated Steel Wire: 0.177-inch diameter, tension wire according to ASTM F 1664, Class 2a over aluminum-coated steel wire.
 1. Color: Black, according to ASTM F 934.
- C. Aluminum Wire: 0.192-inch- diameter tension wire, mill finished, according to ASTM B 211, Alloy 6061-T94 with 50,000-psi minimum tensile strength.

2.5 FITTINGS

- A. Provide fittings according to ASTM F 626.
- B. Post Caps: Provide for each post.

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1. Provide line post caps with loop to receive tension wire or top rail.
- C. Rail and Brace Ends: For each gate, corner, pull, and end post.
- D. Rail Fittings: Provide the following:
 1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches long.
 2. Rail Clamps: Line and corner boulevard clamps for connecting bottom rails to posts.
- E. Tension and Brace Bands: Pressed steel.
- F. Tension Bars: Steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.
- H. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
 1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:
 - a. Hot-Dip Galvanized Steel: 0.148-inch- diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.
- I. Finish:
 1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. of zinc.
 - a. Polymer coating over metallic coating.
 2. Aluminum: Mill finish.

2.6 GROUT AND ANCHORING CEMENT

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout, recommended in writing by manufacturer, for exterior applications.
- B. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

2.7 GROUNDING MATERIALS

- A. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

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- B. Connectors and Grounding Rods: Listed and labeled for complying with UL 467.
 - 1. Connectors for Below-Grade Use: Exothermic welded type.
 - 2. Grounding Rods: Copper-clad steel, 5/8 by 96 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for a certified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
 - 1. Do not begin installation before final grading is completed unless otherwise permitted by Design Engineer.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 CHAIN-LINK FENCE INSTALLATION

- A. Install chain-link fencing according to ASTM F 567 and more stringent requirements specified.
 - 1. Install fencing on established boundary lines inside property line.
- B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
- C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - a. Exposed Concrete: Extend 2 inches above grade; shape and smooth to shed water.
 - b. Posts Set into Sleeves in Concrete: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed according to anchoring material manufacturer's written instructions. Finish anchorage joint to slope away from post to drain water.

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- c. Posts Set into Holes in Concrete: Form or core drill holes not less than 5 inches deep and 3/4 inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed according to anchoring material manufacturer's written instructions. Finish anchorage joint to slope away from post to drain water.
- D. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more. For runs exceeding 500 feet, space pull posts an equal distance between corner or end posts.
- E. Line Posts: Space line posts uniformly at 10 feet o.c.
- F. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.
 - 1. Locate horizontal braces at midheight of fabric 72 inches or higher, on fences with top rail, and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
- G. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch- diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:
 - 1. Extended along top and bottom of fence fabric. Install top tension wire through post cap loops. Install bottom tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.
- H. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.
- I. Intermediate and Bottom Rails: Secure to posts with fittings.
- J. Chain-Link Fabric: Apply fabric to inside of enclosing framework. Leave 1-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- K. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts, with tension bands spaced not more than 15 inches o.c.
- L. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach

other end to chain-link fabric according to ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.
- M. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.4 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation.

3.5 GROUNDING AND BONDING

- A. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Fence and Gate Grounding:
1. Ground for fence and fence posts shall be a separate system from ground for gate and gate posts.
 2. Install ground rods and connections at maximum intervals of 500 feet.
 3. Ground fence on each side of gates and other fence openings.
 - a. Bond metal gates to gate posts.
 - b. Bond across openings, with and without gates, except openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least 18 inches below finished grade.
- C. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at grounding location.
1. Make grounding connections to each barbed wire strand with wire-to-wire connectors designed for this purpose.
 2. Make grounding connections to each barbed tape coil with connectors designed for this purpose.
- D. Connections:
1. Make connections with clean, bare metal at points of contact.
 2. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 3. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.

4. Make above-grade ground connections with mechanical fasteners.
5. Make below-grade ground connections with exothermic welds.
6. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests.
- B. Grounding Tests: Comply with requirements in Section 264113 "Lightning Protection for Structures."
- C. Prepare test reports.

3.7 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.

3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain chain-link fences and gates.

END OF SECTION 323113

SECTION 329100

PLANTING PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

The specification section, "General Conditions of Contract", "Special Conditions" and "Division 1 – General Requirements" form a part of this section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

A. Section includes:

1. Furnish, mix and install Planting Soil for lawns, meadows and plant beds.
2. Preparation of subgrade and finish grade and compaction mitigation.
3. Clean up.

B. Related requirements:

1. Section 017419 "Construction Waste Management"
2. Section 312000 "Earth Moving"
3. Section 329200 "Turf and Grasses and Meadows"
4. Section 329300 "Plants"

1.3 REFERENCES

A. The following apply to work in this Section:

1. Agricultural Chemist: Qualified, experienced public or private soils testing laboratory, capable of providing test results as specified.
2. ASTM: American Society of Testing Materials.
3. USDA: United States Department of Agriculture.
4. AOAC: Association of Official Agricultural Chemists.
5. SSSA: Soil Science of America, Methods of Soil Analysis.
6. TMECC: Test Methods for the Examination of Composting and Compost.

1.4 GENERAL DEFINITIONS

A. Finish Grade: Elevation of finished surface of Planting Soil.

B. Topsoil: A native mineral soil taken from the O and A Horizons of a well-drained site and having a USDA soil texture classification as specified herein.

- C. Planting Soil: Imported Topsoil or Salvaged Topsoil, amended as necessary to meet material requirements herein.
- D. Planting Soil Component: Including, but not limited to, Topsoil, Sand and Organic Amendment.
- E. Salvaged Topsoil: Stripped Topsoil from the Project Site that has been screened and stockpiled for reuse.
- F. Subgrade: Surface or elevation of subsoil remaining after completing excavation immediately beneath Planting Soil.

1.5 SUBMITTALS

A. Qualifications

1. Installation and maintenance foreman on the job shall be experienced in landscape installation and maintenance on projects with similar scope. Perform work with personnel totally familiar with Planting Soil preparation and lawn, meadow, seeding and planting installations under the supervision of a foreman experienced with landscape work.
2. Testing Laboratory: Experienced person or persons employed by public or private testing laboratory, qualified and capable of performing tests, making soil recommendations, and issuing reports as specified. The Testing Laboratory shall submit a Statement of Qualifications with regard to the specified testing. The Testing Laboratory shall be as approved by the Owner's Representative.
3. Soil Supplier and Installing Contractor shall be experienced in fabrication and installation of soil mixes with similar complexity.

B. Sequencing, Scheduling and Protection Plan

1. Submit a detailed plan for scheduling and sequencing of all soil work including but not limited to rough grading, Planting Soil installation, fine grading, equipment data and settlement/compaction methodology.
2. Coordinate all soils work with Contractors requiring access through the site.
 - a. Indicate with schedules and plans the utilization of Planting Soil and subsoil protection measures until Substantial Completion.
 - b. Indicate with schedules and plans protection measures (wooden protection boards or other approved methods) over areas where construction operations will traverse installed Planting Soil.

C. Samples, Product Data and Certificates

1. Samples: Submit loose materials in sealed bags labeled with the name of the project title, material, manufacturer/supplier.
 - a. Topsoil, 1-gallon re-sealable plastic bag.
 - b. Salvaged Topsoil, 1-gallon re-sealable plastic bag (sample after stockpiling).
 - c. Sand, 1-gallon re-sealable plastic bag.
 - d. Organic Amendment, 1-gallon re-sealable plastic bag.

- e. Planting Soil, 1-gallon re-sealable plastic bag.
 - f. Any other soil amendment or conditioner as requested by the Owner. Submit certificates and product data cut sheets for each type of amendment material.
2. Provide written confirmation that the source of supply can meet the quantities required for the scope of work. Multiple sources for a single item are not acceptable.
 3. Quality Control Samples: Maintain a 5-gallon bucket of final approved Planting Soil and Compost on-site in a protected, secure location. If the installed or delivered Planting Soil or Compost deviate from the control samples additional testing will be required at the Contractors expense.

D. Soil Testing

1. Prior to delivery of Planting Soil to the site, submit all required Planting Soil Components, and Planting Soil mix to an approved soil testing laboratory and test as defined herein.
2. Planting Soil Components (Topsoil, Sand and Organic Amendment) and Planting Soil test reports, shall be submitted for review and approval prior to delivery to the site.
3. Planting Soil mix ratio may be adjusted, based on test reports of Planting Soil Components. If adjustments are required to bring Planting Soil into conformance with specifications, Contractor to re-test the adjusted Planting Soil mix and re-submit test reports for review and approval by Owner's Representative prior to delivery to the site. Contractor to adjust and re-test as necessary, at the expense of the Contractor, until the Planting Soil mix is approved.
4. Submit Compost test reports for review and approval prior to performing the in-situ Compost amendment.
5. The contractor shall coordinate testing, submittal review, and fabrication allowing enough time to complete the testing and review process, and Planting Soil fabrication within the construction timeline and without impacting the schedule.
6. All test results and samples shall be submitted to the Owner's Representative for review and approval.
7. Test results of samples shall conform to the specifications, and if required, specific soil amendments shall be proposed to bring Planting Soil in conformance with specifications. Proposed Amendments and quantities and shall be submitted to the Owner's Representative for approval.
8. Testing Agencies: An A2LA Accredited Lab shall perform all testing for Planting Soil Components and Planting Soil mix. Submit the testing laboratory credentials for review and approval prior to submitting materials for testing. Utilize a single approved testing laboratory unless approved otherwise or indicated otherwise herein.
9. Provide test data from one of the following testing agencies, or an approved equal. The Solvita® maturity index test may be provided by Woods End Laboratories in addition to one of the agencies listed in "a" through "e".
 - a. Rutgers Agricultural Experiment Station, Soil Testing Laboratory, PO Box 902, Milltown, NJ 08850, phone: 732-932-9295, website: njaes.rutgers.edu/soiltestinglab/.
 - b. University of Delaware Soil Testing Program, Department of Plant and Soil Sciences, 152 Townsend Hall, 531 South College Avenue, Newark, DE 19716-2170, phone: 302-831-1392, website: ag.udel.edu/dstp/index.html.

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- c. University of Massachusetts Soil and Plant Tissue Testing Laboratory, West Experiment Station, 682 North Pleasant Street, Amherst, MA 01003, phone: 413-545-2311, website: soiltest.umass.edu.
 - d. Penn State Agricultural Analytical Services Laboratory, University Park, PA 16802, phone: 814-863-0841, website: www.aasl.psu.edu/Default.htm.
 - e. Hummel & Co, 35 King Street, Trumansburg, NY 14886, phone: 607-387-5694, website: www.turfdactor.com.
 - f. Woods End Laboratories, Inc., PO Box 297, Mt. Vernon, ME 04352, phone: 207-293-2457, email: lab@woodsend.org, website: www.woodsend.org.
10. All Test Reports must be labeled with the following information.
- a. Date material sampled from source/supplier.
 - b. Date material tested in lab.
 - c. Project title.
 - d. Name of contractor.
 - e. Name of source/supplier and material tested.
 - f. Testing agency name and contact information.
 - g. Test type and test result including units reported.
 - h. Results of test including deviations from acceptable ranges as defined by the specifications. If not defined by the specifications then as recommended by the testing agency.
 - i. Test reports must be submitted with sample of the material tested.
11. Test Reports: Submit this specification and Planting Soil Component samples intended for use in Planting Soil mix or in-situ Organic Amendment to the approved Testing Agency. All reports must be submitted with representative samples. Provide test reports indicating results inclusive of all criteria specified in Part 2 herein.

1.6 REGULATORY REQUIREMENTS

- A. Comply with all rules, regulations, laws and ordinances of local, state and federal authorities having jurisdiction. Provide labor, materials, equipment and services necessary to make Work comply with such requirements without additional cost to Owner.
- B. Procure and pay for permits and licenses required for work of this section.

1.7 PROJECT CONDITIONS

- A. Environmental Requirements for Soil:
 - 1. Perform on-site soil work only during suitable weather conditions. Do not disc, roto-till, or work soil when frozen, excessively wet or muddy, or in otherwise unsatisfactory condition.
 - 2. Planting Soil shall not be handled, hauled or placed during rain or wet weather when over-compaction will occur.

- B. Sequencing and Scheduling: Adjust and coordinate work of this Section with work of all other Sections of Project Specifications. Notify the Owner's Representative of any changes to the previously approved on the Sequencing, Scheduling and Protection Plan submittal.
- C. Pre-Installation Conferences: The person(s) responsible for soil preparation and mixes of this Section shall attend Pre-Installation Conference(s) to coordinate with work of other sections.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Planting Soil and organic amendment materials shall be protected from intrusion of contaminants and erosion at all times. Once mixed, cover the final stockpile with filter cloth or store in a covered space.
- B. Soil materials shall not be delivered to the site until samples and test reports have been approved by the Owner's Representative. However, such approval does not constitute final acceptance of Planting Soil.
- C. Stockpiling: On-site stockpiling shall be restricted to no more than the needs of what can be used in a 24 hour period, unless approved otherwise by the Owner's Representative. Stockpiles should be no more than 6 feet in height to prevent anaerobic conditions within the pile(s). Composts should be turned weekly.
- D. Deliver packaged materials to the location where soils are to be mixed, in unopened bags or containers, each bearing the name, guarantee, and trademark or the producer, material composition, manufacturer's certified analysis, and the weight or the material. Retain packages for review by the Owner's Representative.
- E. Store and handle packaged materials in compliance with manufacturer's instructions and recommendations. Protect all materials from weather, damage, and theft.

PART 2 - PRODUCTS

2.1 PLANTING SOIL

- A. Planting Soil shall meet the requirements stated below. The primary component of the Planting Soil shall be Topsoil. The soil supplier may make adjustments to the Planting Soil with an approved Organic Amendment and Sand as necessary and in conformance with the material requirements specified herein.
 - 1. Organic Amendment and/or Sand amendments shall be homogenously blended and uniformly mixed with Topsoil using a mechanical soil blender designed for such purpose or shall be uniformly mixed by wind-rowing.
 - 2. Topsoil that is to be blended with Sand must be screened or shredded before mixing with Sand.
 - 3. Soil materials must be maintained moist, not wet, during mixing.
 - 4. Compost may not be added greater than 20% by volume.

5. Topsoil shall be a natural, loamy, friable mineral soil taken from the O and A Horizons essentially free from heavy or stiff clay lumps, stones, cinders, concrete, brick, roots, sticks brush, litter, plastics, metals, refuse or other deleterious materials in accordance with ASTM D 5286-92. The soil shall be free of herbicides, petroleum-based materials or other substances of a hazardous or toxic nature, which may inhibit plant growth. The soil shall be free of noxious weeds, seeds or vegetative parts of weedy plants that cannot be selectively controlled in the planting.

B. Planting Soil shall meet all the requirements listed herein and shall be a fertile, natural soil, free from large stones, roots, sticks, clods, plants, peat, sod, pockets of coarse sand, pavement and building debris, glass, noxious weeds including invasive species, infestations of undesirable organisms and disease causing pathogens, and other extraneous materials harmful to plant growth. Soil shall be consistent throughout the project, and shall be obtained from the same approved source, matching approved samples. If source is changed at any time during construction, the Contractor shall obtain complete tests of new source samples and submit them to the Owner's Representative for review and approval, prior to ordering.

1. **Particle Size:**

- a. Planting Soil shall be tested for particle size and organic content after passing through a 1/4-inch sieve rather than the standard 2-mm sieve to include larger pieces of organic material.
- b. Particle Size Analysis shall be performed and compared to the USDA Soil Classification System per ASTM D422 (hydrometer test) and USDA sand and gravel classifications shall be determined on material retained on the #270 sieve following a wet washing procedure unless specified otherwise herein. Test data shall clearly indicate results in percent passing and percent retained and shall conform to the following particle size distribution:

USDA Particle Name	Size (mm)	% Passing (% Oven Dry Weight)
Sand	(0.05 to 2 mm)	50% - 60%
Silt	(0.002 to 0.05mm)	shall not exceed 30%
Clay	(less than 0.002mm)	10-20%

2. **Sand sieve analysis:** planting soil shall have 50%-55% total of medium to coarse sands. Sieve analysis shall be classified in categories gravel, very coarse sand, coarse sand, medium sand, fine sand, very fine sand, and fines corresponding to respective US Standard Sieve sizes No. 10, 18, 35, 60, 140, and 270.
3. **Organic Matter Content:** planting soil shall have a range of three to six percent organic matter by weight (3.0 - 6.0%) as determined by ASTM F1647-11, loss-on-ignition, oven-dry weight. To adjust organic content, planting soil may be amended, prior to placing and final grading, with the addition of organic amendments as defined herein.
4. **pH:** planting soil shall have a pH range of 6.0 to 7.0.
5. **Nutrient Analysis:**
 - a. Include at a minimum macro-nutrient analysis including Phosphorus (P), Potassium (K), Calcium (Ca), Magnesium (Mg), and Sulfur (S). Test results shall be cited in parts per million.

- b. Nutrient test shall identify any deficiencies and shall make recommendations to correct deficiencies specific to the plants specified on the Drawings (contractor to properly indicate plant types to Testing Agency).
 - c. The testing lab shall also provide notice when chemicals are in excessive levels and are toxic to plants, humans or animals.
6. **Salinity:** soluble salts content shall be less than 2.0 mmhos/cm (dS/m) and shall be determined by electrical conductivity of a 1:2 soil/water sample reported in millimhos per cm.
 7. **Cation Exchange Capacity (CEC):** shall be a minimum of 12 Meq/100g and shall be determined using the pH 7 ammonium acetate method.
 8. **Carbon to nitrogen (C:N) ratio:** shall be between 10:1 and 20:1.
 9. **Dry Bulk Density:** shall be less than 1.65 for a sandy loam

2.2 TOPSOIL

- A. Topsoil shall be taken from the A Horizon of a well-drained site and have a USDA soil texture classification of Loam or Sandy Loam and be a loamy, friable mineral soil essentially free from heavy or stiff clay lumps, stones, cinders, concrete, brick, roots, sticks brush, litter, plastics, metals, refuse or other deleterious materials in accordance with ASTM D 5286-92. The soil shall be free of herbicides, petroleum-based materials or other substances of a hazardous or toxic nature, which may inhibit plant growth. The soil shall be free of noxious weeds, seeds or vegetative parts of weedy plants that cannot be selectively controlled in the planting. Perform the following tests and submit test reports showing the following criteria are met:
 1. **Particle Size:** perform and compare to the USDA Soil Classification System per ASTM D422 (hydrometer test). Determine USDA sand and gravel classifications on material retained on the #270 sieve following a wet washing procedure. Indicate test data results in percent passing and percent retained.
 2. **pH:** shall fall between 5.5 to 6.5 and Buffer pH shall fall between 6.8 to 7.0.
 3. **Salinity:** Soluble salts content shall be less than 0.5 mmoh/cm as determined by electrical conductivity of a 1:2 soil/water sample reported in millimhos per cm.
 4. **Organic matter content:** shall have a range of two to four percent organic matter by weight (2.0 - 4.0%) as determined by ASTM F1647-11, loss-on-ignition, oven-dry weight.
 5. **Cation Exchange Capacity (CEC):** shall be a minimum of 15 Meq/100g for a 1:2 soil:water ratio as determined using the pH 7 ammonium acetate method.
 6. **Nutrient levels:** as defined below and cited in parts per million (ppm).

<u>Nutrients</u>	<u>Target Levels (ppm)</u>
Nitrate Nitrogen (NO ₃)	5 to 15
Phosphorus (P)	30 to 50
Potassium (K)	120 to 510
Calcium (Ca)	700 to 1300
Magnesium (Mg)	140 to 270

2.3 ORGANIC AMENDMENT (COMPOST)

- A. Organic Amendment shall conform to the following minimum characteristics as indicated on submitted test reports:
1. Testing shall be done in conformance with the U.S. Compost Council's publication Test Methods for the Examination of Composting and Compost (TMECC) unless otherwise specified herein.
 2. Organic Amendment shall be stable, mature, weed-free, aerobically composted yard waste. Woodchip bulked bio-solids, sewage sludge, peat, peat-humus and mushroom compost products are not acceptable.
 3. Organic Amendment shall be a homogenous material essentially free of soil clods, lumps, roots and stones.
 4. Organic Amendment shall be a well-aged, black to dark brown color with few identifiable parts.
 5. **Inert Materials:** The Organic Amendment shall have a man-made foreign material (hard plastics, metal, glass, etc.) content less than 1.5% as material retained on a U.S. Std. No. 5 (4 mm) sieve (TMECC 03.06).
 6. **Particle Size:** The Organic Amendment shall be screened such that a minimum of 90% passes a U.S. Std. 3/4" sieve and that no more than 10% passes a U.S. Std. No. 10 sieve on a dry weight basis.
 7. **Carbon/ Nitrogen ratio:** shall be less than 30:1. Optimum ratio is less than 15:1.
 8. **Degree of maturity:** Organic Amendment shall be considered stable as determined by the Solvita compost maturity index. Organic Amendment must achieve a maturity index of at least 7 indicating a "finished compost" that is well matured, aged compost, curing grade; few limitations for usage.
 9. **Organic Matter Content:** shall be 35% minimum as determined by ASTM F1647-11, loss-on-ignition, oven-dry weight.
 10. **pH:** of the finished composted organic matter shall be near 7.0, and be within the range of 6.5 to 7.5.
 11. **Salinity:** Soluble salts content shall be <3.0 mmhos/cm (dS/m) and shall be determined by electrical conductivity of a 1:2 soil/water sample reported in millimhos per cm.
 12. **Ammonium content:** Ammonium shall be less than 400 ppm on a dry weight basis.

2.4 SAND

- A. **Type:** Sand amendment shall be clean, sharp, natural silica Coarse Concrete Sand complying with ASTM-33 Fine Aggregate with a Fine Modulus Index between 2.8 and 3.2.
1. **pH:** shall fall between 6.0 and 7.0.
 2. **Salinity:** soluble salt content shall be less than 2.0 millimhos per cm and shall be determined by electrical conductivity of a 1:2 soil/water sample reported in millimhos per cm.
 3. **Organic Matter Content:** shall be less than 1.0%.

2.5 SOIL AMENDMENTS

- A. Additional Amendments: Use only as required per soil test reports.
1. Lime shall be an approved agricultural ground, high magnesium limestone containing not less than 85% total carbonates, 95% passing a 20 mesh sieve, 40% passing a 60 mesh sieve and a minimum of 30% percent passing a 100 mesh sieve, and shall be applied at the rate as recommended by the soil tests. Lime shall be applied mechanically at least 2 weeks prior to planting and fertilizer applications and incorporated into full depth of Planting Soil prior to fine grading.
 2. Humic Acid by the following manufacturer:
 - a. "TerraVive MHA" as manufactured by Natural Environmental Systems, www.naturalenviro.com, (800) 999-9345.
 - b. "HUMUS BIO-GRO" as manufactured by Biofix Holding, Inc. www.biofix.com (940) 382-2594.
 - c. "Humax" as manufactured by JH Biotech, Inc. www.jhbiotech.com (863) 537-1200.
 - d. Or equal approved by Owner's Representative.
 3. Fertilizer shall be a complete slow-release commercial fertilizer, complying with all Federal and State fertilizer laws. Fifty percent of the fertilizer components shall be derived from natural organic sources. Fertilizer chemical make-up shall be based on the soil test recommendations by the soil-testing laboratory and shall be delivered to the site in the original unopened containers each showing the manufacturer's guaranteed analysis. Store fertilizer so that when used it shall be dry and free flowing. For bidding purposes, assume fertilizer analysis to be 20,20,20 (N,P,K).

PART 3 - EXECUTION

3.1 VERIFICATION

- A. Prior to construction and soil placement operations at planting areas ascertain the location of all electric cables conduits under drainage systems and utility lines. Take proper precaution to protect sub-grade elements from disturbance or damage. Contractor failing to take these precautions shall be responsible for making requisite repairs to damaged utilities at Contractor's own expense. Verify that required underground utilities are available, located, and ready for use. Coordinate with other trades.
- B. Verify that all work requiring access through or adjacent to areas where Planting Soil is to be placed has been completed and no further access will be required. In the event that access will be required, this must be coordinated with the Contractor.
- C. Any soils polluted by gasoline, oil, mortar and grout debris, construction debris, unacceptable soils, or other substances that would render the soils unsuitable for a proper plant growth shall be removed from the premises whether or not such pollution occurs or exists prior to or during the Contract period. In the event that such material is placed, this material shall be removed and replaced with approved material. All remedial operations associated with soil mixes shall be reviewed and approved by the Owner's Representative.

- D. Subgrade shall be unfrozen, firm, and stable with no standing water, mud, or muck.
- E. Prior to soil placement operations ascertain that subgrade conditions allow reasonable water infiltration. Report slow water infiltration to the Owner's Representative prior to proceeding with work.
- F. Verify that previously installed protection measures are in place.
- G. Verify that excavation and rough grading is complete.
- H. Do not begin work until all other work is complete.
- I. Beginning installation means acceptance of existing conditions.

3.2 EQUIPMENT

- A. Utilize low-impact machines only. All equipment shall be rated for a ground pressure of 4 psi or lower. Equipment with track belts is preferred.
- B. Excavation shall be performed in-the-dry and shall be accomplished by methods, which preserve the undisturbed state of subgrade soils. The existing subgrade shall not be compacted or subject to excessive construction equipment prior to placement of soil materials. Use of equipment with narrow tracks or tires, rubber tires with large lugs, or high-pressure tires that will cause excessive compaction shall not be permitted within the excavation.

3.3 SITE PROTECTION

- A. Protect adjacent existing and finished construction from damage or staining by the subgrade soil and Planting Soil. Use ½" plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.
 - 1. Clean up all trash and any soil or dirt spilled on any paved surface at the end of each working day.
- B. Maintain all silt and sediment control devices required by applicable regulations.
- C. Provide adequate methods to assure that trucks and other equipment do no track soil from the site onto adjacent property and the public right of way.

3.4 PREPARATION OF SUBGRADE FOR PLANTING SOIL

- A. Subgrade shall be defined as 6-inches below proposed finished grade in lawn areas and meadow areas, 12-inches below finished grade at ornamental grass planting areas, 18-inches below proposed finished grade at shrub planting areas, and 30-inches below proposed finished grade at tree plantings. Existing grades shall be modified as necessary to fulfill this requirement even if existing grades coincide with the proposed finished grades.

- B. Make thorough evaluation of the subgrade to ensure water infiltration and drainage, particularly in areas that are not receiving a subsurface drainage system. If drainage is impeded or excessively slow alert the Owner's Representative immediately for corrective measures. Do not proceed with work until remedial action as be determined and implemented.
- C. Do not grade subgrade soil when muddy or excessively wet or frozen. Only work soil when friable. Adhere to environmental requirements as specified herein.
- D. Clear the excavation of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete washout silts or other material harmful to plants have been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Fill any over excavation with approved fill and compact to the required subgrade compaction.
- E. Remove stones larger than 1-1/2" in any dimension and sticks, roots, rubbish and other extraneous matter and legally dispose of them off the Owner's property.
- F. Confirm that the subgrade is at the proper elevation and prepared as required. Subgrade elevations shall slope parallel to the finished grade and or toward the subsurface drain lines as shown on the drawings. Subsurface drains lines, if applicable, shall be installed prior to the installation of the Planting Soil.
 - 1. Install grade stakes on a 20-foot grid in open areas and sufficiently spaced in other areas to insure correct line and grade of subgrade and finished grade. Verify subgrade elevations and do whatever additional grading is necessary to bring the subgrade to a true, smooth slope parallel to the finish grade.
- G. Do not proceed with the installation of the Planting Soil until all proposed construction in the area has been installed. For site elements dependent on Planting Soil for foundation support, postpone installation until immediately after the installation of Planting Soil. Excavate area adjacent to walks and structures with care so not to undermine the supporting structure.
- H. Once rough grading of subgrade has been completed, the subgrade shall be loosened and fine graded by harrowing, disking, dragging the teeth of a backhoe bucket through the subgrade, or as dictated by the condition of the subgrade to a depth of 6" minimally to mitigate compaction created during grading operations.
 - 1. Loosen subgrade incrementally in bands to the extent which Planting Soil can be installed without traversing the area repeatedly with equipment. Each band shall be equal to the reach of the loader bucket. Work from the interior areas to outside edges to avoid driving over previously loosened subgrade.
- I. Request subgrade review by Owner's Representative prior to placing Planting Soil. Clean up subgrade and dispose of all debris prior to review. Planting Soil installation should proceed immediately following subgrade preparation.

3.5 INSTALLATION OF PLANTING SOIL

- A. Do not place, spread or grade Planting Soil when muddy or excessively wet or frozen. Only work soil when friable. Adhere to environmental requirements as specified herein.

- B. Soil Transition Layer: To facilitate soil drainage and de-compaction and to decrease hardpan conditions, spread approximately 3-inches of Planting Soil over loosened subgrade. Till Planting Soil thoroughly into the top 5 to 6 inches of subgrade. Spread the remainder of Planting Soil.
1. Create the Soil Transition Layer incrementally in bands to the extent which Planting Soil can be installed without traversing the area repeatedly with equipment. Each band shall be equal to the reach of the loader bucket. Work from the interior areas to outside edges to avoid driving over previously loosened subgrade.
 2. Install the Soil Transition Layer where soil depths are less than or equal 8-inches.
- C. Placing, spreading and compacting of Planting Soil may be done using one the following methods.
1. Place Planting Soil in bands to full depth over approved subgrade as shown on the drawings. Each band shall be equal to the reach of the loader bucket. Work from the interior areas to outside edges to avoid driving over previously placed soil.
 2. Place Planting Soil in 6-inch to 8-inch lifts to full depth indicated. Lightly compact each lift of Planting Soil to prevent settlement and to consolidate soil. Compaction shall be 80% standard Proctor density and shall not exceed 85% standard Proctor density as determined by ASTM D698-12. Approved compaction equipment includes a smooth drum roller or plate compactor. Typically one to three passes per lift will achieve approximately 80% to 85% standard Proctor density. Conditions will vary depending on exact soil properties. The Contractor shall adjust installation methods to achieve uniform compaction at the specified rate. Use of vibratory machines is prohibited, as they will create greater compaction levels than specified herein. Minimize driving over the same areas of previously installed lifts of Planting Soil to the greatest extent possible to avoid over-compaction. Back-drag areas that have become compacted with the teeth of the loader bucket before placing the next lift.
 3. To confirm specified compaction levels are met, perform one (1) Proctor density test for the first lift of Planting Soil and subsequent Proctor test for every other lift performed in the first band to be installed. Once verification that compaction methodology conforms to the specified levels installation of the remaining soil installation can proceed. To ensure compaction consistency is being maintained over the course of the work for subsequent planting areas, perform one (1) Proctor density test for every 5,000 square feet of material installed. Proctor density test reports shall be provided to the Owner's Representative for verification. Planting Soil installed with compaction levels exceeding 85% standard Proctor shall be removed and reinstalled at the Contractors expense.
- D. Final finished grade elevation should be greater than the depth required per the Drawings to allow for initial settlement. Taper additional soil volume as required to meet structures including, but not limited to, walls, paving, and curbs. Coordinate with the Owner's Representative to determine estimated settlement based on final approved Planting Soil and installation methodology in accordance with the following guidelines:
1. Lawn with high sand and low organic amendment soil: almost no settlement.
 2. Lawn with loamy sand soil: < 1/2 inch per foot of installed soil depth.
 3. Sandy loam soil: 1/2 inch per foot of installed soil depth.
 4. Sandy clay loam soil: 1 to 1-1/2 inch per foot of installed soil depth.

5. Clay loam soil and any soil with > 10% by volume of organic amendment: 2 inches or more per foot of installed soil depth.
- E. Grading Tolerances: Planting areas shall be fine graded within 1 inch of grades indicated on the Drawings. Tolerances shall be within 1/2-inch of grade when meeting with paved surfaces, curbs, walls, or other structures. Maintain all flat areas and slopes to allow free flow of surface drainage without ponding.

3.6 EROSION CONTROL MATERIALS

- A. Areas with slopes greater than or equal to 6:1, shall be covered with secured erosion control blanket within two (2) days or prior to any precipitation, whichever is shorter in accordance with the product requirements specified herein.
1. Complete meadow and other seeding operations prior to installation of erosion control blankets. See Section 'Lawn and Fine Grading' for turfgrass requirements.
 2. Install erosion control blankets prior to installation of trees, shrubs, herbaceous plants and groundcovers. See Section 'Plants' for planting requirements.
 3. Install erosion-control blanket and fasten per Drawings. Install from top of slope, working downward.

3.7 CLEAN UP

- A. Maintain the site in an orderly condition during the progress of work. Promptly remove debris and trash. Leave the site in a neat, orderly condition, broom clean.
- B. Protect all installed Planting Soil from compaction or contamination. Should either occur, immediately notify the Owner's Representative and the Owner.

END OF SECTION 329100

SECTION 329200

TURF GRASSES AND MEADOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

The specification section, “General Conditions of Contract“, “Special Conditions“ and “Division 1 – General Requirements“ form a part of this section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

A. Section includes:

1. Sodding of new lawn areas.
2. Seeding of meadow areas.
3. Seeding of riparian restoration areas.
4. Plugging of meadow areas.
5. Maintenance.

B. Related requirements:

1. Section 017419 “Construction Waste Management”
2. Section 329100 “Planting Preparation”
3. Section 329300 “Plants”

1.3 REFERENCES

A. The following apply to work in this Section:

1. Agricultural Chemist: Qualified, experienced public or private soils testing laboratory, capable of providing test results as specified.

1.4 SUBMITTALS

- A. Certification of each seed used for turfgrass sod. Include identification of source and name and telephone number of supplier.
- B. Certification of each seed used for perennial plugs. Include identification of source and name and telephone number of supplier.
- C. Certification of Seed: From seed vendor for each meadow seed mixture, stating 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 date of packaging. Include identification of source and name and telephone number of supplier.

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- D. Qualification Data: For qualified landscape Installer, demonstrating the successful completion of turf and meadow establishment for three separate projects. Submit name, address, contact information, photographs of completed work and summary of each project.
- E. Product Certificates: For all fertilizers and soil amendments, from manufacturer.
- F. Instructions: Submit planting and maintenance schedule.
 - 1. Submit in writing the proposed seed, sod and plug installation schedule including season, delivery of materials to the site and installation of seed at the site.
 - 2. The schedule must be approved by The Owner prior to the beginning of work.
- G. Product data: Submit product literature or tear sheets with name of product, and manufacturer for each type of product specified herein.
- H. Test reports: Submit test reports of all seed mixes at least three (3) weeks prior to delivery of materials to site.
 - 1. Seed: Test for purity, proportion by weight, weed seed content and germination percentage of all seed mixture proposed for use. No seed shall be delivered until the test reports are approved. All seed shall be tested within six (6) months immediately preceding date of sowing.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf and meadow establishment as demonstrated in Submittals section above.
- B. Contractor's superintendent shall consult with the Architect regarding final lines, grades and layout of material.
- C. Installer's Field Supervision: Installer's field supervisor shall be present at all times during the execution of this portion of the work and shall be thoroughly familiar with the procedures and materials to be installed.
- D. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY STORAGE AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.
 - 1. Deliver fertilizer in waterproof bags.
 - 2. All bag tags of seed used shall be retained and submitted to The Owner's Representative.
- B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation"

in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.

C. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Environmental requirements:

1. Planting restrictions: Plant during one of the following periods, weather permitting.
 - a. Seed/overseed:
 1. Spring: Between March 15 and April 30. If irrigation is present and operational for duration of work and months following, seeding may occur until May 31.
 2. Fall: Between September 15 and October 31.
 - b. Sod:
 1. Spring: Between April 01 and June 30.
 2. Fall: Between September 15 and October 31.
2. Installer shall not seed or sod outside dates unless otherwise permitted by The Owner's Representative.

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained.

1. Do not seed during adverse weather or windy conditions. Do not seed when ground is frozen or when soil is saturated.
2. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.8 MAINTENANCE SERVICE

A. Initial Turf, Meadow and other seeded plantings Maintenance Service: Provide full maintenance by skilled employees of landscape Installer.

1. Maintain as required in Part 3.
2. Begin maintenance immediately after each area is planted and continue until acceptable turf and meadow is established but for not less than 30 days from date of Substantial Completion.

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PART 2 - PRODUCTS

2.1 SOIL

- A. Requirements for reuse of existing topsoil, imported topsoil or planting soil and soil amendments: See Section 329100 "Planting Preparation".

2.2 SEED

- A. Fresh, clean, new seed. Seed shall be packed in sealed bags showing net weight, composition of mix, date of germination tests and supplier's name. Germination test must be done within a nine-month period prior to sale of the seed.
 - 1. Seed shall not contain in excess of 0.5% weed seed, no more than 3% inert matter, and no other crop or undesirable grass species. Comply with state laws governing noxious weeds. Seed containing prohibited or restricted noxious weeds shall not be accepted.
 - 2. Seed shall have minimum germination rate of 85%.
 - 3. Seed shall be Pennsylvania certified and blue tagged.
 - 4. Seed shall be the following mix:
 - a. Seed Mix A, Seasonally Flooded Grass Mix: Basis of Design is "ERNMX-128" as supplied by Ernst Conservation Seeds (mfr.), Meadville, PA, phone: 1-800-873-3321 or approved equal.
 - b. Seed Mix B, Native Wildflower and Grass Mix: Basis of Design is "ERNMX-153" as supplied by Ernst Conservation Seeds (mfr.), Meadville, PA, phone: 1-800-873-3321 or approved equal.
 - c. Seed Mix C, Partially Shaded Woodland Mix: Basis of Design is "ERNMX-143" as supplied by Ernst Conservation Seeds (mfr.), Meadville, PA, phone: 1-800-873-3321 or approved equal.
 - d. Seed Mix D, Lawn Turf Type Tall Fescue Blend: 10% Kentucky Bluegrass, 45% Turf Type Tall Fescue, 45% Perennial Ryegrass
 - 1. Blue Grass acceptable cultivars: Award, Avalanche, Beyond, Midnight II, Princeton 105
 - 2. Tall Fescue acceptable cultivars: Silverstar, Olympic Gold, Apache III, Masterpiece, Bingo
 - 3. Perennial Rye grass acceptable cultivars: Esteem, Pacesetter, Sierra, Stellar, Citation Fore
 - e. Seed Mix E, temporary cover for erosion and sedimentation control: 100% Annual Ryegrass
 - 5. Sowing Rate:
 - a. Mixture A: 20.0 pounds per 1,000 square feet.
 - b. Mixture B: 20.0 pounds per acre
 - c. Mixture C: 20.0 pounds per acre
 - d. Mixture D: 5.0 pounds per 1,000 square feet.
 - e. Mixture E: 5.0 pounds per 1,000 square feet.

2.3 TURFGRASS SOD

- A. Turfgrass Sod: Certified, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.

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- B. Turfgrass Species: Sod of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
 - 1. Turf-type Tall Fescue blend: 10% Kentucky Bluegrass, 45% Turf Type Tall Fescue, 45% Perennial Ryegrass
 - a. Blue Grass acceptable cultivars: Award, Avalanche, Beyond, Midnight II, Princeton 105
 - b. Tall Fescue acceptable cultivars: Silverstar, Olympic Gold, Apache III, Masterpiece, Bingo
 - c. Perennial Rye grass acceptable cultivars: Esteem, Pacesetter, Sierra, Stellar, Citation Fore

2.4 MULCHES

- A. Mulch: Wood cellulose fiber mulch dyed green or contain a green dye in the package that will provide an appropriate color to facilitate visual inspection of the uniformly spread slurry.
 - 1. fiber length to be approximately 10 mm
 - 2. diameter approximately 1 mm
 - 3. pH range of 4.0 to 8.5
 - 4. ash content of 1.6% maximum
 - 5. water holding capacity of 90% minimum
- B. Apply mulch per the manufacturers recommended application rate.

2.5 WATER

- A. Potable, clean fresh and free from harmful materials. Contractor shall provide all means of conveyance including hoses, sprinklers, tank trucks or other means which may be required to water lawns until accepted by the Owner.

2.6 FERTILIZER

- A. Commercial slow-release fertilizer formulated especially for starting new cool season turfgrass species seed:
 - 1. Nitrogen content shall be between 15% and 25% by weight.
 - 2. Phosphorus content shall be between 20% and 30% by weight.
 - 3. Potassium content shall be between 0% and 10% by weight.
 - 4. Application rate and instructions per manufacturers recommendations.

2.7 EROSION CONTROL

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include the following short-term 100% biodegradable products:
 - 1. Organic Tackifier:
 - a. Profile Products, LLC, 750 Lake Cook Rd., Suite 440, Buffalo Grove, IL 60089, 800-508-8681, www.profileevs.com.
 - 1. ConTack Organic Tackifier Application

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- b. Or equal approved by the Design Engineer.
- OR
- 2. Erosion Control Blanket manufactured by:
 - a. American Excelsior Company, 850 Avenue H East, Arlington, TX 76011, 800-777-7645, www.americaneccelsior.com.
 - 1. Curlex NetFree for slopes 6:1 to 3:1.
 - 2. Curlex I FibreNet for slopes 3:1 to 2:1.
 - b. North American Green, 5401 St. Wendel-Cynthiana Road, Poseyville, IN 47633, 800-772-2040, www.nagreen.com.
 - 1. BioNet S75BN for slopes 6:1 to 3:1.
 - 2. BioNet S150BN for slopes 3:1 to 2:1.
 - c. Or equal approved by the Design Engineer.
- 3. Fasteners for securing Erosion Control Blanket:
 - a. American Excelsior Company, 850 Avenue H East, Arlington, TX 76011, 800-777-7645, www.americaneccelsior.com.
 - 1. E-staple fastener, 6-inch.
 - b. North American Green, 5401 St. Wendel-Cynthiana Road, Poseyville, IN 47633, 800-772-2040, www.nagreen.com.
 - 1. BioStake fastener, 6-inch.
 - c. Or equal approved by the Design Engineer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
- B. Verify that fine grading is complete.
- C. Do not begin work until all other work is complete. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning installation means acceptance of existing conditions.
- D. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by the Design Engineer and according to all state and federal laws, and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
 2. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

- A. Limit turf subgrade preparation to areas to be planted.
- B. See Section 'Soil Preparation' for requirements.

3.4 SEEDING

- A. Seed lawn, either as seeding or hydroseeding or overseeding, shall be applied to all areas of this project that do not receive sod.
1. Sow seed as soon as ground has been properly prepared.
 2. Distribute seed evenly over entire area by sowing equal quantity in two directions at right angles to each other.
 - a. Use suitable mechanical seeder or sow by hand for small areas.
 - b. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
 - c. Do not use wet seed or seed that is moldy or otherwise damaged.
 3. Do not seed against existing or proposed trees or within existing or proposed plant beds. Limit extent of seed to the outside edge of planting saucer or plant bed.
 4. Sow seed at the supplier's recommended application rate for new lawns.
 5. Cover seed with a thin layer of planting soil by lightly raking into the top 1/8 inch of soil.
 6. Roll seed in both directions very lightly with an empty water roller.
 7. Water with a fine spray immediately after seeding operation is completed.
- B. After seed application, apply Erosion Control Blankets or Straw Mulch.
1. Install Erosion Control Blankets in accordance with Manufacturer.
 2. Protect seeded areas with slopes less than 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 thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
 3. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
- C. Water all newly installed seeded areas as necessary to keep lawn healthy. Apply water in sufficient quantities so it penetrates four (4) inches into soil without puddling. Continue watering until seeded areas are accepted by the Owner.
- D. When seeding occurs after acceptable seeding dates, over winter protection shall consist of applying five bales clean straw per 1,000 sq. ft. and anchor mulch by commercial mulch netting or 20 lbs./1,000 sq. ft. cellulose fiber. Asphalt emulsion anchoring is not permitted.

3.5 HYDROSEEDING

- A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
 - 1. Mix slurry with fiber-mulch manufacturer's recommended nonasphaltic tackifier.
 - 2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.

3.6 SODDING

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
 - 1. Lay sod across angle of slopes exceeding 1:3.
 - 2. Anchor sod on slopes exceeding 1:6 with wood pegs or steel staples spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.7 PLUGGING

- A. Plant plugs in holes or furrows, spaced as indicate on Plant Schedule of Plans apart in both directions. On slopes, contour furrows to near level.

3.8 MEADOW

- A. Sow seed by drill seeding.
 - 1. Prepare soil as per Section 329100 "Planting Preparation."
 - 2. Mix and place seed in seed boxes and calibrate machine as recommended by the seed manufacturer.
 - 3. Drill sees into the soil to a depth of 1/4-inch.
 - 4. When soil is disturbed to a greater depth or is not in a firm condition at the time of seeding, firm the soil with a roller. Rollers shall weigh approximately 40lb per foot of width.
 - 5. Immediately after seeding, apply fiber mulch over bare soil to cover at least 90 percent of the surface.

6. Utilize a spreader or hand-broadcast when within the root zone of existing trees. 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.
 7. Do not use wet seed or seed that is moldy or otherwise damaged.
- B. Sow seed at a rate as indicated on Plant Schedule of Plans.
- C. Water newly planted areas and keep moist until meadow is established.

3.9 LAWN MAINTENANCE PRIOR TO SUBSTANTIAL COMPLETION

- A. Begin maintenance immediately after each lawn area is installed. Provide all care necessary to keep lawns healthy including but not limited to: watering, mulching, weeding, re-seeding, fertilizing, mowing, disease and pest control, filling soil settlement, reseeded wash outs and any other procedure consistent with good horticultural practice necessary to insure normal, vigorous and healthy growth of all lawn work. Provide materials and installation the same as those used in the original installation.
1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 2. Roll, re-grade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth turf.
 3. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
- B. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain the specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.
1. Do not attempt first mowing until lawn areas are fully germinated, firmly rooted and secure in place.
 2. At the time of the first cutting, set mower blades to a grass height of 2-1/2-inches. Set mower to a grass height of 3-inches for subsequent mowings.
- C. Watering: When rainfall precipitation is not adequate, provide temporary irrigation to keep turf uniformly moist to a depth of 4 inches.
1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.

3.10 MEADOW MAINTENANCE

- A. Maintain and establish meadow by watering, weeding, mowing, trimming, replanting, and performing other operations as required to establish a healthy, viable meadow. Roll, re-grade, and replant bare or eroded areas and re-mulch. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and meadow damaged or lost in areas of subsidence.
 - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
 - 3. Apply treatments as required to keep meadow and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain temporary piping, hoses, and meadow-watering equipment to convey water from sources and to keep meadow uniformly moist.
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 - 2. Water meadow with fine spray at a minimum rate of 1/2 inch per week for through Substantial Completion unless rainfall precipitation is adequate.
- C. If meadow is established in Fall season matures to a height exceeding eight inches, Contractor shall provide a single mowing to eight inches in height, or the height recommended by seed manufacturer.

3.11 SATISFACTORY TURF

- A. Complete at least three (3) mowings, at least one week apart, before contacting the Landscaper Architect for inspection for Substantial Completion.
- B. Turf installations shall meet the following criteria as determined by the Owner's Representative:
 - 1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been well established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
 - 2. Rework any areas that fail to show a uniform stand of grass until they are approved.
 - 3. All areas that fail to show a uniformly thick and well-developed stand of grass shall be re-seeded or re-sodded repeatedly until they are covered with a satisfactory growth of grass.
 - 4. Lawn areas shall be anchored to the soil with vigorous, healthy root growth.
- C. Complete all repairs and adjustments prior to Substantial Completion.
- D. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.
- E. Prior to inspection for Substantial Completion remove all excess soil and debris from site and repair damage resulting from seeding or sodding operations.

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3.12 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with the Owner's operations and others in proximity to the Work. Notify the Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.13 CLEANUP AND PROTECTION

- A. Protect work during and after installation and until Substantial Completion by providing all materials necessary to protect seeded areas from damage.
- B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- C. Maintain the site in an orderly condition during the progress of work. Promptly remove debris and trash. Leave the site in a neat, orderly condition, broom clean.
- D. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

END OF SECTION 32 92 00

SECTION 329300

PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

The specification section, "General Conditions of Contract", "Special Conditions" and "Division 1 – General Requirements" form a part of this section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

A. Section includes:

1. Furnish and install trees, shrubs, and groundcover.
2. Nursery visits and plant selection.
3. Tree stabilization.
4. Clean up.

B. Related requirements:

1. Section 017419 "Construction Waste Management"
2. Section 329100 "Soil Preparation"
3. Section 329200 "Turf Grasses and Meadows"

1.3 REFERENCES

A. The following apply to work in this Section:

1. ASNS: "American Standard for Nursery Stock," latest edition, published by the American Nursery and Landscape Association.
2. SPN: "Standardized Plant Names," latest edition, by the American Joint Committee on Horticultural Nomenclature.
3. NAA: "National Arborist Association Standards for Pruning", latest edition, published by the National Arborist Association.

1.4 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than sizes indicated; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

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- C. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.
- D. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- E. Finish Grade: Elevation of finished surface of planting soil.
- F. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- G. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- H. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- I. Planting Area: Areas to be planted.
- J. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- K. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- L. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- M. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- N. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- O. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- P. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.5 SUBMITTALS

- A. Qualification Data:

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1. For qualified landscape Installer: Include list of **similar** projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons. Projects shall include seeded meadow installations.
- B. Certifications: Submit certificate with names of materials and manufacturer to the Owner's Representative for review and approval prior to furnishing material.
 1. Plants: Furnish certificates of inspection as may be required by Federal, State or other authorities that plants are free of disease or hazardous insects.
 2. Commercial fertilizers: Include guaranteed analysis.
- C. Instructions: Submit planting and maintenance schedule to the Owner's Representative for review.
 1. Submit in writing the proposed planting schedule indicating dates for tagging and installation, and a detailed program of Warranty Period maintenance for trees, shrubs, herbaceous plants, ornamental grasses, and groundcovers.
- D. Product data: Submit product literature or tear sheets with name of product, and manufacturer to the Owner's Representative for review and approval.
 1. Herbicides, pesticides, and fungicides.
 2. Mulch.
- E. Samples: Submit physical sample of loose materials in sealed bags labeled with name/type of material, manufacturer/supplier and date that sample was obtained to the Owner's Representative for review and approval.
 1. Mulch, 1-gallon re-sealable plastic bag.
- F. Source of supply: Submit in writing all proposed sources of plant material for review by the Owner's Representative.
 1. Locate trees and make all pre-selection arrangements at the source of supply required to ensure an efficient selection procedure. The Owner's Representative, with Contractor present, will select plants at nursery on the basis of their compliance with the Drawings. Contractor shall inspect the selected plants on the basis that the plants are free of disease and otherwise conform to the requirements of the Contract Documents. The accuracy of the varieties of species specified for plant material shall be the Contractor's responsibility. Request visit at least 14 days in advance of desired inspection date.
 - a. Trees will be inspected and reviewed by the Owner's Representative at the nursery for conformity to Specification requirements. Such review shall not affect the right of inspection and rejection during delivery and installation.
 - b. All trees specified as B&B must be in the ground at the growing source (nursery) at the time of inspection. **Pre-dug trees shall not be acceptable.**
 - c. Photographs shall be provided to the Owner's Representative prior to scheduling any nursery visits. Include color photographs in digital format (sent via email) at least 4 by 6-inch of each required species and size of plant material, as it will be furnished to the Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other

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measuring device in each photograph. For species where more than 20 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.

- G. Warranty: Sample of special warranty.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants, with particular focus on the installation and establishment of seeded meadows.

1. Experience:
 - a. Five years experience in general landscape installation in addition to requirements in Section 014000 "Quality Requirements."
 - b. Five years experience in seeded meadow installation in addition to requirements in Section 014000 "Quality Requirements."
2. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
3. Pesticide Applicator: State licensed, commercial.

- B. Plants: Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

1. Plant List: Investigate sources of supply prior to submitting bid. Confirm that size, variety and quantity of plants specified on Plant List can be supplied. Failure to take this precaution shall not relieve the successful bidder from responsibility for furnishing and installing all plants in strict accordance with Contract requirements.
 - a. Substitutions shall not be permitted unless substantiated written proof is supplied that a specified plant is not available. Proposals to use the nearest equivalent size or variety will only be considered with such substantiated written proof.
 - b. Plant substitutions may be permitted upon written request submitted to the Owner's Representative, and only upon approval by the Owner's Representative.
 - c. All plants shall be grown on their own roots. No grafted species shall be acceptable.

- C. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.

1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

- D. Plant Material Observation: The Owner's Representative may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species,

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variety, cultivar, size, and quality. the Owner's Representative retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

- E. Pre-installation Conference: Conduct conference at Project site with the Owner's Representative prior to installation of any trees or other plant material.
 - 1. Contractor to mark in field, by flag or stake, the location of all proposed trees prior to conference.
 - 2. Contractor to review all location with the Owner's Representative and indicate any trees that are required to be installed in locations other than those indicated on the Drawings due to unforeseen conflicts.

1.7 DELIVERY STORAGE AND HANDLING

- A. Packaged materials: Deliver packaged materials in clearly marked containers showing net weight, guaranteed analysis and name of manufacturer. Specified requirements for packaged materials apply to bulk shipments. Protect materials from deterioration during delivery and during storage.
 - 1. Deliver fertilizer in waterproof bags.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.
- C. Plants: Notify the Owner and Owner's Representative seven (7) days in advance of any delivery of plants to site.
 - 1. Dig and handle trees with care to prevent injury to trunks, branches and roots. Do not prune prior to delivery. Do not bend or bind-tie trees in such manner as to damage bark, break branches or destroy natural shape. Pack and ship to ensure arrival at site in good condition. Provide protective covering during delivery. Plants with cracked or broken root balls shall not be accepted.
 - 2. Deliver plants after preparation of planting areas has been completed and approved, install plants immediately.
 - a. If planting is delayed more than eight (8) hours after delivery, set balled and burlapped (B&B) plants on the ground well protected with soil, wet mulch or other acceptable material. Protect balls and roots, and container grown material from freezing, sun, drying winds and/or mechanical damage. Water as necessary until planted.
 - b. Do not heel in plants for more than two (2) weeks without prior approval from Construction Manager.

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3. Immediately remove rejected plants from site.
- D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, 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 plants during shipping and delivery. Do not drop plants during delivery and handling.
 - E. Handle planting stock by root ball.
 - F. Store bulbs, corms, and tubers in a dry place at 60 to 65 degrees Fahrenheit until planting.
 - G. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
 1. Set balled stock on ground and cover ball with soil, mulch, or other acceptable material.
 2. Do not remove container-grown stock from containers before time of planting.
 3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by the Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:
 1. Notify the Owner no fewer than (5) five days in advance of proposed interruption of each service or utility.
 2. Do not proceed with interruption of services or utilities without the Owner's written permission.
- C. Environmental requirements:
 1. Planting Restrictions: Plant only within the following dates, weather permitting.
 - a. Spring Planting: Plant B&B deciduous trees and shrubs between April 1 and June 15.
 - b. Fall Planting: Plant B&B deciduous trees and shrubs between and September 15 and November 15.
 - c. Plant ground cover between March 15 – April 31. If ground cover must be planted in Fall, review proposed planting date with the Owner's Representative.
 2. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained.

- a. Do not plant during adverse weather, when ground is frozen or when soil is saturated.
 - b. Apply products during favorable weather conditions according to manufacturer's written instructions.
- D. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.9 SEQUENCING AND SCHEDULING

- A. Coordinate work of this Section with work of all other Sections of Specification.

1.10 INSPECTION FOR SUBSTANTIAL COMPLETION

- A. General: The Owner's Representative will make an inspection for Substantial Completion of the work of this Section.
1. Submit a written request for inspection at least two (2) weeks prior to the day on which inspection is requested.
 2. Contractor shall prepare a list of items to be completed or corrected for review by the Owner's Representative.
 - a. Upon completion of the inspection, the Owner's Representative shall amend the list of items to be completed or corrected, and indicate the time period for their completion or correction.
- B. Trees and shrubs:
1. All trees and shrubs shall be alive, healthy, and installed as specified to be accepted.
 2. Warranty Period for trees and shrubs shall not begin until all items have been completed or corrected.
 3. Contractor will be notified by the Owner of the date of the beginning of Warranty Period.
- C. Ground cover, grasses, perennials:
1. All ground cover shall show a uniform or appropriate coverage of the designated areas. the Owner, after an additional inspection, shall certify in writing the Substantial Completion of the work.

1.11 WARRANTY PERIOD FOR PLANTS

- A. Warrantys shall be in addition to, and not in lieu of, all other liabilities which manufacturers and Contractor may have by law or by other provisions of the Contract Documents.

- B. Contractor shall not be held responsible for acts of vandalism occurring after the beginning of Warranty Period, nor shall Contractor be held responsible for deleterious effects caused by maintenance procedures performed by the Owner without concurrence of Contractor.
- C. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by the Owner, or incidents that are beyond Contractor's control.
 - b. Structural failures including plantings falling or blowing over.
 - c. Faulty performance of tree stabilization, edgings, tree grates.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Periods from Date of Substantial Completion:
 - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
 - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
 - c. Annuals: Three months.
 - 3. Include the following remedial actions as a minimum:
 - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
 - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.12 MAINTENANCE SERVICE

- A. Initial Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
 - 1. Maintenance Period: 12 months from date of Substantial Completion.
- B. Initial Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
 - 1. Maintenance Period: 12 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL, GENERAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
- B. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.
- C. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as shown on Drawings.
- D. Annuals: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery.

2.2 TREES

- A. Provide freshly dug trees nursery grown in accordance with good horticultural practice.
 - 1. Sound, healthy and vigorous, well-branched and fully foliated when in leaf. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots will be rejected.
 - 2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
 - 3. Nomenclature: Agree with SPN or as accepted in the nursery trade for varieties not listed therein.
- B. Conform to measurements specified on Plant List. Dimension plants in their natural position. Measure height or spread and quality in accordance with standards specified in ASNS.
- C. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to the Owner's Representative, with a proportionate increase in size of roots or balls.
- D. Provide B&B stock with a compact natural ball of earth, firmly wrapped and tied in burlap so that upon delivery the soil in the ball is still firm and compact about the small feeding roots. Root ball sizes shall be in accordance with standards specified in ASNS.

- E. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- F. Plants shall be measured before pruning, with branches in normal position. Any necessary pruning shall be done at time of planting. Requirements for the measurement, branching, grading, quality, balling, and burlapping of plants shall be in accordance with standards specified in ASNS.

2.3 SHRUBS AND GROUND COVER

- A. Furnish in sizes indicated on plant list and conform to ASNS standards for species and sizes.
- B. All container grown plants shall be healthy, vigorous, well rooted and established in the container in which they are sold. Plant development shall be sufficient so that the root mass will hold together when removed from the container.

2.4 MULCH

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and groundcovers, consisting of one of the following:
 - 1. Type: Double shredded hardwood bark.
 - 2. Size Range: 3 inches maximum, 1/2 inch minimum.
 - 3. Color: Natural. Dyed mulch is not permitted.

2.5 WATER

- A. Potable, clean fresh and free from harmful materials.

2.6 TREE STABILIZATION MATERIALS

- A. Stakes and Guys:
 - 1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.
 - 2. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or compression springs.
 - 3. Guys: Nylon straps shall be used wrapped loosely around tree trunks and securely fastened to stakes.
 - 4. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.

2.7 PESTICIDES

- A. General: Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as

required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

- B. Herbicides, fungicides, and pesticides: Before use, product data must be submitted for review and approval by the Owner for type and rate of application.
- C. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- D. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.8 MISCELLANEOUS MATERIALS

- A. Organic Soil Amendments: See Division 32 Section 'Soil Preparation' for Compost specification requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by the Owner's Representative and replace with new planting soil.
- D. Verify that previously installed protection measures are in place.
- E. Verify that excavation, grading and paving is complete.
- F. Do not begin planting until all other work, except lawn work, is complete.
- G. Beginning installation means acceptance of existing conditions.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and outline areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain the Owner's Representative's acceptance of layout before excavating or planting. Make minor adjustments as required.
- D. Verify by testing that planting areas are free draining. If planting areas are not free draining notify the Owner's Representative and submit recommendation to restore drainage for approval.
- E. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

3.3 INSTALLATION

- A. Planting Pits and Trenches for Trees and Shrubs: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
 - 1. Do not plant until layout has been approved by the Owner's Representative.
 - 2. Excavate approximately three times as wide as ball diameter for balled and burlapped or container-grown stock.
 - 3. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk.
 - 4. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
 - 5. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
 - 6. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 - 7. Maintain supervision of excavations during working hours.
 - 8. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
 - 9. Plant to such depth that the finished grade level of the tree or shrub, after settlement, will be the same as that at which the plant was grown.
 - 10. Plant upright and plumb and faced to give the best appearance or relationship to adjacent plants and structures.

11. Do not pull burlap out from under balls. Remove all platforms, wire and surplus binding from the bottom, top and sides of ball. Cut and remove the top 1/3 of burlap from planting pit. Cleanly cut off all broken or frayed roots.
12. Remove all non-biodegradable materials from the planting area.
13. Do not use planting stock if root ball is cracked or broken before or during planting operation.
14. Backfill shall be comprised of excavated soil mixed with Compost. Mix ratio 4 parts soil to 1 part Compost. Turn Compost into soil with hand shovel.
15. Backfill around root ball in 6-inch deep layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
16. Apply water slowly to ensure penetration into the entire root system.
17. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.
18. Mulch within two (2) days of planting. Install 2-inch depth within mulch ring at trees in lawn.
19. Neatly prune trees and shrubs to remove broken or badly bruised branches with a clean cut in accordance with NAA standards, and at the time designated by, and to the satisfaction of the Owner's Representative and Owner's Representative.
 - a. Preserve the plant's natural character,
 - b. Perform pruning with clean, sharp tools.
 - c. Do not apply pruning paint to wounds.
20. Obstructions: Notify the Owner's Representative if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
 - a. Hardpan Layer: Drill 6-inch diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.

B. Planting herbaceous plants, ornamental grasses, and groundcovers:

1. Excavation and placements of Planting Soil, to depths and limits indicated on Plans and according to Specification Section 0329100 "planting Preparation," for entire area of plant bed shall be completed prior to the planting of any material. Grade smooth immediately before planting.
2. Set out and space ground cover, perennials, shrubs and ornamental grasses, spaced as indicated on Plant Schedule located on Plans, and in even rows with triangular spacing unless otherwise indicated.
3. Make necessary adjustments to layout and spacing to provided full coverage of bed area. Notify Owner's Representative of any areas which require extensive adjustments to plant spacing, or which result in bare plant bed areas that are unable to receive coverage with the quantities indicated on Plans.
4. Remove plastic containers before planting.
5. Dig holes large enough to allow spreading of roots.
6. Work soil around roots to eliminate air pockets.
7. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
8. Mulch within two (2) days of planting. Install two (2) inches of mulch continuously over entire planting beds. Keep mulch at least 2 inches away from base of plant.

3.4 TREE STABILIZATION

- A. Drawings do not indicate tree stabilization. If contractor is unable to provide the required Warranty for trees without guying, this work shall be included at no additional cost to the Owner. Guying, if provided, shall conform to recognized and accepted horticultural standards.
- B. If conditions dictate stabilization, install trunk stabilization as follows unless otherwise indicated:
 - 1. Upright Staking and Tying: Stake trees of 2- through 5-inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend at least 60 inches above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
 - 2. Use two stakes for trees up to 12 feet high and 2-1/2 inches or less in caliper; three stakes for trees less than 14 feet high and up to 4 inches in caliper. Space stakes equally around trees.
 - 3. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

3.5 EDGING INSTALLATION

- A. Shovel-Cut Edging: Separate mulched areas from turf areas with a 45-degree, 4- to 6-inch deep, shovel-cut edge to delineate bed edge as indicated on Plans.
 - 1. Bed edges shall be straight and true lines and true radius arcs as indicated on Plans.

3.6 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with the Owner's operations and others in proximity to the Work. Notify the Owner before each application is performed.
- B. Pre-Emergent Herbicides (Selective and Non-Selective): Apply to tree, shrub, and ground-cover areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas.
- C. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.7 PLANT MAINTENANCE PRIOR TO SUBSTANTIAL COMPLETION

- A. Begin maintenance immediately after each planting area is installed.
- B. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or

vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

- C. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- D. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.
- E. Prior to inspection for Substantial Completion remove all excess soil and debris from site and repair damage resulting from planting operations.

3.8 PLANT MAINTENANCE DURING WARRANTY PERIOD

- A. General: Perform procedures set forth in the submitted and approved maintenance program for the duration of Warranty Period.
- B. Inspect all trees at least once a month to locate any disease or pest infestations. If infestation is present, submit a proposed method of control to the Owner for approval prior to application of control measures.
- C. Remove dead plants within ten (10) days of notification by the Owner.
 - 1. Replacement plants may be installed during the next appropriate planting season.
 - 2. Replacement plants shall be of the same species and size as specified in the Plant List.
- D. Perform all maintenance procedures, including but not limited to: fertilizing, watering, weeding, and mulching.
 - 1. Prune, as necessary, to remove dead, diseased and damaged branches.
 - 2. When rainfall is not sufficient, water at least once a week during the growing season or as conditions required to promote plant health and limit plant loss.
 - a. Apply water slowly to penetrate the entire root zone and restrict water runoff.
 - b. Contractor shall provide all equipment or products for irrigation.
 - c. The Owner shall provide the water source for irrigation, however the Contractor is responsible for watering by portable tank or similar means from a source not provided by the Owner, should the water source not yet be available on site.
 - 3. Completely remove, by hand pulling, all weeds within mulch areas. Under no circumstances are weeds to attain more than two (2) inches of growth.
 - a. Herbicide use is only acceptable with the Owner's approval and with the Owner's restrictions and application procedures.
 - 4. Restore mulch around trees as necessary to preserve their appearance and to control weed growth.
 - 5. If any tree settles from its proper elevation, re-set tree to the proper level. Stabilize the rootball to prevent cracking or any other damage. Utilize a lift sling as necessary to facilitate re-setting the tree and to minimize rootball damage potential.
 - 6. If spraying to control insects, fungus, and other diseases is required seek approval from the Owner before spraying. Furnish spray program and product information on all sprays

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to be used to the Owner for approval. After approval, application will only be permitted by licensed applicators. Applicators shall follow Notification requirements and report any Chemical Hypersensitivity Registries for the area.

3.9 CLEAN UP AND PROTECTION

- A. Maintain the site in an orderly condition during the progress of work. Promptly remove debris and trash. Leave the site in a neat, orderly condition, broom clean.
- B. During planting, keep adjacent paving and construction clean and work area in an orderly condition.
- C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.10 FINAL ACCEPTANCE

- A. At end of Warranty Period, submit a written request for Inspection for Final Acceptance at least two (2) weeks prior to the day on which inspection is requested.
- B. At the end of the Warranty Period, the Owner, the Owner's Representative and Contractor shall make an inspection to determine that all plants are living and healthy. Any plant that is dead or not in satisfactory condition, as determined by the Owner, shall be removed from the site and replaced in accordance with the specifications. New plants installed, as part of the original Warranty Period shall also carry a new Warranty Period, which begins at the time of acceptance of the replacements plant(s). Any replacement and repair work that is required shall be re-inspected by the Owner.

END OF SECTION 329300

SECTION 334600

SUBDRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Geotextile filter fabrics.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Geotextile filter fabrics.

PART 2 - PRODUCTS

2.1 DRAINAGE PANELS

- A. Molded-Sheet Drainage Panels: Prefabricated geocomposite, 36 inches wide with drainage core faced with geotextile filter fabric.
 - 1. Filter Fabric: Nonwoven needle-punched geotextile, manufactured for subsurface drainage, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with the following properties determined according to AASHTO M 288:
 - a. Survivability: Class 2.
 - b. Apparent Opening Size: No. 40 sieve, maximum.
 - c. Permittivity: 0.2 per second, minimum.
 - 2. Film Backing: Polymeric film bonded to drainage core surface.

2.2 SOIL MATERIALS

- A. Soil materials are specified in Section 312000 "Earth Moving."

2.3 WATERPROOFING FELTS

- A. Material: Comply with ASTM D 226, Type I, asphalt-saturated organic felt.

2.4 GEOTEXTILE FILTER FABRICS

- A. Description: Fabric of PP or polyester fibers or combination of both, with flow rate range from 110 to 330 gpm/sq. ft. when tested according to ASTM D 4491.
- B. Structure Type: Nonwoven, needle-punched continuous filament.
 - 1. Survivability: AASHTO M 288 Class 2.
 - 2. Styles: Flat and sock.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.
- B. If subdrainage is required for landscaping, locate and mark existing utilities, underground structures, and aboveground obstructions before beginning installation and avoid disruption and damage of services.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.3 POROUS PAVER INSTALLATION

- A. Excavate paver outlook area to appropriate depth as indicated on plans.
- B. Lay flat-style geotextile filter fabric in porous paver locations and overlap sides.
- C. Place drainage course over scarified subgrade and geotextile filter fabric, to depth of not less than 4 inches.
- D. Add 2-inch choker extent of porous paver limits.
- E. Place layer of flat-style geotextile filter fabric over top of drainage course, overlapping edges at least 4 inches.
- F. Install drainage panels on foundation walls as follows:

SOUTH TO CHRISTIAN, PHASE 2 IMPROVEMENTS

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SUBDRAINAGE

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1. Coordinate placement with other drainage materials.
 2. Lay perforated drainage pipe at base of footing. Install as indicated in Part 3 "Piping Installation" Article.
 3. Separate 4 inches of fabric at beginning of roll and cut away 4 inches of core. Wrap fabric around end of remaining core.
 4. Attach panels to wall beginning at subdrainage pipe. Place and secure molded-sheet drainage panels, with geotextile facing away from wall.
- G. Place backfill material over compacted drainage course. Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Final backfill to finish elevations and slope away from building.

3.4 PIPING INSTALLATION

- A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.
1. Foundation Subdrainage: Install piping level and with a minimum cover of 36 inches unless otherwise indicated.
 2. Underslab Subdrainage: Install piping level.
 3. Plaza Deck Subdrainage: Install piping level.
 4. Retaining-Wall Subdrainage: When water discharges at end of wall into stormwater piping system, install piping level and with a minimum cover of 36 inches unless otherwise indicated.
 5. Landscaping Subdrainage: Install piping pitched down in direction of flow, at a minimum slope of 0.5 percent and with a minimum cover of 36 inches unless otherwise indicated.
 6. Lay perforated pipe with perforations down.
 7. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.
- B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.
- C. Install thermoplastic piping according to ASTM D 2321.

3.5 FIELD QUALITY CONTROL

- A. Tests and Inspections:
1. After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling.
 2. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.
- B. Prepare test and inspection reports.

3.6 CLEANING

- A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION 334600

SPECIAL PROVISION #1
FOR
DESIGN-BUILD IRRIGATION SYSTEM

The Irrigation System component of this project will utilize the Design-Build method of contracting. This component will be included in the overall contract between the Owner and the successful Bidder.

I. DESCRIPTION

This work involves the design and installation of a landscape irrigation system for the full length of the trail project. While much of this work was completed during the Phase 1 construction, additional work is needed in Phase 2 to complete the irrigation system.

SRDC has identified “Green Estates Lawn Sprinklers Inc.” as the proprietary irrigation sub-contractor for Phase 1 and Phase 2. Green Estates will continue installation of the system on the greenway using the water source shown in the Civil Drawings, the power source shown in the Electrical Drawings, and the conceptual irrigation plan shown in the Landscape Drawings.

Contact information for Green Estates is as follows:

Green Estates Lawn Sprinklers Inc.
7331 Rising Sun Avenue
Philadelphia, PA 19111
Attn: William Campion
wjcampion@gelsnow.com
215-725-3666

The prime contractor will be expected to coordinate and manage this work with Green Estates, who will act as a sub-contractor to the prime contractor.

II. MEASUREMENT AND PAYMENT

Green Estates will perform its work at the pre-determined price listed in the proposal. There shall be no additional mark-up allowed for this item, per Section 012100 – Allowances. Any additional costs to the prime contractor associated with this work should be included in the Mobilization pay item.

SPECIAL PROVISION #2
FOR
CHOP BRIDGE LANDING AREA

I. DESCRIPTION

This work involves the construction of a new plaza area at the base of the existing stairway to the CHOP pedestrian bridge. The plaza area will include porous paving with a concrete curb edge, as shown on the Landscape Drawings. This work includes excavation of the plaza area to subgrade along with handling and offsite disposal of the excavated material per Specification Section 026113.

II. MEASUREMENT AND PAYMENT

Payment shall be on a Lump Sum basis per Section 012200 – Unit Prices, and is to include all labor, materials, equipment, and incidentals for the fully constructed plaza.

SPECIAL PROVISION #3
FOR
PLANTING OF SITE “A”

I. DESCRIPTION

This item is the complete site preparation and planting of Site “A” (the tidal basin near Walnut Street) as shown on the accompanying Sketch “Site A Planting” included as part of this item. Prior to planting, contractor shall remove and dispose of all debris within the basin which may be bagged (20 lbs maximum/bag) and left next to the trash receptacle at Locust Street. Also, contractor will dig out all root balls from previous invasive plants that have been removed prior to installing new plants. Following installation of the plant material, the contractor shall install a temporary plastic construction fence around the land side of the site. The purpose of this fence is to allow the plant material to become established.

The contractor is strongly encouraged to view this site prior to bidding to ensure complete understanding of the task.

Plant List:

Immersion area

- Yellow pond lily (50 ea)
- Broadleaf arrowhead (50 each)

Semi-immersion area

- Tall marsh grass (50 each)
- Pickerel weed (50 each)

Shore edge area

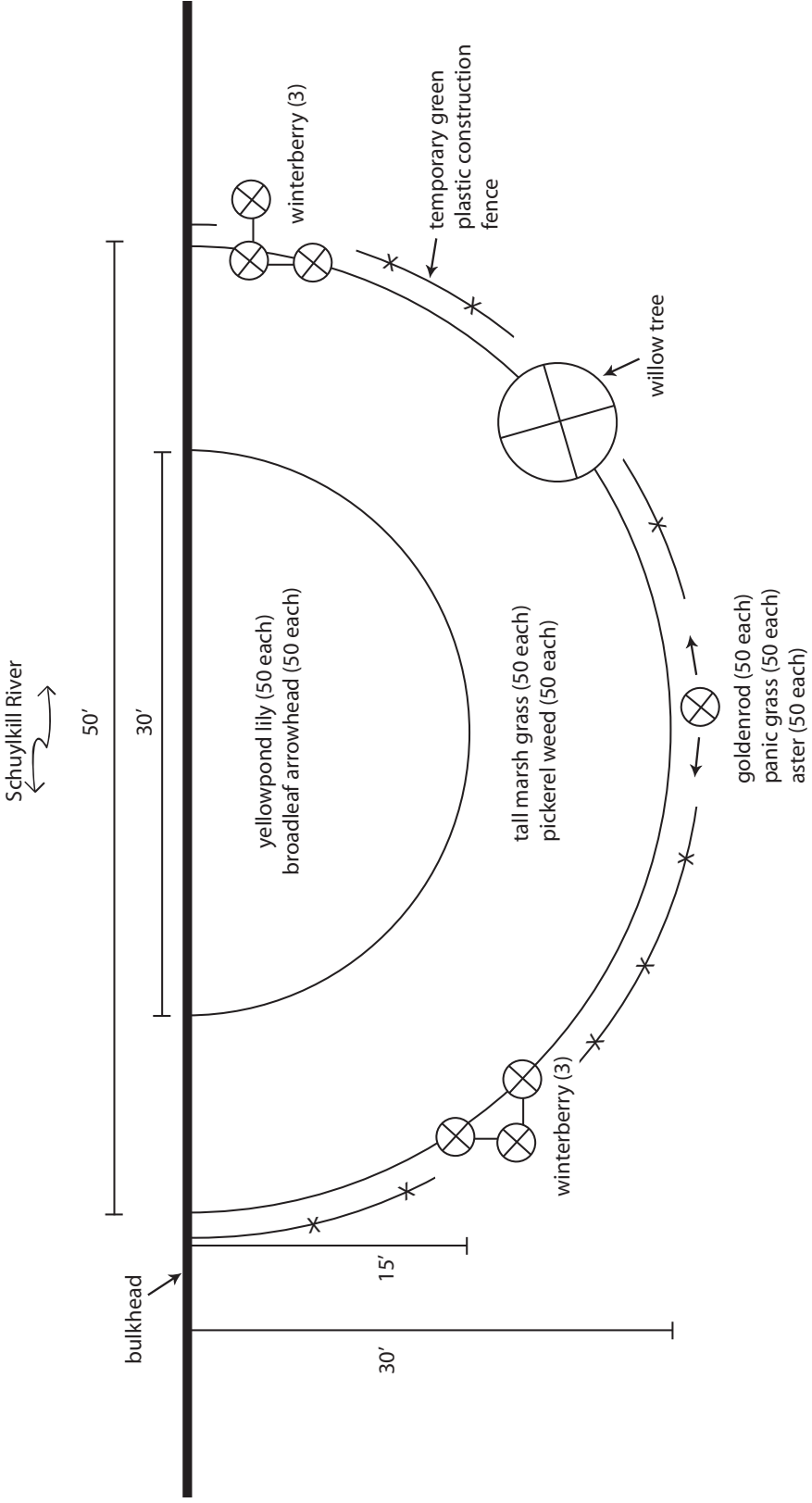
- Goldenrod (50 each)
- Panic grass (50 each)
- Aster (50 each)
- Winterberry (50 each)
- Willow tree (1 each)

Notes

- All plants are 1 gallon containers
- The Willow tree shall be 2 ½” to 3” caliper; balled and burlapped

II. MEASUREMENT AND PAYMENT

Payment shall be on a Lump Sum basis per Section 012200 – Unit Prices, and is to include all labor, materials, and tools to complete planting of Site “A” as per special provision and sketch.



PLANTING - SITE A

SPECIAL PROVISION #4
FOR
PLANTING OF SITE “B”

I. DESCRIPTION

This work is the complete preparation and planting of Site “B” (area along right of way fence near Locust Street) as shown on Sketch “Site B Planting” included as part of this item.

There are electric and possibly fiber optic lines in this area. The contractor will be required to hand dig these tree pits and must have utilities in the area investigated and marked by the utility marking company (per Special Provision 15 – Locating and Marking of Underground Utility Lines).

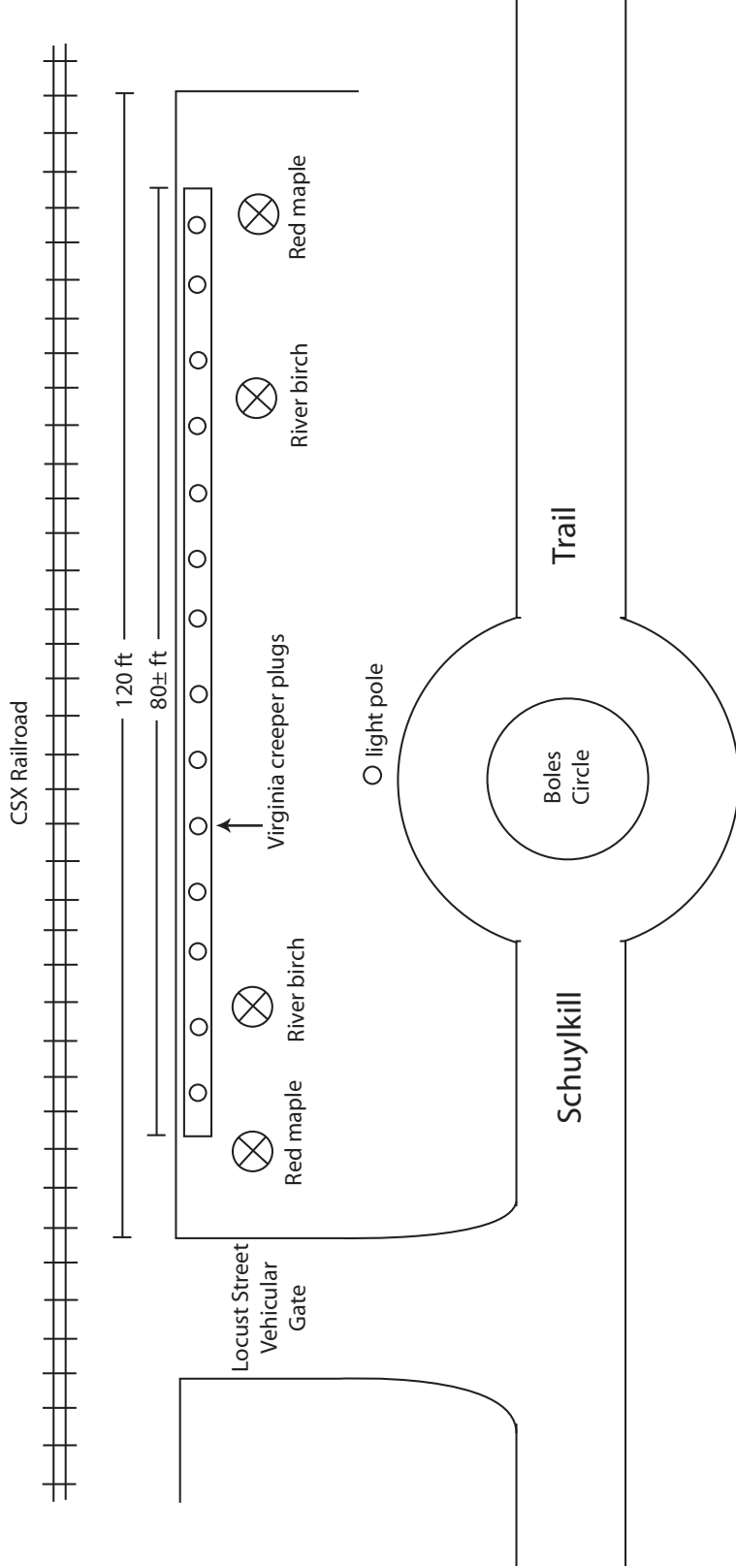
The contractor is strongly encouraged to view this site prior to bidding to ensure complete understanding of the task.

Plant List:

- Red maple trees – 2 ½” caliper (2 each)
- River birch trees, single stem – 2 ½” caliper (2 each)
- Virginia creeper (100 plugs)

II. MEASUREMENT AND PAYMENT

Payment shall be a Lump Sum basis per Section 012200 – Unit Prices, and is to include all labor, materials, and tools to complete planting of Site “B” as per special provision and sketch.



- NOTES:**
1. Investigate and mark utilities and electric line locations
 2. Hand dig plant pits
 3. Vegetation locations to be verified with SRDC prior to planting (assume trees at 15 ft. minimum spacing, 3 feet off of fence; Virginia creeper plugs at 1 ft. spacing)
 4. Trees and Virginia creeper plantings to include mulch



PLANTING - SITE B

SPECIAL PROVISION #5
FOR
PLANTING OF SITE “C”

I. DESCRIPTION

This work is the complete preparation and planting of Site “C” (landscaped area adjacent to South Street Bridge ramp) as shown on Sketch “Planting, Site C” included as part of this item.

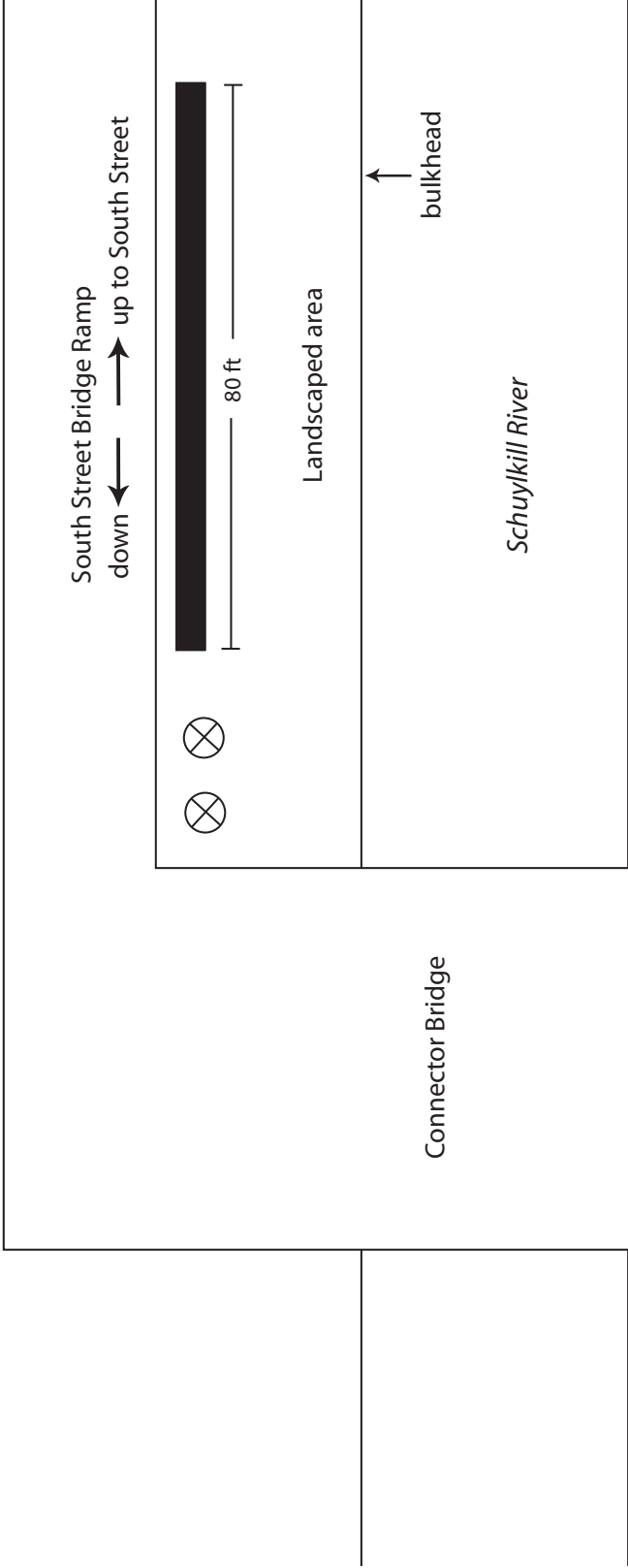
The contractor is strongly encouraged to view this site prior to bidding to ensure complete understanding of the task.

Plant List:



- River birch trees, 2 ½” to 3” caliper (2 each)
 - Includes removal and disposal of two existing dead or dying trees)
- Virginia Creeper (80 plugs)

II. MEASUREMENT AND PAYMENT

Payment shall be a Lump Sum basis per Section 012200 – Unit Prices, and is to include all labor, materials, and tools to complete planting of Site “C” as per special provision and sketch.



LEGEND

-  Existing dead tree - replace with single stem river birch (2 1/2" - 3" caliper)
-  Install Virginia creeper (80 plugs at 1 ft. spacing)

Note 1: Vegetation locations to be verified by SRDC prior to planting.

Note 2: Trees and Virginia creeper to be mulched.



PLANTING - SITE C

SPECIAL PROVISION #6
FOR
TREE TRIMMING AND VINE REMOVAL

I. DESCRIPTION

This work is the removal and off-site disposal of all dead wood and vines along existing tree lines between South to Christian, from right-of-way fence to riverbank.

II. MEASUREMENT AND PAYMENT

Payment shall be on a Crew Day basis per Section 012200 – Unit Prices, and is to utilize a 3 man crew/day including equipment, tools, and off-site disposal of wood and other waste material.

SPECIAL PROVISION #7
FOR
BITUMINOUS PAVEMENT ADJUSTMENTS

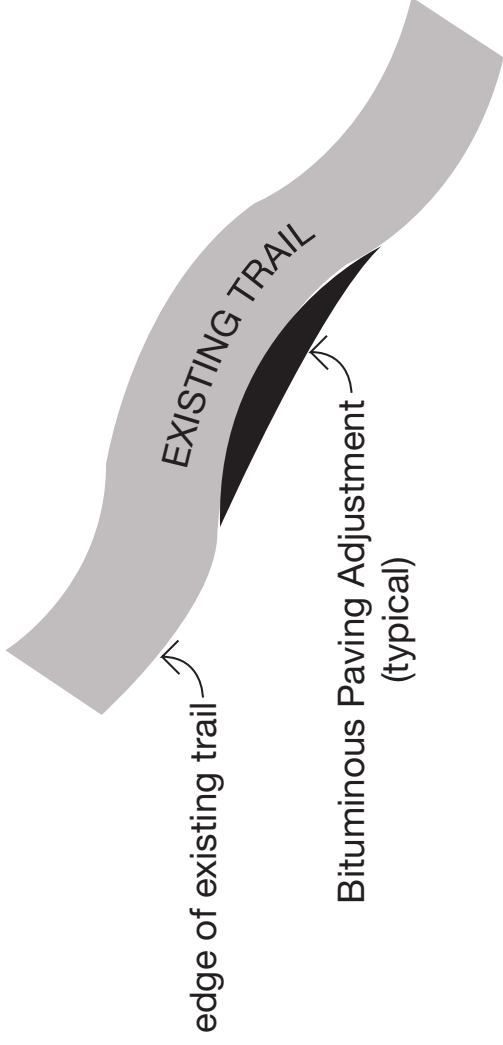
I. DESCRIPTION

This work shall include the paving of small areas in the vicinity of Walnut/Locust Street to better accommodate turning vehicles. The paving cross-section shall be installed as shown in the “Bituminous Paving Sketch” which is included as part of this item. The resulting continuous joint is to be sealed. The disturbed area on the earth side of the paving must be leveled with topsoil and seeded. The Contractor must provide a plan to protect and control bicyclist and pedestrian traffic and obtain approval of the plan from SRDC prior to beginning work.

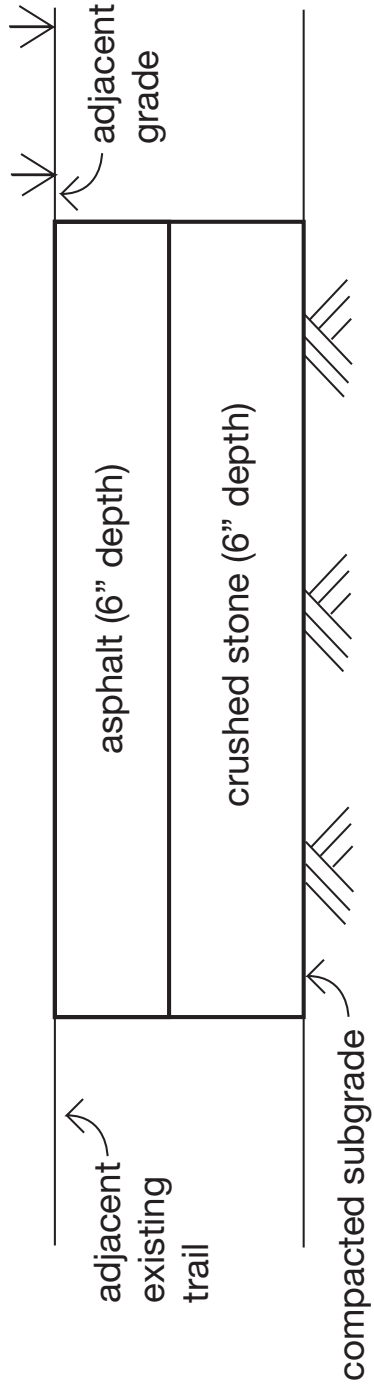
II. MEASUREMENT AND PAYMENT

Payment shall be on a Square Foot basis per Section 012200 – Unit Prices, and is to include all work items (excavation, protection of trench, placement of all material types, sealing of joint, topsoil and seeding) and all material, equipment, tools, and labor necessary to complete the item as shown.

Bituminous Paving Sketch



PLAN



SECTION

Note: Paving excavation must be protected with barricades until work is complete.

SPECIAL PROVISION #8
FOR
BOULDERS ALONG TRAIL

I. DESCRIPTION

This work involves the furnishing and installation of “sitting” boulders along the length of the trail. A detail showing the boulder size, type, and approximate locations is provided in the Landscape Drawings. Boulder locations are to be confirmed in the field with the Landscape Architect prior to installation.

II. MEASUREMENT AND PAYMENT

Payment shall be on an Each basis per section 012200 – Unit Prices, and is to include all material, transport of boulders, labor, tools, and equipment necessary to complete the item as specified.

SPECIAL PROVISION #9
FOR
BOLLARD PAINTING

I. DESCRIPTION

This work is to paint existing bollards located adjacent to the South to Christian trail segment. Painting shall be performed according to Specification Section 099113 – Exterior Painting. Prior to initiating this work, SRDC or the Engineer will locate and mark the bollards to be painted in the field.

II. MEASUREMENT AND PAYMENT

Payment shall be on an Each basis per section 012200 – Unit Prices, and is to include all material, labor, tools, and equipment necessary to complete the item as specified.

SPECIAL PROVISION #10
FOR
RAILING REPAIR NEAR COMPOSTING TOILETS

I. DESCRIPTION

This item is the repair of an existing railing at the composting toilets near Walnut Street. Photos of the broken and bent railing are included with this special provision. Contractor is to submit a repair procedure and schedule to SRDC for acceptance prior to performing work. The contractor is strongly encouraged to view this item prior to bidding to ensure complete understanding of the task.

II. MEASUREMENT AND PAYMENT

Payment shall be on a Lump Sum basis per Section 012200 – Unit Prices, and is to include all labor, materials, tools, and equipment to complete the railing repair.



PHOTO #1 OF BROKEN RAILING AT COMPOSTING TOILETS



PHOTO #2 OF BROKEN RAILING AT COMPOSTING TOILETS

SPECIAL PROVISION #11
FOR
CONCRETE BENCH PADS

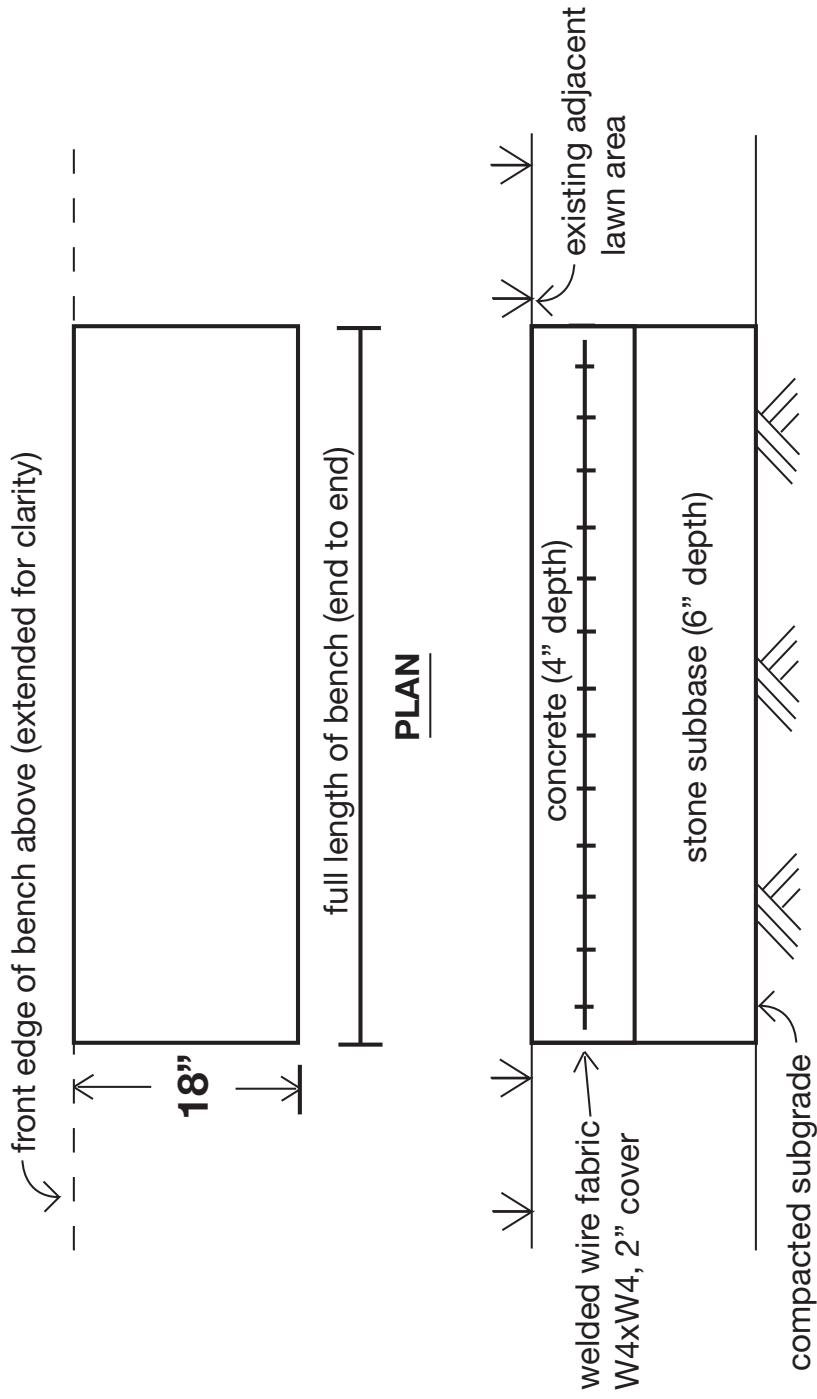
I. DESCRIPTION

This work shall include the construction of concrete pads in front of existing benches in the vicinity of Walnut/Locust Street. Pads shall be in accord with sketch "Concrete Bench Pads" included as part of this item. The Contractor must provide a plan to protect and control bicyclist and pedestrian traffic and obtain approval of the plan from SRDC prior to beginning work.

II. MEASUREMENT AND PAYMENT

Payment shall be on a Square Foot basis per Section 012200 – Unit Prices, and is to include all labor, materials, tools, and equipment to complete the pads as shown.

Concrete Bench Pads



SECTION

Notes:

1. Pads should be flush with existing ground. If ground slopes, pad should slope to meet grade.
2. Paving excavation must be protected with barricades until work is complete.
3. Contractor must backfill form gaps with topsoil to create flush surface and seed area.
4. Pads must be covered with polyethylene sheets after finishing to deter vandalism. Polyethylene shall be properly secured.

SPECIAL PROVISION #12
FOR
SURFACE REPAIR AND COATING OF BULKHEAD

I. DESCRIPTION

This work involves repairs to existing sections of deteriorated concrete along the top of the bulkhead adjacent to the South Overlook. This work also involves applying a coating along the top of the bulkhead to create a uniform, consistent surface. Incidental to this work is the removal of existing vegetation that is protruding from the bulkhead and repair of the created voids. Note that removal of extraneous metal from the top surface of the bulkhead is described and paid for under Section 024119 – Selective Demolition.

Concrete Repairs

The concrete repairs shall be performed according to PennDOT Type I and Type II repair procedures. Refer to PennDOT standard BC-783M for reinforced concrete repair and provide materials and workmanship in accordance with Publication 408.

Prospective bidders are strongly encouraged to view this site prior to bidding to ensure complete understanding of the task. Photos showing representative areas to be repaired are included with this provision.

The following general notes apply to concrete repairs along the bulkhead:

- Use Class AA cement concrete for all repairs
- Provide Grade 60 reinforcing steel bars that meet the requirements of ASTM A 615/A, A 996/A 996M or A 706/A 706M. Do not weld Grade 60 reinforcing steel bars unless specified. Grade 40 reinforcing steel bars may be substituted with a proportional increase in cross-sectional area, if approved by the Engineer.
- Verify all dimensions and geometry of the existing bulkhead in the field as necessary for proper fit of the proposed construction.
- Any damage, beyond the removal or repair limits, to the existing bulkhead caused by the contractor's operations must immediately be repaired to the satisfaction of the Engineer and at no expense to SRDC.
- SRDC reserves the right to change the nature and limits of the work to assure a satisfactory repair.

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SURFACE REPAIR AND COATING OF BULKHEAD

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- Exercise care when removing or repairing concrete and provide satisfactory shielding to prevent debris from falling into the river below. The Contractor is not allowed to allow debris to fall into the river and any debris that does fall into the water is to be retrieved immediately.
- SRDC does not guarantee the quantity of any repairs. The quantity shown in the bid tabs are for the Contractor's guidance only. Actual quantities will be determined and verified in the field during construction.
- Do not consider any of the data on the existing bulkhead supplied in the contract documents as positive representation of the conditions you will encounter in the field. The information provided is not to be considered a basis for computation of the unit prices for bidding purposes.

Coatings

A uniform coating shall be applied to the entire top of the bulkhead, from end to end and from knee wall to the river's edge. The materials to be used for the coating and procedure for applying the coating shall follow specification Section 071800 – Traffic Coatings.

II. MEASUREMENT AND PAYMENT

Payment for the Type I and Type II concrete repairs shall be on a Square Foot basis per Section 012200 – Unit Prices, and is to include all materials, equipment, tools, and labor necessary to complete the item. Steel reinforcement shall be considered incidental to the respective concrete repairs.

Payment for the top coating along the bulkhead shall be on a Square Foot basis per Section 012200 – Unit Prices, and is to include all materials, equipment, tools, and labor necessary to complete the item. Removal of vegetation shall be considered incidental to the top coating.

AREA 1
APPROX. 2.5' x 1.5'



AREA 2
APPROX. 2' x 1.5'



**PHOTOS OF "TYPE 1" REPAIRS
(ITEM SP-12A)**

AREA 1
APPROX. 30' x 2.5' x 1'



AREA 1
APPROX. 30' x 2.5' x 1'



**PHOTOS OF "TYPE 2" REPAIRS
(ITEM NO. SP-12B)**

SPECIAL PROVISION #13
FOR
SIGNAGE PACKAGE

I. DESCRIPTION

Several signage items have been included in the bid proposal as a special provision. These items will be furnished and installed by Urban Sign (527 East Chestnut Ave, Vineland, NJ 08360; Contact: Liz Ruff, 610.724.1094) who have agreed to supply and install these items for the unit prices noted. The successful prime contractor must use Urban Sign for this work and must coordinate their work within the entire project scope, arrange for site access, and pay Urban Sign for work done. Any or all of these signs may be installed at the convenience of the sign manufacturer, subject to coordination with the prime contractor but in no event later than May 15, 2017.

The sign types are listed below. Graphic examples or photos of each sign type are attached to this special provision.

A. Schuylkill Banks Logo Signs

These signs are identical to signs previously placed on the Schuylkill Banks trail and greenway. Urban Sign is familiar with all details of the signs and the installation technique. No catalogue cuts, shop drawings or samples are required. The prime contractor must verify the number of signs to be furnished with SRDC, prior to giving Urban Sign a Notice to Proceed.

B. Street Name Sign

This aluminum sign (see graphic) is to be installed on a trail pole as directed by the Engineer. An image of the sign with dimensions and thickness and the attachment fixture must be submitted to SRDC for approval prior to fabrication.

C. Interpretive Signs

These signs use the PPR format and are similar to other interpretive signs installed on Schuylkill Banks. Urban Sign is familiar with the sign details and no shop drawing is required. The prime contractor shall verify the number and color of the sign frame with

SRDC prior to fabrication. SRDC will provide print ready copy to Urban Sign and will designate the sign locations at the appropriate time.

D. Parapet Signs

These signs are to be provided by Urban Sign, who are familiar with the details of fabrication and installation. No shop drawings are required.

E. Information Sign

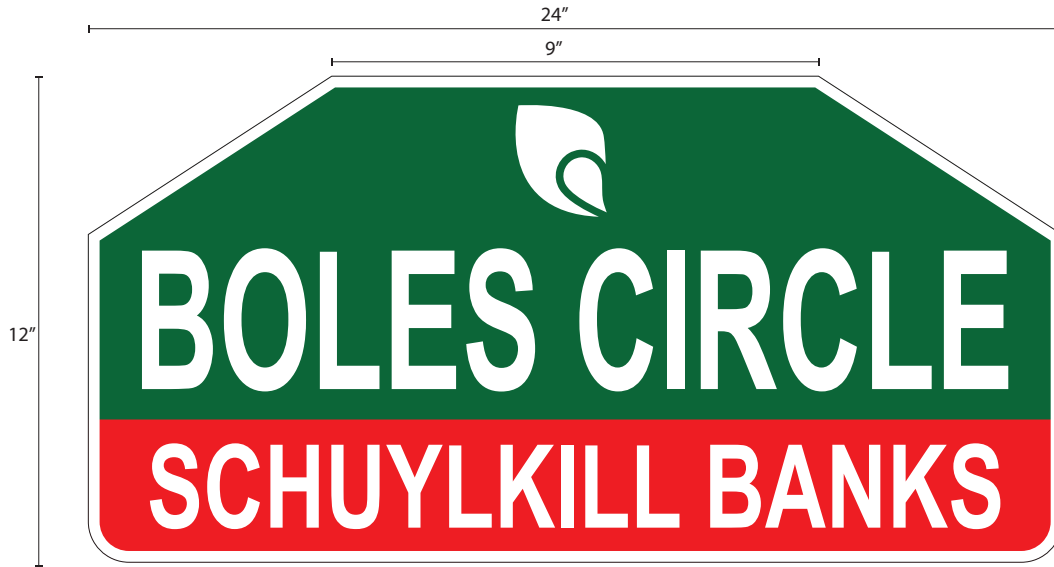
This item is for a 4'x8' RTG sign (1/2" thickness) to be installed at the end of the trail segment, near Christian Street. No shop drawings are required. The graphic is attached.

F. Dock Signs

These signs are to be provided by Urban Sign, who is familiar with the details. No shop drawings are required.

II. MEASUREMENT AND PAYMENT

The Signage Package has been included in the bid proposal as a pre-determined amount. The prime contractor can include these amounts on its invoice to SRDC as the work progresses. SRDC will pay for work satisfactorily completed and accepted but with no additional mark-up or surcharge by the prime contractor.



EXAMPLE OF STREET NAME SIGN

NEXT STEPS FOR SCHUYLKILL BANKS

Schuylkill Banks, envisioned to run eight miles from the Fairmount Dam to Fort Mifflin, is being built in segments as money and land becomes available. Unfortunately, this can lead to some awkward temporary turnaround spots — like this one you just discovered.

SRDC and the City of Philadelphia are working on filling the gap in the trail between Christian Street and the Grays Ferry Crescent. Plans call for a cable supported bicycle and pedestrian bridge running beside the bank of the river, as shown in the conceptual renderings above.

In the meantime on-road connections to the Crescent and Bartram’s Garden are shown on the map to the right.

LEARN MORE ABOUT SCHUYLKILL BANKS PROJECTS & HOW YOU CAN SUPPORT THE TRAIL:
SCHUYLKILLBANKS.ORG

EXAMPLE OF INFORMATION SIGN

SPECIAL PROVISION #14
FOR
TOPDRESSING AND SEEDING

I. DESCRIPTION

This item involves plug aeration, topdressing, and seeding the lawn area between Locust Street and Chestnut Street during early Spring 2017. Topdressed material must be raked into the lawn following spreading.

II. MEASUREMENT AND PAYMENT

Payment shall be on a Square Yard basis per Section 012200 – Unit Prices, and is to include all materials, equipment, tools, and labor necessary to complete the item.

SPECIAL PROVISION #15
FOR
LOCATING AND MARKING UNDERGROUND UTILITY LINES

I. DESCRIPTION

There are existing underground utilities within the project areas. The location and depth of these lines are not precisely known. This item is to engage an experienced, private utility locating firm to identify and mark all underground utilities. Specific tasks include:

- Obtain digging permits prior to start of excavation, and comply with installation requirements for locating and marking underground utilities. Contact Pennsylvania 811 a minimum of 48 hours prior to excavating, to mark utilities, and within sufficient time required if work occurs on a Monday or after a holiday. Verify existing utility locations shown on contract drawings within area of work; contract drawings likely do not include all utilities.
- Identify and mark all utilities potentially not managed and located by the local utility companies or not marked by Pennsylvania811. Contract a Private Utility Locator to scan the scope of work with electromagnetic and ground penetrating radar equipment (ASCE Quality Level B Utility Data), and mark the surface of the ground or paved surface where existing underground utilities are discovered for their horizontal and vertical locations.
- If necessary, verify the elevations of existing utilities that are indicated or discovered during scanning, in locations to be traversed by piping, ducts and other work to be conducted and installed, via vacuum excavation (ASCE Quality Level A Utility Data), for precise utility data.
- Prepare a drawing showing all utilities located for use on the project. Submit the drawing to SRDC for record purposes.

The contractor must get approval from SRDC or its designated representative for the utility locating firm proposed for use. An acceptable firm is:

Master Locators, Inc.
675 Concord Road
Glen Mills, PA 19342
Phone: (800) 495 4248
Email: info@masterlocators.com
Attn: Matt Crosby

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Other firms of equal quality will be considered.

II. MEASUREMENT AND PAYMENT

Payment shall be on a Lump Sum basis per Section 012200 – Unit Prices, and is to include all materials, equipment, tools, and labor to complete the item as specified.

SPECIAL PROVISION #16
FOR
THE INSTALLATION OF WATER IRRIGATION SERVICE LINE

DESCRIPTION:

This work is furnishing and installing approximately 280 linear feet of functional 2” water irrigation service line along the South Street Bridge from the proposed terminus of the 2” copper water service being installed as part of the Children’s Hospital of Philadelphia (CHOP) Project to the previously installed Green Estates Lawn Sprinkler System for the proposed Schuylkill River Trail just south of the South Street Bridge Stair Tower.

Coordinate this work with the Philadelphia Streets Department, CSX and the CHOP project team as outlined below.

Install the water irrigation service line as indicated on the schematic drawings. The installation consists of the conditions summarized as follows:

CONDITION B: (Approximately 180 feet). Mount the proposed 2” Polyethylene (P.E.) water irrigation service pipe in a 4” diameter galvanized steel conduit mounted to ten (10) bridge diaphragms of the existing South Street Bridge structure using approved mounting hardware and brackets. This portion of the installation extends over the existing CSX railroad tracks and includes the riser section extending up the South Street Bridge abutment on the easterly side of the CSX tracks and the riser section extending down the South Street Bridge Pier on the westerly side of the CSX tracks. Coordinate this work with the Philadelphia Streets Department and CSX as outlined below.

All proposed 2” Type K copper water irrigation service line in this area must be installed in a 4” diameter galvanized steel conduit or under an approved conduit shield and no copper pipe shall be left exposed.

It is noted that this area is within the building zone of the CHOP Project and certain prerequisite work must be completed by the CHOP project team prior to the installation of the water irrigation service line. Coordinate with the CHOP project team including the general contractor L.F. Driscoll regarding site access and the general coordination of the work.

CONDITION C: (Approximately 100 feet). Install the proposed 2” Type K copper water service irrigation line in a direct bury trench in the unpaved area just west of the CSX ROW from the South Street Bridge to a point approximately 100 feet south. This work includes trenching

and backfill with on-site material as necessary to install the 2” Type K copper water service irrigation line with 18” of cover and furnishing and installing plastic marker tape above the water irrigation service line. Maintain and protect the adjacent vegetation and fiber optic lines during this work. The point of connection shall be made to the previously installed Green Estates Lawn Sprinkler System.

MATERIALS:

Provide materials in accordance with the Philadelphia Plumbing Code.

SUBMITTALS:

Submit catalogue cuts, shop drawings and supporting documentation to the Engineer for review and approval for all materials necessary for this installation demonstrating conformance with the specifications.

2” TYPE K COPPER WATER IRRIGATION SERVICE PIPE:

Furnish copper service pipe or tube in accordance with ASTM B 88, Type K, annealed (temper O50 or O60).

All water service and water distribution pipe and fittings shall conform to NSF 61-1997b “Drinking Water System Components — Health Effects”.

Provide fittings and bends where required.

Where copper-based component castings are required for fittings, valves, and corporation stop ferrules, furnish castings in accordance with AWWA C 800 and ASTM B 584. Use only Copper Alloy UNS No. C 83600 (Composition Bronze, commercial 85-5-5-5 alloy) in accordance with ASTM B 62 for this work. This alloy consists, nominally, of 85% copper, 5% tin, 5% lead, and 5% zinc. Do not use alloys containing more than 5% lead.

Use solder alloys listed in Section 1 of Table 1 Solder Compositions in ASTM B32, *Standard Specification for Solder Metal*, to join copper tube and fittings. Solders containing lead at concentrations of greater than 0.2% may not be used.

2” POLYETHYLENE (P.E.) WATER IRRIGATION SERVICE PIPE:

Furnish polyethylene pipe in accordance with the requirements of ASTM D2239, AWWA C901 and NSF Standards 14 and 61. Pipe dimensions shall meet Iron Pipe Size (IPS) standards.

Pipe material shall be high-density polyethylene conforming to the minimum requirements of cell classification 44557 4C as defined and described in ASTM D3350, except that carbon black content should not exceed 3.0%. The resin shall have a material designation code of

PE4710 by the Plastic Pipe Institute. Provide 2" polyethylene water irrigation service pipe rated for 200 PSI; SIDR 11.5 or better.

Provide suitable copper to polyethylene pipe connectors rated for 200 PSI.

SCHEDULE 40, PVC CONDUIT:

Furnish schedule 40 PVC conduit manufactured from a Type I, Grade I Polyvinyl Chloride (PVC) compound with a Cell Classification of 12454 per ASTM D1784. Furnish schedule 40 PVC conduit in compliance to ASTM D1785 and D2665 (sizes 1-1/4" – 12"), meeting the Quality Assurance test requirements of this standard with regard to material, workmanship, burst pressure, flattening, and extrusion quality. Furnish bell ends meeting the requirements of requirements of ASTM D2672.

Provide split sleeve PVC conduit where necessary.

Provide PVC conduit in a gray color.

GALVANIZED STEEL CONDUIT:

Furnish hot dip Galvanized Rigid Conduit (GRC) manufactured in accordance with ANSI C80.1

Provide threaded connections for all galvanized steel conduit.

Provide fittings, elbows, and couplings are required per the manufacturer's recommendations.

HARDWARE AND BRACKETS:

Design Submittal: For each anchor and alignment guide, including analysis data, signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
3. Alignment Guide Details: Detail field assembly and attachment to building structure.
4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.
5. Submit product data on all hanger and support devices, including shields and attachment methods. Product data to include, but not limited to materials, finishes, approvals, load ratings, and dimensional information

Furnish approved hot dipped galvanized steel mounting brackets and hardware for mounting all PVC and galvanized steel conduits. Galvanize in accordance with ASTM A123.

Furnish approved vibration isolating clamps and strut system, B-Line, BVT series VibraClamps® by Eaton for directly supporting copper service pipe or tubing.

When flexibility in the hanger assembly is required due to horizontal movement, use pipe clamps with weldless eye nuts, B-Line B3140 or B3142 with B3200. For insulated lines use double bolted pipe clamps, B-Line B3144 or B3146 with B3200 by Eaton.

Any additional required hardware shall be approved hot dipped galvanized per ASTM A123 or stainless steel.

Provide means of preventing dissimilar metal contact such as plastic coated hangers, copper colored B-Line DURA-COPPER™ epoxy paint, or non-adhesive isolation tape (B-Line Iso-Pipe™). Galvanized felt isolators sized for copper tubing may also be used, B-Line B3195CT.

WALL MOUNTED CABINET:

Furnish approved NEMA 36"x24"x12" stainless steel, single door, wall mounted, locking cabinet.

EXPANSION LOOPS FOR COPPER TUBING:

Provide expansion loops for copper tubing as necessary.

2" BALL VALVE:

Furnish full port, forged DZR lead free brass ball valve, 200 psi maximum pressure rating and conforming to NSF/ANSI 61.

SAND:

Furnish backfill sand for direct bury pipe zone in accordance with ASTM C 33 (fine aggregate).

WARNING TAPE:

Furnish Non-Detectable warning tape consisting of a nominal 4 mil overall thickness, inert 100% low-density acid and alkali resistant polyethylene plastic film, formulated for extended use underground and conforming to the APWA Uniform Color Code.

ALUMINUM SIGN:

Furnish flat sheet aluminum sign per PennDOT 408 Specification, Section 1103.04.

CONSTRUCTION:

GENERAL:

This work is subject to the inspection by representatives of the Philadelphia Streets Department where the water service is installed on the South Street Bridge. Notify Mr. William Gural of the Philadelphia Streets Department at least four (4) weeks prior to construction at phone number 215-686-5542 or via email at William.gural@phila.gov .

Comply with the requirements of Pennsylvania Act 121 (2008) as amended including the PA One Call requirements.

Particular attention is directed to the area on the westerly side of the CSX railroad tracks at the base of the stair tower to the South Street Bridge where several communications company's fiber optic facilities are located, including but not limited to Above-Net, AT&T and Verizon. Maintain and protect these facilities at all times during construction.

Access to CSX R.O.W. shall be coordinated by the contractor as necessary to perform this work. The installation of the proposed water service irrigation line across the CSX R.O.W. shall be performed from the CSX R.O.W. as permitted by CSX. the contractor shall be responsible for obtaining the necessary approval from CSX to perform the work. No encroachment into the CSX R.O.W. will be allowed to perform this work unless appropriate arrangements have been made with CSX regarding flagmen. Provide railroad protective insurance policy, as specified, to CSX for approval prior to beginning work.

CHOP PROJECT COORDINATION:

The Children's Hospital of Philadelphia (CHOP) will be installing a new 2" water service connection, meter pit and Philadelphia Water Department approved backflow prevention facilities as part of the CHOP Project for the exclusive use of the S.R.D.C.'s Schuylkill River trail Irrigation System. CHOP's contractor will terminate the new 2" copper water service connection above grade adjacent to the South Street Bridge approach roadway retaining wall, just west of the proposed backflow prevention facilities within the proposed service corridor adjacent to South Street as shown on the plan. Coordinate with the CHOP Project team including their general contractor L.F. Driscoll regarding site access and the general coordination of the work.

It is noted that the work under the CHOP project also includes the removal of a portion of the existing railing on the south side of South Street and the construction of a new abutting structure that will adjoin the southerly sidewalk of South Street to create an on-site plaza area and driveway access to the site. This work will enclose and secure the area immediately to the south of the South Street approach roadway retaining wall to create a utility corridor adjacent to South

Street. This is the area in which the proposed 2" Type K copper water irrigation service line will be installed under Conditions A and B as indicated above.

Coordinate the installation of the proposed 2" Type K copper water irrigation service line as necessary and do not proceed with the installation until directed by SRDC.

INSTALLATION:

All work on water service connections shall be done by, or under the direction of, a licensed Master Plumber.

Perform all work in accordance with the Philadelphia Plumbing Code.

Horizontal copper tubing shall be supported in accordance with ANSI/MSS SP-69 & SP-58.

Install hangers in accordance with the manufacturer's recommendations.

Install hangers to provide a minimum of 1/2 inch space between finished covering and adjacent work.

Place a hanger within 12 inches of each horizontal elbow.

Support vertical piping independently of connected horizontal piping. Support vertical Pipes as indicated. Wherever possible, locate riser clamps directly below pipe couplings or shear lugs.

Install polyethylene pipe in accordance with manufacturer's recommendations using approved fittings.

Complete connections between polyethylene and copper service pipe using approved connection fittings.

Connect to the existing copper water distributing pipe using a suitable and approved socket fitting. Soldered joints for tubing and pipe shall be made with approved fittings. Surfaces to be soldered shall be cleaned bright. Properly flux and solder joints with approved materials.

Install polyethylene thermal plastic insulation around hangers.

Fasten galvanized steel conduits and stainless steel cabinet to existing bridge structure with approved brackets and hardware. De-bur all galvanized steel conduit sufficiently to prevent damage to the inserted polyethylene water irrigation service pipe.

Where copper water irrigation pipe is installed in direct bury trench installation compact sand backfill under pipes and fittings by hand tamping in 8 inch layers. Sand shall 6-inches all around

the copper water irrigation pipe. Compact all other backfill in 8 inch layers by mechanical tamping.

Upon completion of the installation of the water irrigation service line pressure test the service at 75 psi for at least one hour with no measurable drop in pressure and zero leakage. Take all necessary precautions to prevent test pressure from entering the adjoining distribution piping. Upon a drop in pressure or visible leakage, the Contractor shall, at his own expense, locate and make approved repairs as necessary until there is zero leakage.

MEASUREMENT AND PAYMENT:

Lump Sum.

DISTRICT	COUNTY	ROUTE	SECTION	SHEET
6-0	PHILADELPHIA	9015	NAV	4 OF 6
REVISION NUMBER	CITY OF PHILADELPHIA			
DATE	REVISIONS			
BY				



PROPOSED 2" P.E. WATER IRRIGATION SERVICE PIPE IN 4" GALVANIZED STEEL CONDUIT, MOUNTED TO BRIDGE DIAPHRAGM (10 EACH), 180± L.F.

REMOVE & REPLACE 4" CONCRETE SIDEWALK (BY OTHERS - N.I.C.)

EXISTING RAILING (BY OTHERS - N.I.C.) (SEE SHEET 0860)

EXISTING RAILING TO BE REMOVED (BY OTHERS - N.I.C.)

REMOVE & REPLACE 4" CONCRETE SIDEWALK (BY OTHERS - N.I.C.)

PROPOSED 2" P.E. WATER IRRIGATION SERVICE PIPE IN 4" GALVANIZED STEEL CONDUIT, MOUNTED TO BRIDGE DIAPHRAGM (10 EACH), 180± L.F.

PROVIDE SWEEPS OR BRACKETS TO CLEAR EXISTING WALL MOUNTED CONDUIT AND BEAM FLANGE

INSTALL RISES IN 4" GALVANIZED STEEL CONDUIT MOUNTED ON BRIDGE ABUTMENT USING APPROVED BRACKETS AT 8'-0" O.C. (MAX.)

PROPOSED 1" F.I.P. S. FITTING FOR WINTERIZING PURPOSES & 2" TYPE K COPPER WATER IRRIGATION SERVICE PIPE 4'-0"± COV. 220± L.F. SINGLE DOOR, WALL MOUNTED LOCKING CABINET.

LIMIT OF WORK COMPLETE CONNECTION TO PREVIOUSLY INSTALLED 2" COPPER IRRIGATION SERVICE

SECTION B-B
CONDITION B - BRIDGE DIAPHRAGM MOUNT

SECTION A-A
CONDITION A - DIRECT BURIAL BELOW GRADE (N.I.C.)



PROPOSED 2" TYPE K COPPER WATER IRRIGATION SERVICE PIPE 4'-0"± COV. 220± L.F.

BRIDGE ABUTMENT MOUNT

SECTION A-A
CONDITION A - DIRECT BURIAL BELOW GRADE (N.I.C.)

DETAILS - CONDITION A-DIRECT BURIAL (N. I. C.)
& CONDITION B-BRIDGE/CEILING MOUNT

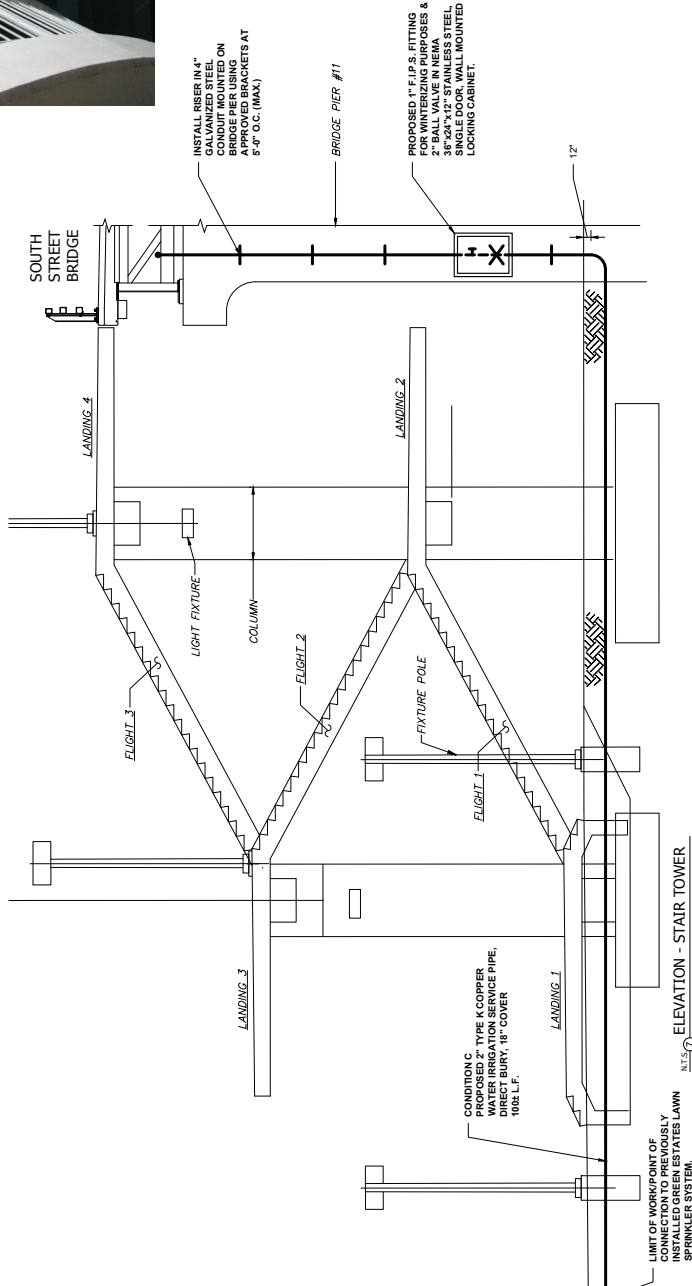
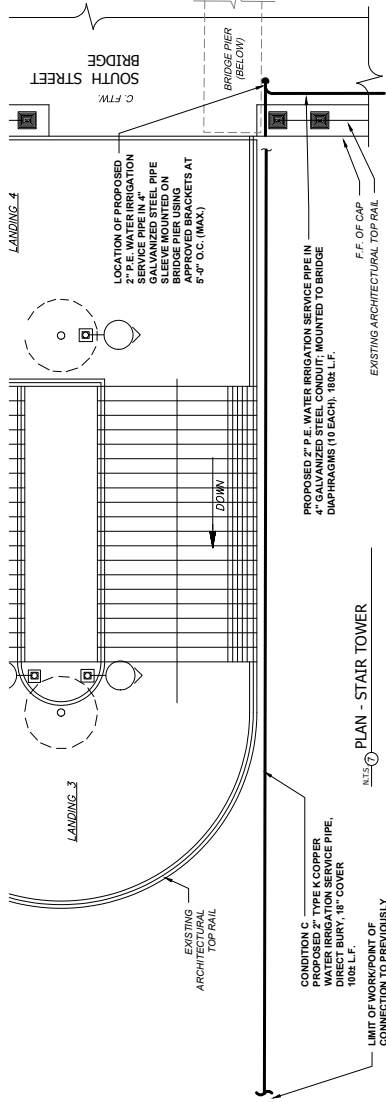


DISTRICT	COUNTY	ROUTE	SECTION	SHEET
6-0	PHILADELPHIA	9015	NAV	6 OF 6
REVISION NUMBER	CITY OF PHILADELPHIA			DATE
	REVISIONS			BY



BRIDGE PIER MOUNT
VERTICAL RISER

PROPOSED #18 WATER IRRIGATION SERVICE PIPE IN 4" GALVANIZED STEEL CONDUIT, MOUNTED TO BRIDGE PIER USING APPROVED BRACKETS AT 5'-0" O.C. (MAX).



SPECIAL PROVISION #17
FOR
WEEP HOLE DRILLING FOR EXISTING RAILINGS

I. DESCRIPTION

This work is to drill weep holes in the bottom channels of the existing “stainless steel railings with infill panels” which are located at the South Overlook, North Overlook, and along the Retaining Wall (locations are indicated on the Landscape Drawings). Locations for the weep holes are provided in Section 000150 – Modifications to Civil Drawings. A photo showing the approximate location for weep holes to be drilled is included with this provision.

Prospective bidders are strongly encouraged to view this site prior to bidding to ensure complete understanding of the task.

II. MEASUREMENT AND PAYMENT

Payment shall be on a Lump Sum basis per Section 012200 – Unit Prices, and is to include all materials, equipment, tools, and labor to complete the item as specified.



**REPRESENTATIVE PHOTO FOR WEEP HOLE DRILLING
(REFER TO EXHIBIT "E" UNDER SECTION 000150 FOR DETAIL)**

SPECIAL PROVISION #18
FOR
IRRIGATION HOTBOX ELECTRICAL TERMINATIONS & DEVICES

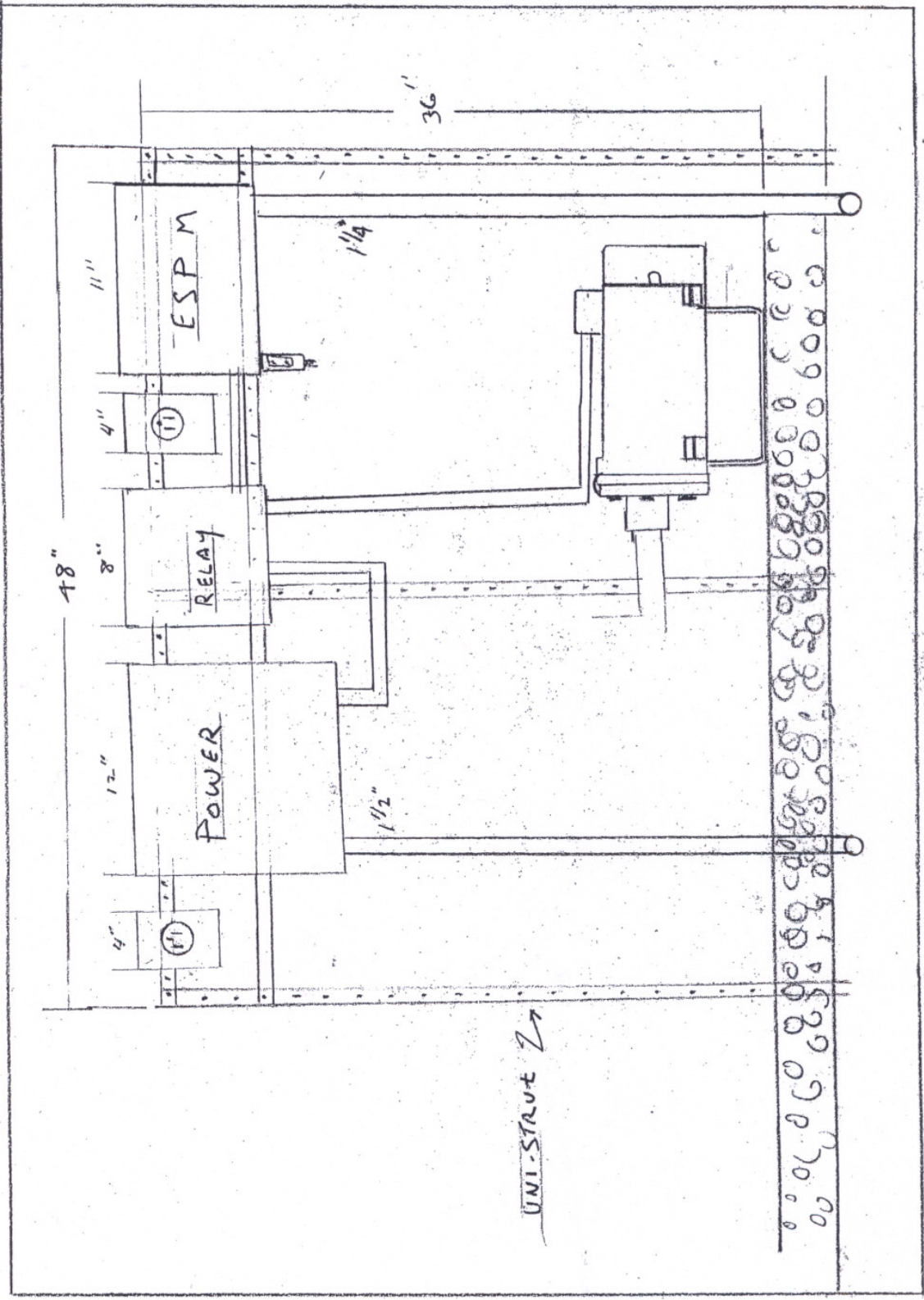
I. DESCRIPTION

This work is to install the electric devices and terminations in the irrigation hotbox for outlets, pump, relay, and irrigation controls as shown in the hot box electrical layout drawing that is attached to this provision. Also attached for reference are accepted submittals from the Phase 1 construction for the pump, hotbox enclosure, relay, and the ESP Modular Controller, which will be supplied by the irrigation contractor as part of SP-01.

Prospective bidders are strongly encouraged to view this site prior to bidding to ensure complete understanding of the task.

II. MEASUREMENT AND PAYMENT

Payment shall be on a Lump Sum basis per Section 012200 – Unit Prices, and is to include all materials, equipment, tools, and labor to complete the item as specified and in accordance with Division 26 - Electrical.



HOT BOX ELECTRICAL DETAIL

The ESP-Modular Controller Maximize Your Productivity

A member of the popular ESP family of controllers, the ESP-Modular is designed to maximize your productivity by saving you time and money. The large, easy to read display and intuitive programming sequence make this the most user-friendly controller in its class. The spacious cabinet and terminal locations make installation and wire-up a snap. And features like the Contractor Default™ program make service calls more efficient and earn you more money by taking less time! The ESP-Modular: Maximizing your Productivity.

Features

- ESP Programming: Extra-Simple Programming with large numbers and text in the LCD to aid user programming
- Three independent programs with 4 start times each for a total of 12 start times
- Four station base model with the capacity to receive plug-in station modules of three stations each allows the controller to expand from 4 to 13 stations
- Hot swappable modules can be installed while in operation and in any position
- Station 13, called an "Auxiliary Station™" can bypass an active sensor to allow watering even if the other stations are disabled or can operate as a normal station
- Contractor Default™ setting allows the contractor to set his own default program and can be accessed with the push of a button. Useful in easily restoring a schedule that has been altered by a homeowner or to replace a temporary schedule for new seed or sod
- 5-year lithium battery maintains time and date during a power outage.
- 365-day calendar with leap year intelligence means that you can set an "Odd" or "Even" day watering schedule and not worry about changing the date on leap years
- Four irrigation cycle modes for maximum flexibility and compliance to all major watering restrictions (Custom 7-day calendar, 1-31 day cycle and odd/even cycles)
- Non-volatile memory maintains the irrigation schedule indefinitely during a power outage

- Permanent day off feature prevents watering on any day of the week in any cycle mode
- Global Season Adjust (0-200%) allows the user to alter the run time of all the valves in every program with the push of a button
- Dedicated sensor terminals allow the user to easily connect a sensor to the controller for maximum water efficiency. A light (LED) and a message on the LCD indicates when a sensor is active
- Sensor bypass switch allows the user to override an active sensor
- Diagnostic self-setting circuit breaker identifies a valve or wire fault and continues to water operable stations
- Enhanced Diagnostic Feedback™ alerts the user to programming errors and other conditions that may render a schedule inoperable
- "Valve Test Terminal" allows the installer to test the valve wires during installation to determine the valve that each wire is connected to
- Master valve/pump start circuit programmable by station allows operation of connected pump as needed.
- Programmable Delay between station feature allows additional time between zones for water well recovery or slow closing valves
- Spacious heavy-duty cabinet with internal junction box provides lots of room for wiring and eliminates the need to purchase an external j-box for a clean and professional looking installation. Outdoor model comes with key-locking cabinet
- Remote ready connector enables the controller to be used with RM1 and RMX1 remote control systems where available.

Operating Specs

- Station timing: 0 to 6 hours for all stations
- Automatic Starts: 4 start times per program on the quarter hour for up to a total of 12 start times per day if using all three programs
- Independent programming schedules:
 - ♦ Custom (water by day of the week)
 - ♦ Odd (water on odd days of the month except 31st or 29th if leap year)
 - ♦ Even (water on even days of the month)
 - ♦ Cyclic (1-31 days: Water from every other day to once every 31 days)



Electrical Specifications

- Input required: 120 VAC ± 20%, 60Hz or 230VAC/240VAC ± 20%, 50Hz.
- Output: 25.5 VAC 1A
- Surge Protection: Primary input side has 2 built in MOVs (metal oxide varistors) to protect microcircuitry. Output side has 2 built in MOVs for each valve station.
- Power back-up: Lithium coin-cell battery maintains time and date while non-volatile memory maintains the schedule
- Multi-valve station capacity: Up to two 24 VAC, 7VA solenoid valves per station plus a master valve

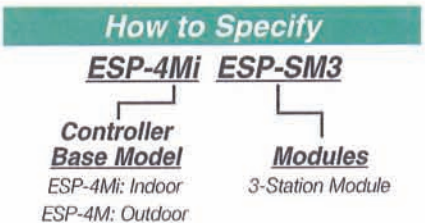
Dimensions

- Width: 10.7 in. (27,2 cm)
- Height: 7.7 in. (19,5 cm)
- Depth: 4.4 in. (11,2 cm)

Models

- ESP-4Mi: 4 station indoor model
- ESP-4M: 4 station outdoor model* ←
- ESP-SM3: 3-station module

*Available in 120VAC, 230VAC and 240VAC models.





Specifications

The controller shall be of a hybrid type that combines electro-mechanical and microelectronic circuitry capable of fully automatic or manual operation. The controller shall be housed in a wall-mountable, weather-resistant plastic cabinet with a key-locking cabinet door (outdoor models only) suitable for either indoor or outdoor installation.

The controller shall have a base unit with 4 stations as well as three expansion slots capable of receiving station modules of three stations each to create a controller of up to 13 stations. Station 13 shall be called an "auxiliary station" and shall have the capability of bypassing an active rain sensor or of functioning as a normal station output. Station timing shall be from 0 minutes to 6 hours. Run time resolution shall be in 1-minute increments from 0 to 59 minutes and 10 minutes from 1 to 6 hours. The LCD shall display "No Run Times" or equivalent icon for 230 VAC models if no run time has been entered for any station in any program.

The controller shall have three separate and independent programs which can have different start times, station timing and watering days. Each program shall have up to 4 start times available. The controller shall stack multiple start times in sequence to prevent hydraulic overload. The LCD shall display "No Start Times" or the equivalent icon for 230VAC models if no start time has

been entered for any program. The controller shall be capable of operating two 24 VAC solenoid valves per station plus a master valve or remote pump start relay. The controller shall operate on 120 VAC ± 20% at 60Hz (230VAC ± 20% at 50Hz for international models). The controller shall have an

electronic, diagnostic circuit breaker that shall sense a station with an electrical overload or short circuit and shall bypass that station and continue operating all other stations.

The controller shall have a 365-day calendar with a permanent day off feature that allows a

day(s) of the week to be turned OFF on any cycle (odd/even/1-31 day cycle). A day set to "Permanent Off" shall override the normal repeating schedule and shall display the words "Day Always Off/Day Off" in the LCD screen. The controller shall have a seasonal adjust feature adjustable from 0% to 200% in increments of 10%. Seasonal adjust shall effect all programs simultaneously. If seasonal adjust is set to 0% the LCD shall display "SEASONAL ADJ" (equivalent icon for 230 VAC models).

The controller shall have a 12-hour AM/PM or 24 hour military (for 230VAC models) clock with a midnight day change over. The controller shall have a sensor circuit for connection to a rain sensor or to an underground moisture sensor system that will interrupt a scheduled watering under "wet" or "moist" conditions. The controller shall have an indicator on the LCD screen and one LED light to indicate that a sensor is connected and active and that watering has been temporarily disabled.

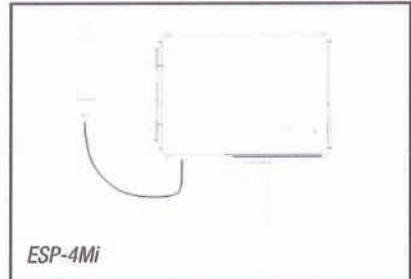
The controller shall have access to a variety of "hidden features" by turning the dial to a specific location on the dial and pushing the ON OFF buttons simultaneously. These features shall include: 1) save a custom default program 2) retrieve a custom default program 3) bypass an active rain sensor on the Auxiliary Station 4) allow the Auxiliary Station to be interrupted by an active rain sensor 5) Clear memory 6) Set a day as "Permanently Off" 7) Set master valve/pump start circuit by station 8) Set programmable delay between station.

The controller shall have the following manual operations and manual advances for semi-automatic control:

- Run a single valve
- Run multiple manually stacked valves
- Run a semi-automatic program
- Run a test on all valves (all stations with any time assigned regardless of the program) from 1 to 10 minutes



ESP-4M



ESP-4Mi

The controller shall have a removable, battery programmable front panel (uses a 9 volt battery (not included)) for conveniently programming the controller away from the installation site or for teaching irrigation scheduling.

The controller shall have the capacity for the program to be erased allowing the user to start programming with a blank controller. The controller shall have multiple knockouts, sizes and locations, including the back of the cabinet, to facilitate installation and provide a clean professional look. The controller shall have a factory default program that runs 10 minutes every day beginning 8 hours after power resumption.

The controller shall have a reset button to reset the controller in the case of micro-controller "lock-up" due to power surges or frequent interruption to the power supply.

Rain Bird Corporation

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6991 East Southpoint Road, Tucson, AZ 85706
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Rain Bird International, Inc.

145 North Grand Avenue, Glendora, CA 91741
Phone: (626) 963-9311 Fax: (626) 963-4287

Rain Bird Technical Service

1-800-RAINBIRD (U.S. and Canada only)

www.rainbird.com

For systems that use a pump to provide water, the relay that delivers reliability at an economical price



PSR Pump Start Relay

Whether you require the use of a booster pump or pull water directly from a creek or pond, it is imperative that your irrigation system includes a relay that can be counted upon to activate your pump each and every time. The Pump Start Relays have been created to provide that reliability – as well as a lockable NEMA rated enclosure – at an economical price. Available

in a choice of three models to accommodate a variety of power sources and landscape needs, the product is fully compatible with all standard 24VAC controllers. It's also designed with user-friendliness in mind, with flying leads that allow for effortless 24 volt connections plus a wide array of "knockouts" on the cabinet to make wiring easy, whatever your particular mounting considerations.

Features & Benefits



NEMA 3R rated locking enclosure

Enclosure has a high rating for outdoor use and is weatherproof, secure, rust-resistant and shock proof

Choice of 3 different models

Internal hardware has been sized accordingly to fit your particular voltage and landscape requirements

24VAC flying leads

Makes connections to controller quick and easy

Compact design

Enclosure measures 6½" H x 7½" W x 4½" D

UL approved

The PSR-22 meets the demanding electrical requirements necessary for UL approval for both relay and cabinet. The PSR-52 and PSR-53 contain UL approved contactors.

Electrical Specifications

Models	Single Phase		3 Phase HP @ 240VAC	Max Full Load AMPS	Max Resistive AMPS	Coil VA		Coil VA	
	HP @ 110VAC	HP @ 240VAC				Inrush (AMPS)	(AMPS)	Holding (AMPS)	(AMPS)
PSR-22	2*	5*	N/A	22	22	31	(1.29)	7	(.29)
PSR-52	5	7.5	N/A	40	50	56	(2.33)	6	(.25)
PSR-53	5	7.5	10	40	50	56	(2.33)	6	(.25)

* Approximate horsepower



Wiring the PSR to your controller and pump is simple and fast.

STA-RITE® J/JB Series

General purpose centrifugal pumps



The J/JB Series Pumps have a heavy-duty cast iron construction and are offered in high and medium head models, with Noryl® or silicon bronze impeller.

APPLICATIONS

Water systems and sprinkling... for homes, farms and industry.

SPECIFICATIONS

Body and Seal Plate: Close-grained cast iron

Base: Steel 12 gauge

Impeller: J Series – Noryl

Impeller: JB Series – Silicon bronze

Shaft: 416 stainless steel

Mechanical Seal: Carbon/ceramic, Buna-N

FEATURES

1/3 through 2-1/2 HP: High head and medium head models, with heavy-duty motors, easy service design and four-position discharge.

Drain Port: Provided for easy winterizing.

Medium Head Models: Deliver up to 110' of head with capacities to 140 GPM.

High Head Models: Deliver up to 140' of head with capacities to 90 GPM.

Easy Serviceability: All models include replaceable wear ring and feature back pull-out design.

J Series with Noryl Impellers: Abrasion-resistant for normal applications with working temperatures to 140°F.

JB Series with Silicon Bronze: JB pumps equipped with shaft seals rated for temperatures to 225°F.

ORDERING INFORMATION

HIGH HEAD

Catalog Number		HP	Pipe Tapping Sizes		Motor Voltage	Phase	Approx. Wt. Lbs.
Noryl® Impeller	Silicon Bronze Impeller		Suct.	Disch.			
JHB	JBHB	1/3	1-1/4"	1"	115/230	1	38
JHC	JBHC	1/2	1-1/4"	1"	115/230	1	39
JHC3	JBHC3		1-1/4"	1"	208-230/460	3	39
JHD	JBHD	3/4	1-1/4"	1"	115/230	1	42
JHD3	JBHD3		1-1/4"	1"	208-230/460	3	42
JHE	JBHE	1	1-1/4"	1"	115/230	1	45
JHE3	JBHE3		1-1/4"	1"	208-230/460	3	45
JHF	JBHF	1-1/2	1-1/4"	1"	115/230	1	49
JHF3	JBHF3		1-1/4"	1"	208-230/460	3	49
JHG	JBHG	2	1-1/2"	1-1/4"	115/230	1	69
JHG3	JBHG3		1-1/2"	1-1/4"	208-230/460	3	69
JHHG	JBHHG	2-1/2	2"	1-1/2"	115/230	1	74
JHHG3	JBHHG3		2"	1-1/2"	208-230/460	3	74

ORDERING INFORMATION

MEDIUM HEAD

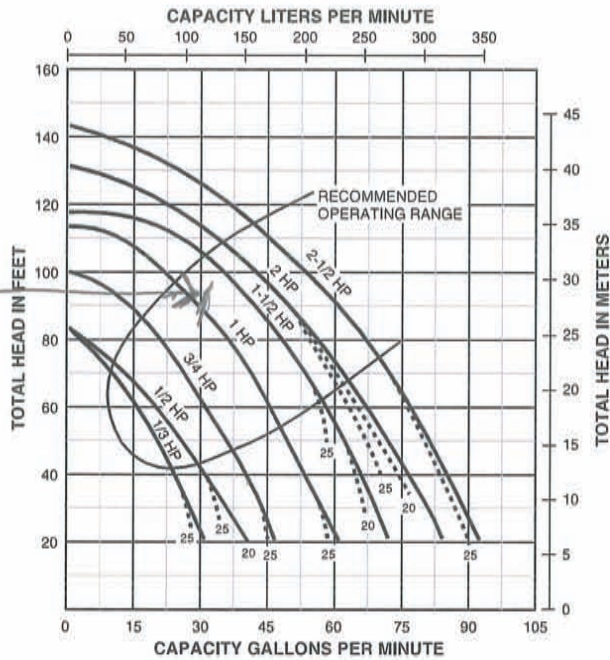
Catalog Number		HP	Pipe Tapping Sizes		Motor Voltage	Phase	Approx. Wt. Lbs.
Noryl® Impeller	Silicon Bronze Impeller		Suct.	Disch.			
JMB	JBMB	1/3	1-1/4"	1"	115/230	1	38
JMC	JBMC	1/2	1-1/4"	1"	115/230	1	39
JMC3	JBMC3		1-1/4"	1"	208-230/460	3	39
JMD	JBMD	3/4	1-1/4"	1"	115/230	1	42
JMD3	JBMD3		1-1/4"	1"	208-230/460	3	42
JME	JBME	1	1-1/2"	1-1/4"	115/230	1	43
JME3	JBME3		1-1/2"	1-1/4"	208-230/460	3	43
JMF	JBMF	1-1/2	1-1/2"	1-1/4"	115/230	1	54
JMF3	JBMF3		1-1/2"	1-1/4"	208-230/460	3	54
JMG	JBMG	2	1-1/2"	1-1/4"	115/230	1	66
JMG3	JBMG3		1-1/2"	1-1/4"	208-230/460	3	66
-	JBMMG	2-1/2	2"	1-1/2"	115/230	1	74
-	JBMMG3		2"	1-1/2"	208-230/460	3	74

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STA-RITE® J/JB Series

General purpose centrifugal pumps

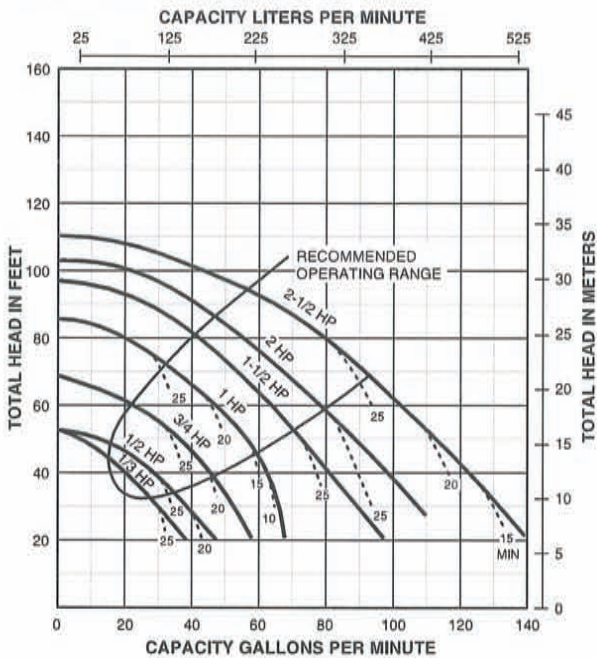
PUMP PERFORMANCE HIGH HEAD



PUMP PERFORMANCE (CAPACITY IN GALLONS PER MINUTE) HIGH HEAD

HP	Discharge Pressure		Dynamic Suction Lift				
	PSI	Feet Head	5'	10'	15'	20'	25'
1/3	10	23.1	—	26	24	22	20
	20	46.2	20	18	15	11	10
	30	69.3	6	—	—	—	—
1/2	10	23.1	—	34	32	29	26
	20	46.2	25	21	18	15	11
	30	69.3	10	—	—	—	—
3/4	10	23.1	—	—	42	39	37
	20	46.2	35	32	30	28	26
	30	69.3	24	22	19	15	10
1	20	46.2	48	46	45	43	40
	30	69.3	38	35	31	28	25
	40	92.4	23	20	15	—	—
1-1/2	20	46.2	62	60	58	55	52
	30	69.3	50	48	44	40	37
	40	92.4	37	32	29	22	—
2	20	46.2	71	68	66	62	60
	30	69.3	60	57	52	59	45
	40	92.4	45	40	36	31	24
	50	115.5	22	15	—	—	—
	20	46.2	81	79	76	74	71
2-1/2	30	69.3	69	67	63	60	56
	40	92.4	56	51	47	44	38
	50	115.5	33	30	22	15	—

MEDIUM HEAD



Tested and rated in accordance with Water Systems Council Standards.

NOTE: Pumps installed with a Pro-Source® tank require a 100 PSI relief valve. Pumps with a conventional tank require a 75 PSI relief valve. Relief valve must be capable of relieving entire flow of pump at relief pressure.

NOTE: Dotted lines indicate performance reduction at high suction lift.

STA-RITE® J/JB Series

General purpose centrifugal pumps

PUMP PERFORMANCE (CAPACITY IN GALLONS PER MINUTE)

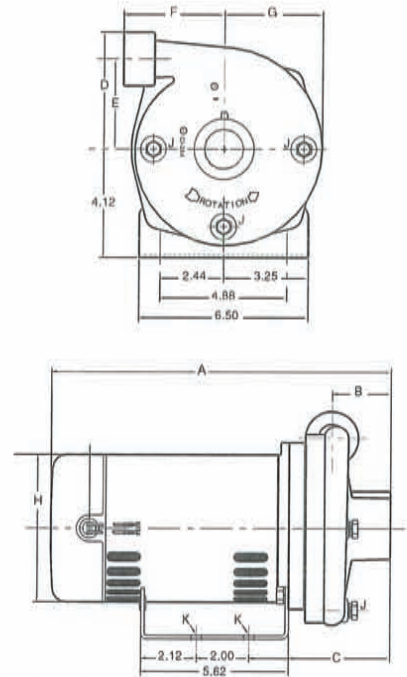
MEDIUM HEAD

HP	Discharge Pressure		Dynamic Suction Lift				
	PSI	Feet Head	5'	10'	15'	20'	25'
1/3	10	23.1	32	27	18	—	—
	20	46.2	—	—	—	—	—
1/2	10	23.1	40	37	32	27	17
	20	46.2	—	—	—	—	—
3/4	10	23.1	—	50	46	42	32
	20	46.2	37	29	21	—	—
1	20	46.2	54	51	44	40	33
	30	69.3	33	28	18	—	—
1-1/2	20	46.2	71	69	62	57	51
	30	69.3	52	47	34	30	20
2	20	46.2	88	84	78	70	66
	30	69.3	67	60	50	45	40
	40	92.4	25	13	—	—	—
2-1/2	20	46.2	111	106	101	95	90
	30	69.3	90	83	77	70	60
	40	92.4	46	38	20	—	—

Tested and rated in accordance with Water Systems Council Standards.

NOTE: Pumps installed with a Pro-Source® tank require a 100 PSI relief valve. Pumps with a conventional tank require a 75 PSI relief valve. Relief valve must be capable of relieving entire flow of pump at relief pressure.

OUTLINE DIMENSIONS



Dimensions (in inches) are for estimating purposes only.

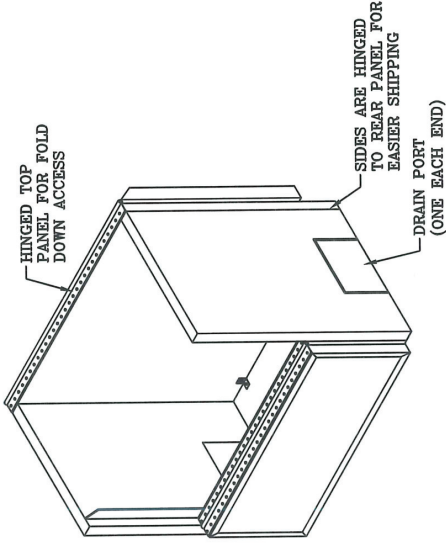
DIMENSIONS (IN INCHES)

HIGH HEAD

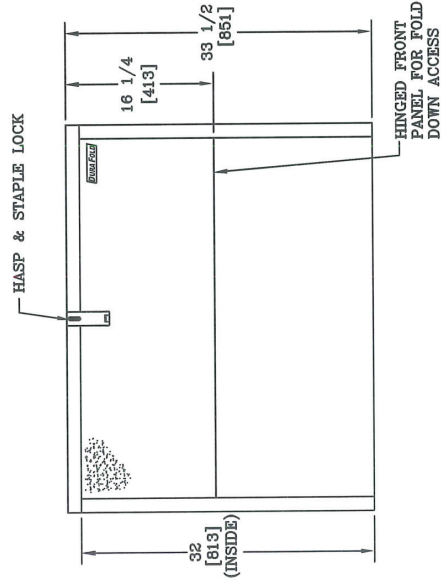
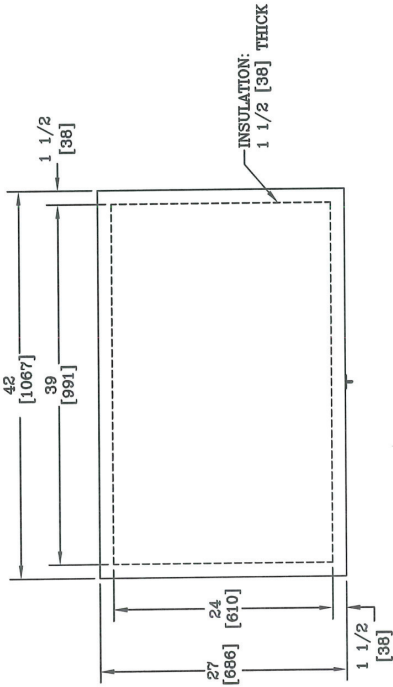
HP	NPT Suct.	NPT Disch.	A (1 Phase)	A (3 Phase)	B	C	D	E	F	G	H	NPT J	K
1/3	1-1/4	1	13	13-3/8	2-1/16	5-9/16	4-1/2	3-7/16	3-7/8	3-15/16	5-5/8	1/4	3/8 Dia.
1/2	1-1/4	1	11-21/32	13-3/8	2-1/16	5-9/16	4-1/2	3-7/16	3-7/8	3-15/16	5-5/8	1/4	3/8 Dia.
3/4	1-1/4	1	11-25/32	13-3/8	2-1/16	5-9/16	4-1/2	3-7/16	3-7/8	3-15/16	5-5/8	1/4	3/8 Dia.
1	1-1/4	1	12-25/32	13-7/8	2-1/16	5-9/16	4-1/2	3-7/16	3-7/8	3-15/16	5-5/8	1/4	3/8 Dia.
1-1/2	1-1/4	1	13-39/64	14-3/8	2-1/16	5-9/16	4-1/2	3-7/16	3-7/8	3-15/16	5-5/8	1/4	3/8 Dia.
2	1-1/2	1-1/4	16-3/4	16-15/16	2-13/16	6-5/16	4-27/32	3-13/32	4-5/8	4	6-7/16	1/4	3/8 Dia.
2-1/2	2	1-1/2	17-3/4	17-1/4	2-13/16	6-5/16	4-27/32	3-13/32	4-5/8	4	6-7/16	1/4	3/8 Dia.

MEDIUM HEAD

1/3	1-1/4	1	12-9/16	12-15/16	1-7/16	5-1/8	4-7/16	3-1/4	2-1/4	3-1/4	5-5/8	1/4	3/8 Dia.
1/2	1-1/4	1	11-7/32	12-15/16	1-7/16	5-1/8	4-7/16	3-1/4	2-1/4	3-1/4	5-5/8	1/4	3/8 Dia.
3/4	1-1/4	1	11-31/32	12-15/16	1-7/16	5-1/8	4-7/16	3-1/4	2-1/4	3-1/4	5-5/8	1/4	3/8 Dia.
1	1-1/2	1-1/4	12-11/32	13-7/16	1-7/16	5-1/8	4-7/16	3-1/4	2-1/4	3-1/4	5-5/8	1/4	3/8 Dia.
1-1/2	1-1/2	1-1/4	13-25/32	14-9/16	2	5-3/4	4-13/16	3-1/2	4-1/4	3-15/16	5-5/8	1/4	3/8 Dia.
2	1-1/2	1-1/4	16-3/16	16-3/8	2	5-3/4	4-13/16	3-1/2	4-1/4	3-15/16	6-7/16	1/4	3/8 Dia.
2-1/2	2	1-1/2	17-3/16	16-11/16	2	5-3/4	4-13/16	3-1/2	4-1/4	3-15/16	6-7/16	1/4	3/8 Dia.



- NOTES:**
- HEAT IS PROVIDED BY A 90WATT, 120V SINGLE PHASE HEAT TRACE TAPE FOR UNHEATED VERSION REPLACE THE PREFIX "H" WITH AN "L".
 - FOUR INTERNAL BRACKETS AND CONCRETE ANCHORS ARE SUPPLIED WITH THE ENCLOSURE.
 - FOR RECOMMENDED SLAB SIZE ADD 9" [229] TO THE ENCLOSURE EXTERIOR.
 - THIS ENCLOSURE IS DESIGNED WITH A FLIP UP LID & A FOLDABLE/REMOVABLE FRONT FOR EASE OF MAINTENANCE AND TESTING.
 - OLD P/N: DF2000H



BY		DATE	SCALE	DRAWING DESCRIPTION	LOC
DRN	CHK	ENG	APR	APR	REV
1/2/08	9/25/08	1"-1"	B	HOT BOX ALUMINUM ENCLOSURE	S A
PROJECT NUMBER					DRAWING NUMBER
091021					HD024038032
SHEET 1 OF 1					9/08

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FOCUS SYSTEMS, FL 32254
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