THE SCHOOL DISTRICT OF PHILADELPHIA
Office of Capital Programs
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Philadelphia, PA 19130

TELEPHONE: (215) 400-4730

Addendum No. 1

Subject: Motivation High School – Major Renovations
SDP Contract Nos. B-014C, B-015C, B-016C, B-017C of 2017/18

Location: Motivation High School
5900 Baltimore Avenue
Philadelphia, Pennsylvania 19143

This Addendum, dated 9th of March, 2018, shall modify and become part of the Contract Documents for the work of this project. Any items not mentioned herein, or affected by, shall be performed strictly in accordance with the original documents.

The following items, clarifications and/or revisions are to be included in the Contract Documents:

1. All Pre-Bid RFIs are to be submitted no later than 12:00 PM, March 16, 2018. Submit RFIs concurrently to the following parties:

   Sara Nordstrom, Design Project Manager, SDP
   snordstrom@philasd.org

   Jerry Thompson, Contracts Manager, SDP
   gcthompson@philasd.org

   Courtney Anspach, Project Manager, SCHRADERGROUP Architecture
   canspach@sgarc.com

2. The Post-Bid Conference, originally scheduled for Friday, March 30, 2018 at 10:00 AM per DOCUMENT 00 0050 INVITATION TO BID shall be held on Monday, April 2, 2018 at 10:00 AM. Attendance by low bidders for each prime contract is required.

3. Specification DIVISION 32 (EXTERIOR IMPROVEMENTS) and DIVISION 33 (UTILITIES) were inadvertently omitted. They are attached.

4. The BID PROPOSAL FORM – MECHANICAL has been modified as follows:

   a. UNIT PRICE 6: Base bid quantity has been revised to 698 LF.
   b. UNIT PRICE 7: New unit price added for hydronic indoor fiberglass piping insulation replacement on existing pipe fittings. See attached.

End of Addendum

SECTION 321216 - HOT-MIX ASPHALT PAVING

GENERAL

1.1 SUMMARY: This work consists of the work required for the proper installation of paving materials and sealing in areas designated on the Civil Drawings. Refer to Civil Drawings for types and quantities of materials. All pavement stone and pavement materials shall be acquired from an approved PennDOT plant. Certification that the plant is PennDOT approved must be submitted to the Architect/Engineer for approval. All paving shall be performed by a PennDOT approved installer. Certification that the installer is PennDOT approved must be submitted to the Architect/Engineer for approval. No slag based products or recycled materials will be allowed notwithstanding any PennDOT approval for this type of material.

A. This Section includes the following: Hot-mix asphalt paving, patching, overlays, and marking paint.

1.2 The contractor is responsible to ensure that the proper material is provided by supplying a copy of an approved PennDOT Bituminous Asphalt Mix Design a minimum of 5 working days prior to the start of the work or at the pre-construction meeting. The contract shall also supply the municipality with a Daily Bituminous Material Certification on a TR-465 or CS-4171 within 24 hours of placing the bituminous material for each day's placement.

1.3 SYSTEM DESCRIPTION

A. Provide hot-mix asphalt pavement according to the materials, workmanship, and other applicable requirements of the standard specifications of the state or of authorities having jurisdiction.

1. Standard Specification: As indicated and in accordance with PennDOT Form 408 requirements. When there is a discrepancy between the project specifications and PennDOT Form 408, Form 408 requirements shall govern for pavement materials and installation. **Except no slag or recycled materials shall be allowed.** Contractor is solely responsible for locating a waste disposal area and shall dispose of all waste materials in accordance with state, local, and federal regulations.
2. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.4 SUBMITTALS

A. Product Data: For each product specified. Include technical data and tested physical and performance properties.

B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work. Supply materials from an approved PennDOT asphalt mixing plant. Provide certification of the same.

C. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate dedicated handicapped spaces with international graphics symbol.

D. Samples: 12 by 12 inches minimum, of paving fabric.

E. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Engineers and owners, and other information specified.

F. Material Test Reports: Indicate and interpret test results for compliance of materials with requirements indicated.

G. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

H. Daily Bituminous Material Certification: as required by Section 1.3

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Contractor shall engage an experienced installer who has completed Superpave hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance of Superpave.

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.

1. Firm shall be a registered and approved paving mix manufacturer with PennDOT.

C. Testing Agency Qualifications: Demonstrate to Architect/Engineer's satisfaction, based on Architect/Engineer's evaluation of criteria conforming to ASTM D 3666, that the independent testing agency has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

D. Regulatory Requirements: Conform to applicable PennDOT requirements for all asphalt paving work, particularly on State Roads.

E. Asphalt-Paving Publication: Comply with AI's "The Asphalt Handbook," except where more stringent requirements are indicated.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings" Review methods and procedures related to asphalt paving including, but not limited to, the following:

1. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
2. Review condition of substrate and preparatory work performed by other trades.
3. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
4. Review and finalize construction schedule for paving and related work. Verify availability of materials, paving Installer's personnel, and equipment required to execute the Work without delays.
5. Review inspection and testing requirements, governing regulations, and proposed installation procedures.
6. Review forecasted weather conditions and procedures for coping with unfavorable conditions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location and within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:

1. Prime and Tack Coats: Minimum surface and air temperature of 40 deg F and rising at time of placement. Apply only when the surface is dry.
2. Asphalt Base Course: Minimum surface and air temperature of 35 deg F and rising at time of placement.
3. Asphalt Surface Course: Minimum surface and air temperature of 40 deg F at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 50 deg F for water-based materials, and not exceeding 95 deg F.

C. Pavement Cost Index: The use of pavement material cost index to adjust project cost of asphalt in accordance with PennDOT indexing of costs for asphalt material is NOT permitted for this project. Contractors shall anticipate the scheduling of work in this regard. Early installation of asphalt base conditions is encouraged, to the extent that it is practical for asphalt base course and binder applications. Wearing course installation will not be permitted until suitable conditions exist that the asphalt and paint marking can be accomplished to deliver a finished product to coincide with other project conditions for overall substantial completion.

1.8 REFERENCES

A. The following references shall apply to work completed under this specification section except no payment provisions from these references shall apply to this contract. In the event of a conflict between the Civil Drawings, project specifications, and referenced specifications, the more stringent shall apply, at the decision of the Architect/Engineer.

1. Pennsylvania Department of Transportation (PennDOT):

a. Publication 408 – Specifications - latest revision, in its entirety, including but not limited to the following sections:

1) Section 309 – Superpave Asphalt Mixture Design, Standard Construction, HMA Base Course.
2) Section 409 – Superpave Mixture Design, Standard and RPS Construction of Plant Mixed HMA Courses.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations. Provide aggregate from sources listed in PennDOT Bulletin 14. Aggregate shall conform to the quality requirements for Superpave Asphalt Mixture Design as specified in PennDOT Bulletin 27. For wearing courses, provide aggregate with at least the SRL designation specified.

B. Coarse Aggregate: Meeting the requirements of PennDOT Publication 408, Section 409.2(b)3.

C. Fine Aggregate: Meeting the requirements of PennDOT Publication 408, Section 409.2(b)3.

D. Mineral Filler: Meeting the requirements of PennDOT Publication 408, Section 409.2(d).

2.2 ASPHALT MATERIALS

A. Bituminous Materials: Virgin Mix, Furnish material conforming to the requirements of Standard Specifications for Performance-Graded Asphalt Binder, AASHTO M 320, except as revised in PennDOT Bulletin 25. Obtain material from a source listed in PennDOT Bulletin 15 for the specified grade. Provide QC testing and certification as specified in PennDOT Pub. 408 Section 106.3(b) and 702.1(b)1. Provide a copy of a signed Bill of Lading for bituminous material on the first day of paving and when the batch number changes.

B. Prime Coat: Per PennDOT Publication 408, Section 461.

C. Tack Coat: Emulsified Asphalt, Class AE-T, Per PennDOT 408 Sections 460 and 702.

D. Water: Potable.

2.3 AUXILIARY MATERIALS

A. Sand: ASTM D 1073, Grade Nos. 2 or 3.

B. Paving Geotextile: Nonwoven polypropylene, specifically designed for paving applications, resistant to chemical attack, rot, and mildew.

C. Pavement Marking Paint per Pa DOT publication 408.

2.4 MIXES

A. Hot-Mix Asphalt: Provide dense, hot-laid, hot-mix asphalt plant mixes approved by PennDOT; designed according to procedures in AI's "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types"; and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Provide mixes meeting the requirements of PennDOT Form 408 for the type of paving material specified.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.

C. Notify Architect/Engineer in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

3.2 COLD MILLING

A. In accordance with PennDOT Publication 408 Section 492. Clean existing paving surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement, including hot-mix asphalt and, as necessary, unbound-aggregate base course, by cold milling to grades and cross sections indicated.

1. Repair or replace curbs, manholes, and other construction damaged during cold milling.

3.3 PATCHING AND REPAIRS

A. Patching: Saw cut perimeter of patch and excavate existing pavement section to sound base. Recompact new subgrade. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.

1. Tack coat faces of excavation and allow to cure before paving.
2. Fill excavation with dense-graded, hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.
3. Partially fill excavation with dense-graded, hot-mix asphalt base mix and compact while still hot. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

B. Leveling Course: Install and compact leveling course consisting of dense-graded, 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.

C. Crack and Joint Filling: Remove existing filler material from cracks or joints to a depth of 1/4 inch. Refill with asphalt joint-filling material to restore watertight condition. Remove excess filler that has accumulated near cracks or joints.

D. Tack Coat: Apply uniformly to existing surfaces of previously constructed asphalt or Portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. of surface.

1. Allow tack coat to cure undisturbed before paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

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.

1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

B. Prime Coat: Apply uniformly over surface of compacted-aggregate base 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 for 72 hours minimum.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use just 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.
3. Adjust valve boxes located within the project limits to be flush with the top of bituminous wearing course. No separate payment shall be made for same.

3.5 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt mix on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness, when compacted.

1. 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 minimum temperature of 265 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, except where 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. Complete asphalt base course for a section 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.

3.6 JOINTS

A. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.

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

3.7 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and rerolling to required elevations.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling, while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to ASTM D 1559, but not less than 94 percent nor greater than 100 percent.
2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm. No roller marks shall be left in finished paving upon completion.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with suitable hand tools. Do not use rakes. Compact thoroughly using tamper or other satisfactory method.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials. Remove paving course over area affected 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.

3.8 INSTALLATION TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base/Binder Course: Plus or minus 1/4 inch.
2. Surface Course: Plus 1/4 inch, no minus.

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base/Binder 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.
4. No ‘low spots’ or ‘puddles’ shall remain after completion of paving.

3.9 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect/Engineer. Contractor shall replace any pavement markings lost as a result of construction, in kind to the markings that preexisted construction.

B. Allow paving to cure for 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.

3.10 UTILITY COVERS GRATES

A. All existing utility covers and grates shall be flush with new asphalt surface. Utility covers shall be raised or lowered accordingly to promote successful installation and prevent tripping hazards.

3.11 FIELD QUALITY CONTROL

A. Testing shall be as required by the Architect/Engineer at the Contractor’s expense. No separate payment will be made for this work. The Contractor shall make provision for soil, subbase, and paving materials testing in his bid in accordance with the requirements of this specification.

B. Testing Agency: Contractor shall engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.

C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

D. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

E. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

F. In-Place Density

1. In-place density of compacted pavement will be determined by field density testing.

a. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

G. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.12 WATER

A. The Contractor shall provide, at his own expense, all facilities required for the water supply necessary for water required for the work.

END OF SECTION 321216

SECTION 321723 – PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Pavement markings within PennDOT right-of-way: All pavement markings within PennDOT right-of-way shall be hot thermoplastic.

B. Pavement markings outside PennDOT right-of-way: All pavement markings outside PennDOT right-of-way shall be waterborne pavement markings.

C. Playground markings for court games and play activities: Acrylic pavement color coating and marking products.

1.2 REFERENCES

A. The following references shall apply to work completed under this specification section except no payment provisions from these references shall apply to this contract. In the event of a conflict between the Civil Drawings, project specifications, and referenced specifications, the more stringent shall apply, at the decision of the Architect/Engineer.

1. Pennsylvania Department of Transportation (PennDOT):

   a. Publication 408 – Specifications - latest revision, including but not limited to:

      1) Section 960 – Hot Thermoplastic Pavement Markings.
      2) Section 962 – Waterborne Pavement Markings.

2. Commonwealth of Pennsylvania Code (PA Code):

   a. Title 67, Department of Transportation Chapter 211, Official - Control Devices, Subchapter K - Marking.

1.3 DESCRIPTION OF WORK

A. Work consists of furnishing all equipment, labor materials, and performing all operations necessary for application of parking and traffic lines, markers or legends on roadway surfaces, in accordance with specifications and applicable drawings.

1.4 QUALITY ASSURANCE

A. Certification from the manufacturer, stating that the products supplied meet PennDOT's specifications, shall accompany delivery of material and shall be given to the Architect/Engineer prior to installation of pavement markings.

B. Submit product data and options for color selection in the submittal process.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver pavement marking materials to job site in their original, sealed containers or packages with intact and legible at time of use.

B. Store approved materials at the job site in a suitable and designated area restricted to storage of paint and coating materials and related equipment.

C. Use all means necessary to ensure safe storage of materials and the prompt and safe disposal of waste. Store products protected from weather when they may be affected by freezing.

D. Glass beads shall be in units of 50 lbs. and packed in moisture-proof bags. The beads shall be stored in a cool dry place.

1.6 PROJECT CONDITIONS

A. Environmental Requirements:

1. Adhere to manufacturer's data on air and surface temperature limits and relative humidity during application and curing of coatings.
2. Schedule work to avoid dust and airborne contaminants.

B. Protection:

1. Protect pavement marking products before, during and after application.
2. Clean up or otherwise remedy, without additional cost, damage by paint coatings to public or private property.

1.7 WARRANTY

A. The Contractor shall guarantee, in writing, to replace, at no expense to the Owner, that portion of the thermoplastic pavement marker or legend Products which, in the opinion of the Architect/Engineer, has not remained within reasonably close proximity to the location placed, or has not remained effective in performing useful daylight and nighttime service, for a period of one (1) year from the date of acceptance of the Work. The required service is as follows:

1. Intersection Units: Ninety percent of an intersection unit where the intersection unit is defined as all material on an approach leg within 150 feet of the intersection.
2. Midblock Unit: Ninety percent of a midblock unit where the midblock unit is defined as each individual legend, symbol, crosswalk or stop line.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Thermoplastic Pavement Marking Materials: Material shall be pigmented, 125 mils thick, preformed, retro-reflective, composed of hydrocarbon resin, aggregates, pigments, binders, and glass beads, conforming to AASHTO M249-79, and meeting the requirements of the Manual on Uniform Traffic Control Devices for Streets and Highways. Lines, legends, and symbols shall be capable of being affixed to bituminous or Portland Cement pavements by the use of the normal heat of a propane type of torch. Colors shall be yellow or white as required by project.

1. Application for this paint type shall be all traffic marking directional arrows, stop bars, crosswalks and any other location calling for Thermoplastic paint.
2. Material shall be capable of conforming to pavement contours, breaks and faults through the action of traffic at normal pavement temperatures.
3. Material shall have resealing characteristics and shall be capable of fusing with previously applied thermoplastic markings when heated with the torch.
4. Material shall be capable of being applied in temperatures down to 32° F without any special storage, preheating or treatment before application.
5. Graded Glass Beads: Glass beads shall be clear and transparent and shall be distributed throughout the entire cross-sectional area. The material shall contain a minimum of 30% graded glass beads by weight with not more than 20% consisting of irregular fused spheroids, or silica. The index of refraction shall not be less than 1.50.
6. Pigments:

    a. White: Similar to Federal Highway White, Color No. 17886, as per Federal Standard 595.
    b. Yellow: Similar to Federal Highway Yellow, Color No. 13655, as per Federal Standard 595. Yellow pigment shall be of organic origin only.

B. Water borne line marking materials:
1. Water soluble high wear resistant line marking materials in colors for white, yellow, red and blue specified markings of stenciled “Fire Lane” letters, painted traffic lane lines, traffic separation lines, handicap parking markings etc.
2. PennDOT approved traffic marking paint.
3. Sherwin Williams “Pro Park” water borne traffic marking paint or equal.

C. Athletic Marking Materials: Paint all game lines white and paint selected game lines or markings yellow unless otherwise noted on drawings.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Contractor shall clean the surface of the roadway before application of traffic lines or pavement markings to provide a clean, dry roadway surface which is free of loose dirt and other debris, to the satisfaction of the Architect/Engineer an in accordance with all manufacturer's recommendations, directions and specifications..

B. Legends shall be applied with equipment approved by the Architect/Engineer; hand brushes or rollers are not permitted.

3.2 EXECUTION

A. General:

1. Place pavement markings as indicated on the Civil Drawings

2. Utilize thermoplastic markings at site entrances to provide traffic direction control and throughout bus loading island where markings are indicated on plans. Utilize acrylic water borne marking systems for parking lines, stop bars and all other traffic markings.

B. Thermoplastic Pavement Marking Material Application:

1. Asphalt: The materials shall be applied using the propane torch method recommended by the manufacturer. The material shall be applied at ambient and road temperatures no less than 32° F without any preheating of the pavement to a specific temperature.
2. Portland Cement Concrete: The same application procedure shall be used as described under Paragraph 1, above. However, a compatible primer sealer may be applied before application to assure proper adhesion.
3. Additional glass beads shall be applied on the surface after application of marking if directed by Architect/Engineer.

C. Standard Marking Details:

1. Markings, unless otherwise specified, shall be detailed and placed in accordance with the Pennsylvania Department of Transportation regulations set forth in Subchapter K of the current edition of PennDOT Publication 68 - Pavement Markings.

END OF SECTION 321723

SECTION 323001 – ATHLETIC EQUIPMENT & SITE FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following items which shall be installed by a qualified installer of playground equipment who is trained and certified in the safety aspects of public playgrounds:

1. Benches
2. Bicycle racks
3. Trash and Recycling Receptacles
4. Basketball goals

B. The work required under this Section consists of furnishing all labor, materials, services and related items necessary to install play equipment, swings and structures, all site furnishings, and all related work, complete, as indicated on the drawings or specified herein.

1.2 SUBMITTALS

A. Manufacturer's Data: Submit manufacturer's shop drawings and/or catalogue cuts for each item of play equipment and site furnishing.

B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

C. Submittals: For all equipment items submit product data and color options in submittal process.

D. Maintenance Data: For furnishings, equipment and finishes to include in maintenance manuals specified in Division 1.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Contractor qualifications include as follows. An experienced installer who has specialized in installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to equipment manufacturer.

B. Manufacturer Qualifications: A firm whose athletic equipment components have been certified and been in service for a minimum of 10 years.

C. Source Limitations: Obtain each type of equipment through one source from a single manufacturer.

1.4 PROJECT CONDITIONS

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

1. Notify Owner at least 3 days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's written permission.
3. Before excavating, contact utility-locator service for area where Project is located.

1.5 COORDINATION

A. Coordinate construction of equipment with field of play and associated conditions of the site.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free from surface blemishes and complying with the following:

1. Extruded Bars, Rods, Wire, Profiles and Tubes: ASTM B 221.
2. Sheet and Plate: ASTM B 209.
3. Coatings of PVC fuse bonded types or approved equal
4. Specified manufacturer conditions may override these requirements.

B. Steel: Free from surface blemishes and complying with the following:

1. Tubing: Cold-formed steel tubing complying with ASTM A 500.
2. Pipe: ASTM A 53, standard weight Schedule 40, unless another weight is indicated or required by structural loads.
3. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513, or steel tubing fabricated from steel complying with ASTM A 569 and complying with dimensional tolerances of ASTM A 500; zinc coated internally and externally.
4. Coatings of PVC fuse bonded types or approved equal.
5. Specified manufacturer conditions may override these requirements.

C. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for exterior applications.

D. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" to produce normal-weight, air-entrained concrete with a

minimum 28-day compressive strength of 3000 psi, 3-inch slump, and 1-inch maximum size aggregate.

2.2 EQUIPMENT:

A. All specified items below are to be “or approved equal” items.

1. BENCHES – 6’ Blue Powder Coated Steel Strap
PATTERSON-WILLIAMS 3104-06, or approved equal

a. MOUNTING:

1) Bench must be anchored into concrete (see detail)

b. SEAT:

1) One piece assembly with 1-1/2" x 1/4" steel bar rolled to form seat and welded to 1-5/8" heavy duty steel underneath and 1-7/8" heavy duty steel tube on top of bench

c. END FRAMES:

1) One piece 3/8" x 2" steel bar rolled and welded to form a durable frame. Weld solid square steel bar (4" long) in location provided. Weld top end frame steel round bar connecter.

d. MATERIAL:

1) Stainless steel

e. FINISH:

1) Super durable blue polyester powder coat.

f. INSTALLATION INSTRUCTIONS:

1) Bench must be anchored into concrete (see detail)

2. BICYCLE RACKS – Inverted U-style, 8 Space Compatible
PATTERSON-WILLIAMS Blue Powder Coated Rainbow Model 1608, or approved equal

a. MOUNTING:

1) Footing sizes are based on average soil conditions. Loose and/or sandy soil is not average & footing sizes must be increases accordingly to meet soil conditions & local building codes & specifications.
2) Surface mount plates are welded to rack for quick & easy installation. Pick desired location & anchor to surface using holes in mounting plates as a guide. Anchors not included.

b. SPECIFICATIONS:

1) Heavy-duty, multiple loop style bike rack that will fit in all areas for single or double side load. It can be surface-mounted or permanently installed in-ground.

c. MATERIAL:

1) Manufactured from 2-3/8" O.D. heavy-duty 10-gauge galvanized steel tube ASTM A-787 or manufactured from 2-3/8" O.D. Stainless Steel.

d. FINISH:

1) Blue color
2) Coating specs meet ASTM A-653.

e. INSTALLATION INSTRUCTIONS:

1) FOOTER:

a) Determine location where bike rack is to be installed. If locating near building or wall. (See detail) NOTE: Use rack for spacing.
b) Set legs of bike rack in center of holes & shim from below or fill such that the top of the bike rack is 36" above finish grade. Plumb the bike rack to true vertical & brace. NOTE: Place a 2x4 on the ground under the bike rack to shim bottom of bike rack ensuring the correct height is kept while pouring concrete footing.
c) Pour concrete up to finish grade. Allow concrete to cure for 3 days.

2) ANCHORED:

a) Determine location where bike rack is to be installed. If locating near building or wall. (See detail) NOTE: Use rack for spacing.
b) Rack must be anchored into concrete (see detail)

3. TRASH AND RECYCLE RECEPTICLES – 32 Gallon Round Blue Powder Coated Steel Strap with Side Door, Lid & Liner
PATTERSON-WILLIAMS 3150-SH, or approved equal

a. MOUNTING:

1) Must be anchored into concrete

b. FRAME:

1) ¾” O.D. Solid Steel Rod

c. SIDES:

1) 1-1/2”x 3/16” steel strap sides

d. MATERIAL

1) Stainless steel

e. FINISH:

1) Blue super durable polyester powder coat
2) Recycling will be distinguished by manufacturer’s decal/plate with Recycling logo/text (to be approved by Engineer/Client)

f. INSTALLATION INSTRUCTIONS:

1) Must be anchored into concrete (see detail)

2) (2) ¼" holes to be drilled by contractor in interior plastic liner (see detail)

4. BASKETBALL BACKSTOPS – High School Men's Basketball Goals and Posts
BISON, JAYPRO, PW ATHLETICS, or approved equal

a. POSTS:

1) Heavy-duty gooseneck systems - 5 9/16" OD pipe schedule 40 structural pipe, hot dipped galvanized with minimum 6' offset from pole. No adjustable hoop height systems permitted. Single post.

b. BACKBOARD:

1) 1/4" steel powder-coated white, rectangular.

c. RIM AND NET:

1) breakaway extra heavy-duty with super nylon net

d. INSTALLATION INSTRUCTIONS:

a) Dig a hole in desired location per footing chart dimensions. Set the bottom of the post in center of the hole and shim from below or fill such that the top of the Gooseneck Post on the offset is (9' 11-5/8") above finish grade. Plumb post true vertical and brace. NOTE: Top of rim will be at 10' when installed. Verify that the backboard mounting plate is perpendicular to the surface by using a level (vertical) before pouring concrete.
b) Pour concrete and allow the concrete to set for 3 days before removal of bracing and completion of installation. Cover footings with turf or court materials.
c) Attach diagonal braces with the brace bands and carriage bolts provided. Slip both brace bands onto post and attach with carriage bolts.
d) Slide brace bands and braces toward the back of the backboard until the opposite end of the diagonal brace aligns with attachment angles or nuts. Attach the diagonal braces either to welded nuts or attachment angles, depending on backboard.
e) Tighten all bolts.
f) Once everything is tightened drill 1/4" Drive Pin holes in the GNP Adapter through the Gooseneck holes on top & bottom of offset end with the undersized (7/32" Drill Bit).
g) Align Rim with holes on Backboard & mounting plate and attach with 3/8" x 1-1/4" Hex Head bolt, Flat Washers and Nylock Nuts.
h) Attach Assembled Rim/Backboard/Sleeve to Gooseneck Post. Flat washers must be used behind plate when mounting backboard.
i) Use 7/32" hex key wrench to hold flathead bolt and secure with 3/8" flat washers and nuts.
j) Adjust backboard to square and tighten all bolts. This model is equipped with welded nuts on the backboard for diagonal brace installation.

2.3 FABRICATION

A. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field. Do not pre-assemble items which manufacturer does not recommend assembled in this manner.

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

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

D. Steel and Iron Components: Galvanize after fabrication. Bare steel or iron components are not permitted.

E. Exposed Surfaces: Polished, sanded or otherwise finished; with smooth surfaces free from burrs, barbs, splinters and sharpness; and with edges and ends rolled, rounded or capped.

2.4 FINISHES, GENERAL

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

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
   1. ASTM A 123, for galvanizing steel and iron products.
   2. ASTM A 153, for galvanizing steel and iron hardware.

B. Coatings: PVC fuse bonded, polyester coated or as otherwise specified by manufacturer data for specific equipment items above.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the subgrade, finish surfaces and installation conditions, for compliance with requirements for site clearing, earthwork, site surface and subgrade drainage, and other conditions affecting performance.

1. Do not commence work until all unsatisfactory conditions are corrected.
2. Do not begin installation before final grading required for placing protective surfacing is completed, unless otherwise permitted by Architect.

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

C. Provide each items free of defects, scratches and abnormalities.

D. Inspect installed equipment for proper location, height etc. Make all adjustments as necessary.

3.2 LAYOUT

A. The trade performing the work of this section assumes full and sole responsibility for the accuracy and correctness of all layouts, lines, levels, grades and other aspects of the work under this Section. Provide accurate and correct layout of lines, levels, grades and other aspects of Work specified in this Section. Lay out all work in accordance with the requirements, including those indicated on Drawings.

3.3 INSTALLATION OF EQUIPMENT AND SITE FURNISHINGS

A. Install specified benches in locations indicated on plans, coordinated with finish pavement patterns and mounting devices field locations etc.. Where direct burial mounting in paved areas is specified install before pavements. Where surface mounted connection is proposed, install after pavement.

3.4 ADJUSTING AND PROTECTION

A. Perform cleaning during installation of the work and upon completion of the work. Clean concrete from posts and other surfaces.

B. Remove from the project site all excess material and equipment at the completion of work of this Section.

C. Provide final protection and maintain conditions in a manner acceptable to Installer that ensures that work is without damage or deterioration at the time of Substantial Completion.

D. Repair damage resulting from installation of site furnishings and equipment.

E. Furnish manufacturer's touch-up and tool kit to Owner at final inspection.

3.5 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work.

B. Remove and dispose from the project site all excess material and equipment at the completion of the work of this section.

C. Repair damage resulting from play equipment and site furnishings work.

END OF SECTION 323001

SECTION **323113** – **FENCES AND GATES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes, but is not limited to, the following:
   1. Chain link
   2. Ornamental Metal

B. Related Sections include the following
   1. 312000 - Earthwork
   2. 033001 – Site Concrete Items

C. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.

D. Shop Drawings and Tables: Show locations of gates, posts, rails, details of extended posts, gate swing, hardware, and accessories.

E. Samples for Initial Selection: Manufacturer's color charts or 6-inch lengths of actual units showing the full range of colors available for components with factory applied color finishes.

F. Maintenance Data: For the following to include in maintenance manuals:
   1. Polyvinyl chloride finish.

1.3 QUALITY INSURANCE

A. Installer Qualifications: An experienced installer who has completed chain-link fences similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

1.4 PROJECT 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 CHAIN LINK FITTINGS AND ACCESSORIES

A. MATERIAL: Comply with ASTM F 626. Galvanized iron or steel
   a. Zinc Coating: Unless specified otherwise, galvanize steel fence fittings and accessories in accordance with ASTM A 153, with zinc weights per Table I.
   b. PVC Coating: All fittings and accessories shall be polyvinyl chloride coated same as specified for fabric and framing members. PVC coating shall be fused to the surface.
2. TIE WIRES: Double-wrapped, 12-gage (0.106-inch diameter) galvanized steel with a minimum of 0.80 oz. per sq. ft. of zinc coating of surface area in accordance with ASTM A 641, Class 3.
3. POST CAPS: Provide watertight closure cap for each post. Provide line post caps with loop to receive top rail. Caps shall be shaped as directed by the Architect.
4. TENSION AND BRACE BANDS: Minimum 3/4 –inch-wide hot-dip galvanized steel with minimum 1.2 oz. zinc coating per sq. ft. of surface area.
5. TENSION BANDS: Minimum 14 gage (0.074 inch) thick.
6. TENSION AND BRACE BANDS: Minimum 12 gage (0.105 inch) thick.
7. GROUT: Nonmetallic, non-corrodible, non-shrink, factory blended and packaged; complying with ASTM C 1107; recommended by manufacturer for exterior use.
8. SELEVAGE: knuckled at top and bottom

B. INSTALLATION:
1. Install chain link fence in accordance with ASTM F567. Use existing posts refinished with Black Zinc or PVC Coating. Install fabric on security side and attach with wire ties or clip to line posts at 15 inches o.c. and to rails, braces and tension wire at 24 inches o.c.

C. EXAMINATION
1. Examine areas and conditions, with Installer present, for compliance with requirements for concrete work, and other conditions affecting performance.
2.
3.

2.2 ORNAMENTAL METAL FENCES AND ACCESSORIES

4.
5. Ameristar’s Echelon Plus 3-Rail Majestic Panel aluminum ornamental fencing, or approved equal.

A. MATERIAL:
1. FRAMEWORK: Aluminum tubular elements (i.e., tubular pickets, rails and posts) shall conform to the requirements of ASTM B221. The aluminum extrusions for posts and rails shall be Alloy and Temper Designation 6005-T52. The aluminum extrusions for pickets shall be Alloy and Temper Designation 6063-T52.
2. RAILS: Horizontal rails shall be 1-1/4" x 1-7/16". The number of rails shall vary with the style, height and strength as determined by manufacturer. Fence posts are 2.5” square.
3. ACCESSORIES: Aluminum castings shall be used for all post caps, scrolls, finials, and other miscellaneous hardware. Hinges and latches shall be fabricated from aluminum, stainless steel or composite materials.

B. INSTALLATION:
1. Fence post shall be spaced and attached to posts with brackets supplied by the manufacturer. Posts shall be set in concrete footers 21” depth recommended. The

"Earthwork" and "Concrete" sections of this specification shall govern material requirements for the concrete footer.

2. If mounted on existing concrete, pre-welded flange posts are required and will be anchored into existing concrete as per manufacturers requirements.

C. FABRICATION: Pre-assemble items in shop to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field. Do not pre-assemble items which manufacturer does not recommend assembled in this manner.

D. METAL COMPONENTS: Form to required shapes and sizes with true, consistent curves, lines and angles. Separate metals from dissimilar materials to prevent electrolytic action.

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

F. CLEANING: The contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts

G.

END OF SECTION 323110

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SECTION 329200– LAWNS AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. The work under this Section includes, but is not limited to, the following:

1. Sodding where indicated on the drawings.
2. Soil amendments.
3. Initial maintenance of seeded and sodded areas.

B. All areas throughout the entire site which are disturbed by construction activities, shall be seeded or sodded as indicated.

1.3 RELATED SECTIONS SPECIFIED ELSEWHERE:

A. Earthwork sections including stripping, stockpiling of existing top soil as well as furnishing additional topsoil to supplement available topsoil is partially specified in other sections for Earthwork and related work. Standards of topsoil are referenced herein as they relate closely to the result of establishing lawns.

1.4 SEED QUALITY STANDARDS

A. All seed shall be fresh, clean, new crop seed delivered to the site in the original unopened containers. Seed shall be Gold Tag Certified by the state or country of origin.

B. Seed germination and purity tests will be furnished to the Architect/Engineer for approval prior to applying seed. For each seed lot number, the Contractor will be required to furnish:

1. State or country of origin.
2. Lot number of the certified seed.
3. Kind of seed and variety.
4. Seed purity, germination, weed content, and inert matter.
5. Delivery slips to substantiate the quantities delivered to the state.

C. Submit labeled samples of fertilizers and other applications showing mixture and composition of each specified.

D. Submit written certification for seed complying with the specification. Indicate name and telephone number of seed supplier including seed mix.

E. Maintenance Instructions: Provide 3 sets of instructions recommending procedures to be established by the Owner for maintenance of grass and seeded areas.

1.5 SOD QUALITY STANDARDS

A. Grown in accordance with The Department of Agriculture rules and regulations for "Certified Turfgrass Sod". Sod shall be free of quackgrass, annual rye, bindweed, Canada Thistle, wild garlic, wild onion, Muhlenbergia, bentgrass, Bermuda grass, clover, common broadleaf weeds, and plants of varieties other than those specified.

B. Sod shall be inspected in the nursery and approved prior to harvesting.

C. Substantiating Information: Submit grower's name, soil type where grown, thatch thickness, age, species, and blend of grass or field location from which sod is to be cut.

D. Age of Sod: Not more than fourteen (14) months old from time of seeding in the nursery.

E. Thatch Layer: Not more than 3/16".

F. All sod shall have been grown on native soil comparable to those found on the job site.

G. Pre-Harvest Sod Maintenance: Maintain for a minimum of three (3) months at a maximum height of 2"; mow prior to harvesting and on same day harvesting at a minimum height of 1 5/8".

H. Sod shall be of a uniform color, density and thickness and of the species, variety and/or blend specified.

I. Sod shall not have any form of non-biodegradable grid or mesh type stabilization system within the root zone or soil layer. Sod grown with nylon reinforced mesh shall not be accepted. Sod grown with a green bio-oriented mesh that is not nylon, as manufactured by Tenax or approved equal, shall be acceptable only with the proof that the material is not nylon and is degradable, and also with the condition that the contractor shall verti-cut the entire sod area once the sod has taken root and is established. Contractor shall verti-cut the sod in two (2) directions perpendicular to one another at a spacing of 2 inches wide or less. The contractor shall verti-cut the sod prior to final acceptance of the project, and shall provide proof that the mesh material has been fully cut. No separate payment shall be made to verti-cut the sod for as many times it takes to fully cut through the mesh fabric.

1.6 SITE CONDITIONS

A. Utilities: All underground utility work shall be installed, inspected and approved before operations are started.

B. Coordinate all seed work to avoid conflict and disturbance with other operations.

C. Topsoil may be stripped and re-used, but must be amended to meet the project specifications. Additional topsoil may be imported for remaining needs to establish turf. Responsibility to strip, stockpile, import, mix and spread topsoil to required thickness shall be performed by the contractor.

1.7 GUARANTEE/WARRANTY

A. Grass and Sod Guarantee: The Contractor shall warrant the condition of the lawns (non-athletic) areas and all the athletic fields playing surface for eighteen (18) months from the date of Substantial Completion. This warranty shall include services by the Contractor, as required to maintain the turf in first class playing condition, free of weeds, fungus, insects and bare spots. The Contractor shall provide all labor and equipment necessary (normal wear and tear, mowing and watering is not included) except as hereinafter specified in Initial Maintenance.

1.8 SAMPLES AND SUBMITTALS

A. The Contractor shall furnish the following samples and submittals in accordance with Division 1 Standard Specifications for approval. Do not order materials until Owner's Designated Representative' approval of samples, certifications or test results has been obtained. Delivered materials shall closely match the approved samples.

1. Topsoil shall be imported as required to meet the specifications. Following the incorporation of amendments and additives, the Contractor shall provide a minimum of one (1) six inch (6") depth by three inch (3") diameter core sample for every 100 cubic yards of soil material. The samples shall be taken for testing, analysis, and approval. The location of each sample shall be as directed by the Owner's Designated Representative. No final grading, seeding or sodding operations shall occur until acceptance of the soil samples has been obtained. Contractor shall deliver samples to testing laboratories and shall have the testing report sent directly to the Owner's Designated Representative.
    a. Mechanical gradation (sieve analysis) and chemical (pH soluble salts) shall be performed by public extension agency or a certified private testing laboratory in accordance with the current standards of the Association of Official Agricultural Chemists. A hydrometer shall be used to determine percent of clay and silt.
    b. Percent of organics shall be determined by the loss on ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 110ºC, plus or minus 5ºC.
    c. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Aluminum, Soluble Salts, and acidity (pH).
    d. Tests, as specified, for gradation, organics, soil chemistry and pH shall be performed by a qualified testing laboratory acceptable to the Owner's Designated Representative.
    e. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for fertilizing and liming applications to support successful turf growth.
    f. All tests shall be performed in accordance with the current standards of the Association of Official Agricultural Chemists.
2. Imported Topsoil: PADEP Form FP-001 – Certification of Clean Fill for each delivery of soil to site.
3. Sod: Submit manufacturer's Certificate of Compliance to the Specifications for seed mixture for sod, identifying sod source, including name and telephone number of supplier.

4. Fertilizer: Submit four (4) certificates of analysis for each type of fertilizer.
5. Erosion Control Materials: Submit four (4) copies of manufacturer's literature and one (1) material sample.
6. Wood Cellulose Fiber Mulch: Submit four (4) copies of manufacturer's literature and one (1) material sample.
7. Straw Mulch: Submit four (4) copies of a certified statement for approval stating compliance with specifications.
8. Peat: Submit a one cubic foot (1 ft^3) sample and supplier's certification of contents.
9. Maintenance Instructions: At the time of Acceptance, the Contractor shall submit complete maintenance plan for lawn care for the Owner's use. The instructions shall be reviewed for approval by the Owner's Designated Representative as a pre-condition for Acceptance.

    a. Qualification Data for firms and persons specified in the Division 1 Standard Specifications Sections to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses of Engineers and Owners, and other information specified.
    b. Planting schedule indicating anticipated dates for each type of planting.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed landscaping work similar in material, design and extent to that indicated for this Project and with a record of successful landscape establishment.

B. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that landscaping is in progress.

C. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Owner's Designated Representative's satisfaction, based on evaluation of agency submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Packaged materials: Deliver packaged materials in the original, unopened containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site. Fertilizer shall be delivered in waterproof bags.

B. Sod: Harvest, deliver, store, and handle sod according to the requirements of the American Sod Producers Association's (ASPA) "Specifications for Turf grass Sod Materials and Transplanting/Installing."

1.11 EXAMINATION OF CONDITIONS

A. All areas to be fine graded and seeded/sodded shall be inspected by the Contractor before starting work. Any defects such as incorrect grading, etc. shall be reported to

the Owner's Designated Representative prior to beginning this work. The commencement of work by the Contractor shall indicate his acceptance of the areas to be fine graded and seeded/sodded, and he shall assume full responsibility for the work of this Section.

1.12 COORDINATION AND SCHEDULING

A. Recommended periods for seeding of lawn areas is as follows: April 1 through May 31 and August 16 through October 15. Summer seeding shall only be performed only if an adequate supply of irrigation water is available to ensure successful germination.

PART 2 - PRODUCTS

2.1 DELIVERY AND STORAGE OF MATERIALS

A. Seed will be delivered to the site in the original, sealed and labeled and undamaged containers.

B. Sod shall be harvested, delivered, stored, and handled according to the requirements in the Turfgrass Producers International's (TPI's) "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in its "Guideline Specifications to Turfgrass Sodding."

C. Fertilizers and other materials shall be delivered and stored in original unopened packages, kept dry and not opened until needed for use. Damaged or faulty packages shall not be used.

2.2 MATERIALS

A. Sod Species Excepted:

1. One of the following will be approved as Zoysia Japonica sod on site:

a. 'Empire', 'Compadre', 'Zenith', 'Zoyboy', 'Palisades'

B. Sod Pad Size: Uniform thickness of 5/8 inch, plus or minus ¼ inch, measured at time of cutting, excluding top growth and thatch. Provide in suppliers size of uniform length and width with 5 percent allowable deviation in either length or width. Roll size for athletic fields shall be 4 feet wide by 70 to 100 foot length in contiguous rolls. Broken or torn pads or pads with uneven ends are not acceptable.

C. Sod Strength and pre-harvest maintenance: Sod shall be carefully grown and maintained to provide high quality sod appearance and strength and maturity. Maintain for a minimum of three months at maximum of 2" height. Mow prior to harvesting on same day of harvesting to blade height of 1 5/8". Provide sod pads capable of supporting their own weight and retaining size and shape when pad is suspended vertically from a firm grasp on upper 10 percent of the pad. Sod shall be uniform in color, density and thickness. No internal mesh stabilization systems within sod pads will be approved.

D. Existing Top Soil: All topsoil stripped from suitable areas having existing topsoil on the site shall be carefully managed throughout the project to minimize erosion or the establishment of a weed crop in the topsoil which may drop seed and contaminate a lawn seed bed. Stripped topsoil and imported topsoil is to be stockpiled, maintained until ready for use, re-spread to specified depths and graded to uniform surface conditions before final processing of rock picking and seeding or sodding.

1. Imported Planting Soil: Shall be required to complete the project in addition to the quantity of existing top soil which can be salvaged may be required. Amounts of each type shall be the site contractor's responsibility to determine. In no case shall final depth of topsoil be less than specified.
2. The site contractor shall provide and pay for soil analysis on all imported topsoil and on the existing top soil from an approved testing laboratory. Submit 3 copies of test results to the Architect/Engineer.
3. Imported Planting Soil shall comply with the following:
    a. Shall be natural, fertile, friable loam or sandy loam as classified by the U.S. Department of Agriculture Soil Classification system, and typical of the cultivated topsoils of locality.
    b. The planting soil shall contain not less than 1% or more than 8% by weight, of decayed organic matter (humus), as determined by ASTM F-1647.
    c. The planting soil shall be taken from a well drained, arable site, free from sub-soil, large stones, earth clods, sticks, stumps, clay lumps, roots, hazardous materials, or other objectionable, extraneous matter, debris or manufactured uniformly mixed individual soil components to create an amended soil providing it meets the specification herein.
    d. Topsoil shall also be free of Quackgrass rhizomes, Agropyron Repens, and the nut-like tubers of Nutgrass, Cyperus Esculentus, and all other primary noxious weeds.
    e. Topsoil shall not have a pH of less than 6.0 or greater than 7.0. Topsoil shall not be delivered or used for planting while in a frozen or muddy condition.
    f. The top soil shall be approved by the Architect/Engineer prior to use and after review of test reports.
4. Both existing Topsoil to be amended and any Imported Topsoil shall conform to the following particle size distribution, as determined by pipette method in compliance with ASTM F-1632:

Sand	(0.05 to 2mm)	60% to 70%
Silt	(0.002 to 0.05 mm)	5% to 10%
Clay	(<0.002 mm)	5% to 10%
Gravel	(>2.0mm)	<4%

    a. Maximum size shall be ½ inches largest diameter.
5. Organic amendments: Organic content 4%-6% by weight, as determined by loss on ignition (ASTM D2974). To adjust organic content, planting soil may be amended, prior to placing and final grading, with the addition of organic compost. Commercially manufactured humus product that is dark, crumbly, fine textured, well-aged decayed organic matter specifically manufactured for use as a soil amendment to promote vegetative growth and free of toxic materials.
    a. pH within 6.5-7.0

b. Mushroom compost is prohibited

6. Imported planting soil shall be tested for hazardous materials. Submit testing report with analysis of chemical content including heavy metals, parts per million ratios, etc.
7. Topsoil shall be loamy sand, sandy loam clay loam, loam, silt loam, or sandy loam determined by mechanical analysis (ASTM D-422) and based on the "USDA Classification System", and as approved by the Owner's Designated Representative. It shall be of uniform composition, without admixture of subsoil. It shall be free of stones greater than ½" inch, lumps, plants and their roots, debris and other extraneous inorganic matter. It shall not contain toxic substances harmful to plant growth. Topsoil must have a pH in the range of 6.00-7.0. Soluble salts shall not be higher than 500 parts per million.
8. Topsoil Source: field exploration should be made to determine whether quantity and/or quality of on-site surface soil justifies stripping. Stripping is confined to the immediate construction area. Contractor may use on-site topsoil as required to complete sodding, seeding and hydro-seeding work provided that the topsoil is first tested as specified herein and deficiencies noted are amended as recommended by the soil test analysis prior to use on-site. Contractor shall import topsoil as described in this Section if on-site supplies prove inadequate.

E. Lime: Lime shall be standard ground agricultural limestone not less than 50% lime oxides (calcium oxide and magnesium oxide), 98% of which will pass a twenty (20) mesh sieve: 40% of which will pass a one hundred (100) mesh sieve.

F. Fertilizers: All fertilizers shall be uniform in composition, free flowing and suitable for application with approved equipment, delivered to the site in original bags or cartons and fully labeled in conformance with applicable state fertilizer laws bearing the name, trade name or trademark and warranty of the producer.

1. Basic Fertilizer: Analysis 0-25-25 or equivalent 1-4-4 ratio fertilizer 6% soluble nitrogen derived from urea and/or ammonium nitrate. 24% available phosphate derived from super phosphate. 24% water soluble potash derived from muriate of potash.
2. Insoluble Nitrogen Fertilizers: Analysis 25-5-10 and 46-0-0 with nitrogen having 60% of the total nitrogen as water insoluble nitrogen (WIN). Nitrogen may be derived from a natural organic material or a ureaform compound (minimum availability index 45). Urea Nitrogen not acceptable as organic nitrogen.

G. Micronutrient Fertilizer: Shall be Chelated Plant Nutrients such as Agri-Plex 4X.

1. Guaranteed Minimum Analysis shall be as follows:

a. Primary Nutrients:

1) Available Phosphoric Acid: 4.0
2) Soluble Potash: 4.00%

b. Secondary Nutrients:

1) Magnesium: 3.00%
2) Sulfur: 4.00%

c. Micronutrients:

1) Boron: 0.08%
2) Iron: 5.00%

3) Manganese: 0.20%
4) Zinc: 0.20%

H. Straw Mulch: Wheat or oat straw, free of viable seed, well cured to less than 20% moisture content by weight.

I. Mulch Binder: Either water soluble natural vegetable gum blended with gelling and hardening agents or a water-soluble blend of hyrophyllic polymers, viscosifiers, sticking aids and gums.

PART 3 - EXECUTION

3.1 FINISH GRADE PREPARATION

A. The surface grades shall be surveyed in accordance with these specifications and any undulations or irregularities resulting from applications and soil structuring shall be corrected.

1. The turf sub-contractor will observe and coordinate with the site prime contractor for providing and general placement and grading of topsoil. Subsequent to the spreading of topsoil by the site contractor, the turf sub-contractor shall spread and incorporate soil amendments and lime, fertilizer, etc. and complete the preparation of the surface for application of seed or sod.
2. Apply 4 - 6” of topsoil to seeded lawn (non-athletic) areas and areas scheduled to receive sod. Apply a minimum of 6”of topsoil on all seeded and sodded athletic fields.
3. No greater than 1” of depth shall be lost to natural settlement, picking of rocks and final preparation of seed beds. If any area is found to have lost greater than 1”, additional topsoil shall be spread to raise depths to the original minimum depth.
4. In tree pit areas, soil shall be placed in lifts of 6-8”, compacting each lift slightly prior to adding subsequent lifts

B. First stone pick operation: Any stones larger than 2” inches in any dimension shall be removed from the top 3” utilizing a mechanical rock picker. Mechanical equipment for rock picking shall be approved before use. Machines which comb the surface and drag debris are not acceptable. Machinery shall lift and separate large particles from the top layer of topsoil and debris shall be deposited in rows to be collected or cast into a basket or conveyor to collection area. All deposited spoil shall be removed and disposed of properly off site.

C. Final grading shall be accomplished utilizing a LASER ASSISTED hydraulic land plane attached to a flotation tired agricultural tractor.

D. Cultivate and restructure the topsoil to a depth of 3-4”. Grade tolerance shall be held to ¼” per foot for the athletic fields area ½” per foot for the other seeded areas.

E. Regrade, re-firm and grade the soil surface. This is a smoothing and leveling operation to establish the final crown contours and elevations.

F. Final stone pick the surface of all lawn areas using hand rakes. Owner may require additional stone pickings as long as stones of 1 ½” size in any direction are observed in

the surface until seed is fully established, mowed three times by the contractor and accepted by the owner.

G. Tree pit areas: soil shall be placed in lifts of 6”-8” compacting each lift firmly prior to adding subsequent lifts

3.2 SOIL STRUCTURING AND NUTRIENT REPLENISHMENT

A. After the topsoil is prepared and graded to the proper elevations, the following materials shall be applied and tilled (mixed) into the full depth of the topsoil taking care not to disturb the subsoil. All of the following shall be required, however, amounts and types may be modified based upon soil testing results. All soil test information supplied for consideration of alternative soil amendments shall be supported by a testing lab analysis of recommended soil adjustments for establishment of maintained athletic field lawns.

1. Lime shall be evenly broadcast at 50 lbs/1,000 sq. ft. for existing top soil (or as per soil test) and at the rate recommended by the soil tests for imported top soil.
2. Soil Conditioner shall be evenly broadcast at 50 lbs/1,000 sq. ft.
3. 0-25-25 Basic Fertilizer shall be evenly broadcast at the rate of 10 lbs/1,000 sq. ft.
4. Apply Micronutrient Fertilizer at the rate of soil tests indicate.
5. Apply Biostimulant as recommended by the manufacturer.

B. After incorporation of the above materials, the topsoil shall be refirmed by dry-rolling (topsoil moisture content must be near zero percent) with a five (5) ton roller on a dual flotation tired agricultural factor.

C. Final stone pick the surface of any stones larger than 2”.

3.3 SODDING

A. Extent of sod areas as defined on the Landscape Plan and the Erosion and Sediment Control Plan

B. Lay sod within 24 hours of stripping. Do not lay dormant sod or if ground is frozen.

C. Lay sod to form solid mass with tightly fitted joints. Butt ends and slides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to avoid damage to subgrade or sod. Tamp or roll lightly to ensure contact with subgrade. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering adjacent grass.

D. Water sod with fine spray immediately after planting. During first 2 weeks, the Contractor shall water daily or more frequently as necessary to maintain moist soil to depth of 4 inches.

E. Sodding will not be permitted until final precision grading is inspected and approved by the Landscape Architect.

F. The contractor shall not allow any sod trucks of other heavy pieces of equipment on the field before, during or after sodding. A fork lift, having large flotation tires, shall be used to move the pallets of sod into the sodding area, providing its tracks are loosened with a “Knogslide Triple K” or similar harrow and raked before installing sod.

G. Dry sod beds shall be watered lightly prior to laying sod to prevent rapid desiccation.

H. The first row of sod should be laid in a straight line with subsequent rows placed parallel and tightly against one another. Lateral joints shall be staggered to promote more uniform growth and strength. Care shall be exercised to insure that the sod is not stretched or overlapped and that all joints are butted in order to prevent voids, which would permit air drying of the roots.

I. Where sod is specified on bank areas, the sod strips will be laid perpendicular to the slope of the bank with the joints staggered.

J. Where sod is placed on banks steeper than one foot of fall in five feet of horizontal distance Wooden Sod stakes shall be placed 12” on center near the top of the sod piece (minimum of 2 Stakes per strip of sod). Stakes shall be driven into solid ground with 3” exposed above the sod surface.

K. Sod shall be “dry rolled” prior to heavy watering, providing the soil conditions do not allow the sod to move under the roller.

L. After sod is installed, apply pre-emergence herbicide material before heavy watering begins, at the rate of 6 lbs/acre (50% wettable powder) to all sod areas.

M. After sod is installed, apply 25-5-10 Nitrogen Fertilizer at the rate of 6.0 lbs/1,000 sq.ft. to all sod areas.

N. During periods of high temperature the sod shall be lightly watered to prevent wilting during the progress of the work. Immediately after sodding is completed in any one section, that entire section shall be thoroughly irrigated to a depth of 4 inches or more.

O. The Contractor shall not use any pieces of sod, which has been damaged or torn during shipment of handling.

P. It is the responsibility of the Contractor to “fence-off” the newly sodded area the day sodding is started.

Q. Inspection of approval of sod areas shall be made within 24 hours of sod installation. On large sod areas, inspections may be made by sections prior to completion of the project site at least once per week for the first four weeks after completion of sodding.

R. Contractor shall return to the site four weeks later and after an irrigation or rainfall of one half inch, reroll the sodded areas.

S. Sod will be cut into the level of the surrounding grades or pavements to make a smooth even transition.

3.4 MAINTENANCE AND ESTABLISHMENT

A. The Contractor’s responsibility for maintenance shall be continuous until final acceptance of the work. The maintenance period of all seeded and sodded areas shall extend throughout the project. The Contractor shall submit a lawn maintenance schedule to the Architect/Engineer /Landscape Architect for review and approval no later than four (4) weeks after the award of the contract. Maintenance shall include, but not be limited to; watering, resodding, reseeding, fertilizing, weeding, mowing, edging, and additional reworking as follows:

1. Checking the sodded areas before watering to avoid excessive moisture.
2. Refilling of rain-washed gullies and rutted areas.

3. Reworking and resodding of any areas which fail to show a uniform stand of grass.
4. Weeding, cultivating, control of insects, fungus, and other diseases by means of spraying with an all-purpose insecticide and fungicide only as approved by Owner
5. Watering as needed for successful establishment. Water source to be provided by Contractor

B. Turf areas shall be mowed as many times as necessary during the contract period until final acceptance of the work. Turf shall be mowed in order to maintain a maximum height of 4" as measured from the top of the ground. No more than 1/3 of the turf height shall be removed during any one (1) mowing.

C. All aforementioned work shall be done at the Contractor's expense. Replacement of seeded or sodded areas shall be with the same material type originally installed, and repeatedly repaired and maintained until all areas are covered with a satisfactory stand of turf.

D. Mowing: The Contractor shall mow all areas a minimum of 3 times at a height of 2 to 2-1/2" and be responsible for establishing an acceptable stand of grass. Do not mow grass to less than 2".

E. Establishment Acceptance: An acceptable stand of grass means the existence of minimum of 72 viable turf plants per square foot. At the time of final inspection, all areas achieving these criteria will be accepted as completed and only those specific areas not meeting these criteria will continue to receive maintenance by the contractor until the criteria is met provided that the owner is not required to accept multiple small areas of acceptable lawn amid areas of unacceptable lawn. If such conditions exist, the contractor shall provide continued maintenance until the overall area is acceptable.

F. Warranty Maintenance Schedule: As part of the field warranty, the Contractor is required to perform regular turf maintenance applications on installed turf as per the following schedule:

1. Sodded turf: 1 year from Substantial Completion
2. Turf areas must achieve 95% coverage with maximum 10% weed composition.
3. Schedule changes may be made as determined by weather conditions, time of year, and use of the turf if approved by the Owner or their representative

G. Begin maintenance of lawns immediately after each area is seeded and sodded and continue for the periods required to establish acceptable lawns, but no less than the following:

1. Seeded and sodded areas, at least 30 days after the date of Substantial Completion.
2. Contractor shall make all provisions necessary for obtaining water for landscape work.

H. Sod which turns brown will be given no more than 30 days for the contractor to provide water and establish that the sod is recuperated and returned to a green condition. Failure to turn green shall require sod replacement wherever browned out conditions remain.

I. Maintain areas by watering, weeding, mowing, trimming, and other operations such as rolling, regarding, replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.

J. Mow lawns as soon as there is enough top growth to cut with mower set at specified height for principal species planted. Repeat mowing as required to maintain specified height. Remove no more than 40 percent 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. Trim initial and subsequent mowings to maintain following grass height:

1. Mow grass from 2 inches to 2-1/2 inches high. Do not mow to less than 2 inches. During periods of stress, grass heights can be increased slightly.

K. When work is substantially completed, including maintenance, Architect/Engineer will, upon request, make an inspection to determine acceptability.

1. Grass and sod work may be inspected for acceptance in parts agreeable to Architect/Engineer, provided work offered for inspection is complete, including maintenance.

L. Replant rejected work and continue specified maintenance until re-inspected and found to be acceptable.

M. Seeded and sodded lawns will be acceptable provided requirements, including maintenance, have been met and healthy, well-rooted, even-colored, viable lawn is established, free of weeks, open joints, bare area, and surface irregularities.

N. Watering lawns: The contractor shall provide for proper scheduling for use of the system of pipes available. The contractor shall provide additional pipes, hoses and sprinkler devices as necessary to reach from water supply points to areas necessary for watering on fields and surrounding locations.

3.5 CLEANUP

A. Promptly remove soil and debris created by sodding work or stone picking from paved areas or field surfaces. Clean wheels of vehicles before leaving site to avoid tracking soil onto surface of roads, walks, or other paved areas.

END OF SECTION 329200

SECTION 329300 – LANDSCAPE PLANTING AREAS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Trees & Shrubs
2. Small plants, plugs, perennials, ornamental grasses, succulent plants, seed mixtures for specialty landscape areas including bio-retention/rain garden plantings etc.
3. Landscape accessories such as stone beds, mulch, and natural treatments for rain garden structure items etc.

1.2 DEFINITIONS

A. Balled and Burlapped Stock: Exterior plants dug with firm, natural root balls of earth in which they are grown, with ball size not less than 54” diameter for shade trees with heights at 18’ and taller and ball depths as recommended by ANSI Z60.1. Root ball shall be wrapped, tied, rigidly supported, and drum-laced as recommended by ANSI Z60.1.

B. Balled and Potted Stock: Exterior plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size shall not be less than sizes indicated with diameter and depth recommended by ANSI Z60.1 for type and size of exterior plant required.

C. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with 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 kind, type, and size of exterior plant required.

D. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted exterior plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of exterior plant.

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; and free of hazardous materials.

G. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments; and free of hazardous materials.

H. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

1.3 SUBMITTALS

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

B. Samples for Verification: For each of the following:

1. 5 lb of mulch for each color and texture of stone or organic mulch is required, in labeled plastic bags.
2. Weed barrier fabric, 8”x 11” rectangle swatch, with manufacturer's information, specified tensile strength, thickness and weight in ounces / square yard.

C. Product Certificates: For each type of manufactured product, signed by product manufacturer, and complying with the following:

1. Manufacturer's certified analysis for standard products, i.e. Soil Analysis.
2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

D. Qualification Data: For landscape Installer and sub contractors operating heavy equipment.

E. Material Test Reports: Soil analysis for existing soils in proposed planting areas shall be submitted. Samples should be taken at various depths. The first sample shall be the surface soil, 6” depth; the second depth shall be 15”. All imported off site soils for planting shall have a Soil Analysis Report submitted. In both instances Soil Analysis reports shall be conducted by an accredited Soil Lab as approved by the Architect/Engineer.

F. Planting Schedule: Indicating anticipated planting dates for exterior plants.

G. Maintenance Instructions: Maintain trees for the duration of installation process, until acceptance and duration of Maintenance Period. Recommended maintenance procedures to be established by Township for maintenance of exterior plants during a calendar year. Submit before expiration of required maintenance periods.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful planting and establishment of exterior plants.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when exterior planting is in progress.

B. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, such as State University Agricultural Extension Office, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; hazardous material; pH; and mineral and plant-nutrient content of topsoil.

D. Report suitability of topsoil for plant growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil.

E. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock."

F. Tree Measurements: Measure according to ANSI Z60.1 with branches and trunks in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches above ground for trees up to 4-inch, caliper size, and 12 inches above ground for larger sizes. Measure main body of tree for height and spread; do not measure branches or roots tip-to-tip.

G. Observation: Landscape Architect or the Architect/Engineer may observe trees and shrubs either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size, and quality. Landscape Architect or the Architect/Engineer retains right to observe trees, further for size and condition of balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees immediately from Project site.

1. Notify Landscape Architect or the Architect/Engineer of sources of planting materials seven (7) seven days in advance of delivery to site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver exterior plants freshly dug.

B. Do not prune trees and shrubs before delivery, except as approved by Landscape Architect. Protect bark, branches, and root systems from sunscald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery.

C. Handle planting stock by root ball, do not use trunk to lift tree or maneuver root ball within tree pit. Ensure root ball is intact, compacted and whole.

D. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants trees in shade, protect from weather and mechanical damage, and keep roots moist

1. Heel-in bare-root stock.
2. Set balled stock on ground and cover ball with soil, peat moss, wood chips, mulch, sawdust, or other acceptable material.
3. Do not remove container-grown stock from containers before time of planting. Water root systems of exterior plants stored on-site with a fine-mist spray or with slow trickling hose.
4. Water as often as necessary to maintain root systems in a moist condition.

1.6 COORDINATION

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting: mid-March to end of May subject to appropriate conditions for planting.
2. Fall Planting: mid-September to early November subject to appropriate conditions for planting. Furthermore, the use of an anti-desiccant spray is mandatory for all evergreens planted in November.
3. Summer: Project schedules sometimes limit the ability of planting to occur during spring because of lack of site preparation on time. Summer planting to achieve a fall completion may be a necessity but the contractor is advised that additional watering and plant protection must be performed under these circumstances at no additional cost to the owner. The beginning of a maintenance period will not start for these plants until it is demonstrated in the following fall that they are healthy and thriving.
4. Winter: It is not advisable to plant in the winter. If it is done during this time, it is the contractor's risk and the beginning of a maintenance period will not start for these plants until it is demonstrated in the following spring that they are healthy and thriving. If winter planting of evergreens is performed, an anti-dessicant spray must be used.

B. Coordinate with Owner for access to site; locate material staging areas, delivery locations and scheduling so as to not interfere with the school activities.

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

D. Coordinate plant quantities required for complete coverage of the plans. Plant lists and quantity conditions are provided however contractors must add together cumulative plant quantity requirements from partial plant lists or multiple plant list conditions.

E. Coordinate timing of installation and location of utilities with other contractors. In particular, schedule a coordination meeting with the installer of electrical conduits and shallow utility lines which frequently interfere with planting conditions to confirm the locations of such lines and to avoid the interference of lines from scheduled installation.

F. Municipality verification of plant species, size, quantity and location will be performed by municipal review staff. The design landscape architect/engineer will not agree to any changes to material specified unless two weeks advance notice is provided and cost of obtaining changed design approval is paid to the design firm.

G. Availability of plant material from a single nursery source is not an acceptable reason to seek any substitution. Multiple nursery sources may be required to obtain the specified material. Plants are often specified based on a municipality ordinance and the designer may have no freedom to make substitutions.

1.7 WARRANTY

A. Warranty: Warranty the following exterior plants, for the warranty period indicated, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, or incidents that are beyond Contractor's control.

1. Warranty Period for Trees, Shrubs and small plants: Eighteen (18) months from date of final completion. If landscape items are on the final site punch list, warranty shall not begin until the punch list is corrected.
2. Remove dead trees, shrubs and small plants immediately when notified. Plant with same type, variety, and size with appropriate staking and guying if originally included.
3. Replace Trees, shrubs and small plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
4. Prune out dead wood material if less than 25% of the plant is dead. After pruning, the plant shall be evaluated. If the form of the plant is not damaged, it may remain. If the dead wood is due to insects or disease, it is an unhealthy plant and must be replaced anyway.
5. Warranty small plants for six (6) months following the end of maintenance period.
6. It shall be the duty of the contractor to advise the owner in writing, that maintenance period has ended and warranty period has begun. That notification shall also advise the owner of the maintenance responsibilities of the owner outlined below. Failure to notify shall extinguish all arguments that a plant is not covered by the warranty.

1.8 MAINTENANCE

A. Trees and shrubs: Maintain for the following maintenance period by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease. Restore or replace damaged tree wrappings. Notify owner of spray products and obtain approval before application. All trees shall be watered using watering bags mounted to tree stem throughout the first planting season as a measure of tree establishment and maintenance. See owner's maintenance for additional watering requirements.

1. Maintenance Period: Maintenance Period for initial establishment: From time of initial installation until plants are well established and healthy but not less than 90 days from the date of installation. Do not plant sooner than 120 days from project final completion because nobody will maintain the plants. Plants shall be maintained by the contractor until the beginning of the warranty period stated under "Warranty". When a plant is replaced under the punch list, it shall be tagged for the owner to observe it's health. If it does not thrive within 60 days, it shall be replaced again as a warranty replacement.

B. Small Plants including rain gardens: Maintain for the following maintenance period by pruning, cultivating, watering, weeding, mulching, fertilizing, replacing, cleaning up leaf debris as required to establish healthy, viable plantings. Spray as required to keep shrubs and small plants free of insects and disease. Notify owner of spray products and obtain approval before application.

1. Maintenance Period for initial establishment: From time of initial installation until plants are well established and healthy but not less than 90 days from the date of installation.
2. Maintain perennial accent plants, ground covers, bulbs and annuals within planting beds in the same manner as described above for shrubs.

3. Maintain plants within stormwater management basin features and rain gardens such that plug plants thrive and establish and seeded supplement areas become fully established. Such maintenance may be unique compared to other landscape maintenance. Plants killed by excessive duration of inundation must be replaced. Temporary de-watering of basins shall be performed to establish plants. Weed invasion shall be prevented by hand pulling and spot spraying. Plants killed by frost heave shall be replaced. Said replacement is maintenance if it falls within the 90 days for establishment. If the 90 days has expired, perform the replacements as a warranty item.
4. Maintenance of rain gardens and basins shall include a spray application of a natural garlic based or diatomaceous earth based monthly spray application every 30 days within the maintenance period to control mosquitoes. Standing water application of a disc product may be used.

C. Owner's maintenance: The owner is not required to maintain any plants until the contractor's 90 day maintenance period has expired and not until the warranty period has begun. Note that warranty period does not begin until punch list is corrected. During that time, the owner shall be diligent in keeping plants maintained in a general healthy condition using reasonable resources available and including weeding, mulching and insect control. Plants utilized in planting designs are predominately native species which should survive without the use of supplemental watering provided that watering was performed during the maintenance period by the contractor in order to establish the plant. During periods of drought such that average monthly rainfall is more than 1" below the normal for the region according to National Weather Service precipitation data records, the owner shall provide supplemental watering during the following month if the drought condition continues or if stress is observed in the plant. The owner shall maintain records of such watering.

PART 2 - PRODUCTS

2.1 TREE MATERIAL

A. General: Furnish nursery-grown trees complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sunscald, injuries, abrasions, and disfigurement.

B. Grade: Provide trees and shrubs of sizes and grades complying with ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Landscape Architect or Architect/Engineer, with a proportionate increase in size of roots or balls.

C. Label at least one tree of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.

D. If formal arrangements or consecutive order of trees or shrubs is shown, select stock for uniform height and spread, and number label to assure symmetry in planting.

E. Trees shall be tagged and approved at nursery with Project Representative prior to delivery to site.

2.2 SHADE AND FLOWERING TREES AND SMALL PLANTS

A. Shade Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, complying with ANSI Z60.1 for type of trees required.

1. Provide balled and burlapped trees.
2. Branching Height: One-third to one-half of tree height.

B. Upright, Spreading Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1; stem form as follows:

1. Stem Form: Single stem.
2. Provide balled and burlapped trees.

C. Shrubs and small plants: Well formed plants of proper size and maturity grown as specified in containers, plugs or balled an burlapped and meeting ANSI Z 60.1. Plants labeled as “full” are recognized as seasonal in their development of vegetation mass but shall be well formed with mature root systems that will develop rapidly into plants with mass when seasonal conditions are correct.

D. Trees shall be tagged and approved at nursery with Contractor Project Representative prior to delivery to site. Contractor to arrange tagging visit

2.3 FERTILIZER

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 1 percent nitrogen and 20 percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.4 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:

1. Type: Triple shredded hardwood mulch

2.5 ANCHOR STAKE (Only when planting details on drawings include root anchor safety stake)

A. Type: “Root Anchor Safety Stake” below grade rootball anchoring system manufactured by Tree Stake Solutions as necessary to meet the requirements of the specification. Staking and Guy Requirements shall be met for necessary sizes and lengths of “S” Hooks, Tightening Straps, Drive Rods, Anchor Rings, and Anchors per root ball size.

2.6 MISCELLANEOUS PRODUCTS

A. Anti-desiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturers’ written instructions.

B. Trunk-Wrap Tape: Two layers of crinkled paper cemented together with bituminous material, 4-inch wide minimum, with stretch factor of 33 percent.

C. Trunk Guard: 12” long black corrugated pipe with slit the entire length. Install and locate at the base of trunk protecting tree flare.

2.7 BIO-RETENTION / RAIN GARDEN MATERIALS

A. Landscape Boulders, recycled tree logs and tree log stepping stones, 2-3” size smooth riverstone cobbles and bio-diversity products shall be provided as indicated in the plan details and execution section below. Bio-diversity products shall include furnishing and release of live animal life: worms, crickets, frogs and salamanders as a participatory release process by students and staff.

B. Mosquito Control – All natural or biological products with no chemical content, non-harmful and effective for 30-day mosquito control comprised of the following specific products, a combination thereof or equal. All products shall be applied per manufacturer recommendations and may be sprayed or applied to standing water in disc form.

1. Mosquito Barrier by Garlic Research Labs, Glendale California, 800-424-7990
2. Mosquito Dunks by Summit Responsible Solutions, 800-289-6656
3. Diatomaceous Earth mixed into a mosquito control spray application

PART 3 - EXECUTION

3.1 EXAMINATION

A. Flag, mark, spray paint all underground utilities. Contact Pennsylvania ONE CALL, system for aiding in mark out, phone number 1-800-242-1776. Maintain all markings, flags and there locations for the duration of the installation.

B. Examine areas to receive exterior plants for compliance with requirements and conditions affecting installation and performance.

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

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, existing sloped lawn areas and other facilities, and lawns and existing exterior plants from damage caused by planting operations.

B. 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.

C. Lay out individual tree locations for plantings. Stake locations and outline areas; adjust locations when requested, and obtain Architect/Engineer or Owner approval of layout before planting. Make minor adjustments as required.

D. Apply anti-desiccant to trees using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees are moved in full leaf, spray with anti-desiccant at nursery before moving and again two weeks after planting.
2. Apply anti-desiccant spray to evergreens planted late in the year.

3.3 PLANTING BED ESTABLISHMENT

A. Loosen subgrade of planting beds areas to a minimum depth of 8 inches depth throughout the bed plus planting hole excavations exceeding the root ball size per details on the plans. Remove stones larger than 1 inch in diameter and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner’s property.

B. Incorporate planting mix material into planting pits and planting bed areas such that the final prepared condition before installing plants is a bed or rich, friable planting soil, loosened throughout the bed area and containing smooth surfaces and good planting texture free of roots, clods, lumps, rocks, stones, construction debris etc.

C. Individual planting pit holes within grass areas or within hardpan soil areas are unacceptable.

3.4 TREE AND SHRUB EXCAVATION

A. Preparing Shade Tree Planting Pit:

1. Excavate a shallow broad planting hole. The Hole shall be approximately (3) Three times the diameter of the root ball and no deeper than the height of the root ball.

2. Place tree in center of the planting pit. Place on firmly packed soil to prevent settling. The trunk flare, the portion of the trunk where the roots spread at the base of the tree, shall be 1-2" above the edge of the planting pit. The flare shall be partially visible and not wholly covered by planting soil.
3. Remove burlap and wire baskets from tops of root balls and partially from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
4. Thoroughly blend planting soil mix and amendments on-site before placing.
    a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
5. Mix lime with dry soil before mixing fertilizer
6. Do not install planting soil or subgrade if frozen, muddy or excessively wet.
7. Backfill planting soil mix around root ball in layer, water in soil with hoses to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and final layer of planting soil mix.

B. Organic Mulching: Apply 2 inches average thickness of organic mulch extending to the edge of planting. Do not place mulch within 6 inches of trunks or stems.

C. Wrap trees with trunk-wrap tape. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling. Inspect tree trunks for injury, improper pruning, and insect infestation; take corrective measures required before wrapping.

D. Subsoil removed from excavations may be used as backfill after the required amendments are added.

E. Obstructions: Notify Landscape Architect or Architect/Engineer if unexpected rock or obstructions detrimental to trees are encountered in excavations.
    1. Hardpan Layer: Drill 6-inch- diameter holes into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.

F. Drainage: Notify Landscape Architect or Architect/Engineer if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.

G. Fill excavations with water and allow to percolate away before positioning trees.

3.5 TREE PRUNING

A. Prune, thin, and shape trees and shrubs as directed by Landscape Architect.

B. Prune, thin, and shape according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise indicated by Landscape Architect, do not cut tree leaders; remove only injured or dead branches from trees. Under no circumstances should the main leader or a deciduous or evergreen tree be topped.

3.6 TREE STAKING

1. Anchor Staking: (Anchor Staking is required for the contractor's warranty requirements only.) Contractor shall use "Root Anchor Safety Stake" below grade rootball anchoring system manufactured by Tree Stake Solutions as necessary to meet the requirements of the specification, subject to approval. Refer to details for staking and/or guy requirements, and specifications below:
    a. Trees that are not capable of standing upright without falling or leaning shall be anchor staked. The Contractor is responsible for material remaining plumb and straight for all given conditions through the guarantee period. Tree support shall be performed as outlined below.
    b. Rootball, Container and Box size, will determine Root Anchor Safety Stake model to be installed on all trees or shrubs that require staking or guying. Root Anchor is designed for trees and shrubs that conform with the latest American Standards for Nursery Stock, www.anla.org.
    c. Brace plants vertically using Tree Stake Solutions "Safety Stake" Model BG Root Anchor. Select correct Root Anchor using manufacturers Rootball Sizing Chart. Select Root Anchor large enough to overlap the edge of rootball.
    d. Auxiliary stem stakes shipped with trees shall be removed after planting.

B. Tall Plant Staking: Anchor stake trees/tall plants exceeding 18 feet in height and more than 4 inches in caliper, unless otherwise indicated.

3.7 PLANTING BED MULCHING

A. Mulch backfilled surfaces of planting beds and other areas indicated.

B. Organic Mulch: Apply 2 inch thickness of organic mulch, and finish level with adjacent finish grades. Do not place mulch against plant stems. Edges shall be toed in to soil 4" deep.

C. Plantings are arranged in groupings and all plant groupings shall be mulched entirely as a group around and between all plants so that a single continuous mulch bed results. Single mulched plants are not acceptable unless they are stand alone trees outside of a bed area or plant grouping area. Evergreen tree mass groupings shall be fully mulched as a bed also unless the spacing of evergreen trees is greater than 15' apart.

3.8 CLEANUP AND PROTECTION

A. During exterior planting, keep adjacent paving and construction clean and work area in an orderly condition.

B. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged exterior planting.

C. Re-assemble and attach all fencing that may be removed during construction to pre-construction condition or better.

3.9 DISPOSAL

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property. Soil disposal is further specified under Earthwork section.

3.10 BIO-RETENTION/RAIN GARDEN PLANTINGS AND FIT-OUT AREAS

A. Plantings – Refer to details of each bio-retention area including layout, plantings, cross section information etc. for proper depth of 18” prepared soil layer and arrangement and content of plants and fit-out. Plantings shall be installed at proper time of year and maintained carefully for the duration of maintenance periods specified. Plants shall be arranged in groupings as indicated, densely planted, mulched and outer perimeter zones seeded as indicated on the detail plans. There shall be a pre-installation conference with the Landscape Architect before any planting installation.

B. Structure Items – Install riverstone access beds. Use geotextile weed barrier under the stone areas. Install landscape boulders and arrangements of wood tree trunk logs as shown on the plans or as specified herein. Salvage of existing tree logs and tree trunk stepping stones is required under other specifications. Install these items in floor of rain garden areas where directed. Stepping stone slabs and logs shall be drilled and pinned with #4 rebar pins 2’ deep to prevent floatation.

C. Bio-diversity supplements – Bio-diversity shall be achieved in the completed rain gardens by strict compliance with the selected plant material and structure items listed above and shown on the plans. The contractor shall then complete the bio-diversity of rain gardens by furnishing and releasing living animal life material as follows: 2000 red wiggler worms, 1000 nightcrawlers, 500 3/4” crickets, 100 amphibians of native species. Release of live bio-diversity material shall be coordinated with the owner and architect to include school staff and students in an interactive process of rain garden completion and education.

D. Mosquito Control – Immediately following first rainfall event following completion of rain gardens, basins, bio retention areas etc., a spray application of non-harmful mosquito control shall be applied which shall be 30-day active. Where standing water is present, a disc from of mosquito control may be used or in combination with the spray application.

END OF SECTION 329300

SECTION 334000 - STORM DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes storm drainage collection and conveyance systems outside the building and including the site connection of roof drainage discharge points from buildings.

B. Construction of stormwater management holding systems to infiltrate stormwater and to control the rate of run-off. Both above ground and below ground systems are used.

1.2 DEFINITIONS

A. HDPE: High Density Polyethylene plastic.

B. PVC: Polyvinyl chloride plastic.

C. RCP: Reinforced Concrete Pipe.

D. VCP: Vitrified Clay Pipe

1.3 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Ratings: At least equal to system test pressure.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Stormwater Piping.

    a. Contractor shall submit a manufacturer's certificate signed by a manufacturer's representative stating the HDPE product was manufactured, tested, and supplied in accordance with all applicable requirements of AASHTO M294, ASTM F 477, and ASTM D 3212.

2. Stormwater manholes, inlets and structures.
3. Geotextile Fabric.
4. Impermeable liner

B. Shop Drawings: For each of the following:

1. Manholes: Include plans, elevations, sections, details, and frames and covers.
2. Catch Basins and Stormwater Inlets. Include plans, elevations, sections, details, and frames, covers, and grates.
3. Headwalls / Endwalls: Include plans, elevations, sections, details, and safety grates.

4. Outlet Structures: Include plans, elevations, sections, details, frames, covers, outlet sizes and locations, and trash racks.
5. Box Culverts

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and/or fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle all structures and piping materials according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, perform test pits, contact utility locating service, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. The contractor shall become a co-permittee of the NPDES Permit until a Notice of Termination has been filed after the project is constructed in compliance with the Post Construction Stormwater Management Plan (PCSM Plan).

D. Existing Utilities: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner no fewer than ten business days in advance of proposed utility interruptions.
2. Do not proceed with interruption of service without Owner's written permission.

1.7 REFERENCES

A. The following references shall apply to work completed under this specification section except no payment provisions from these references shall apply to this contract. In the event of a conflict between the Civil Drawings, project specifications, and referenced specifications, the more stringent shall apply, at the decision of the Architect/Engineer.

1. Pennsylvania Department of Transportation (PennDOT):
    a. Publication 408 – Specifications – Latest Revision
    b. Publication 72M – Standard for Roadway Construction (RC) – Latest Revision.
    c. Publication 35 - Bulletin 15 – Approved Construction Materials – Latest Revision.
2. American Society of Testing and Materials (ASTM):
    a. ASTM C 76: Specifications for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
    b. ASTM F 405: Standard Specification for Corrugated Polyethylene Pipe and Fittings.

c. ASTM F 477: Standard Specifications for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
d. ASTM D 2321: Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.

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

a. AASHTO M170: Standard Specifications for Reinforced Concrete Pipe.
b. AASHTO M252: Standard Specification for Polyethylene Corrugated Drainage Pipe.
c. AASHTO M294: Standard Specification for Corrugated Polyethylene Pipe, 12 inch to 48 inch diameter.

4. Ordinances, details and specifications of the authority having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

1. Manufacturers listed on PennDOT Bulletin 15 for Precast Structures.

2.2 PVC PIPE AND FITTINGS

A. Product: PVC Schedule 40 PVC pipe manufactured from a Type I, Grade I Polyvinyl Chloride (PVC) compound with a Cell Classification of 12454 per ASTM D1784. The pipe shall be manufactured in strict compliance to ASTM D1785 and D2665 (where applicable), consistently meeting and/or exceeding the Quality Assurance test requirements of these standards with regard to material, workmanship, burst pressure, flattening, and extrusion quality. Standard lengths of pipe sizes 6” and larger shall be beveled each end by the pipe manufacturer.

B. Cleanout risers and surface fittings, elbows etc. shall be PVC schedule 40 as above. Provide cleanout caps with raised or inverted key caps. Only inverted key caps are permitted in sidewalk or paved areas.

2.3 HDPE PIPE AND FITTINGS

A. Provide HDPE pipe and fittings to meet **40% minimum recycled content** such as ADS n-12 ‘Mega Green’ ST products or approved equal. Manufacturer’s shop drawings of these products shall confirm the recycled content product satisfies the soil cover and loading conditions of the proposed plan. All HDPE pipe with recycled content shall be as specified and LEED credits are to be documented as to the recycled material content. This pipe type will be accepted subject to the material being in compliance with ASTM F2648 with fittings conforming to ASTM F2306 and soil tight joints conforming with ASTM F2648 and gaskets conforming with ASTM F477.

Reference in the specification to PennDOT required compliance is waived with respect to the pipe recycled content.

B. HDPE pipes used for underdrains must be made of continuously perforated HDPE plastic piping with a smooth interior and a minimum inner diameter of four inches. HDPE pipe must meet the specifications of AASHTO M252, Type S, or AASHTO M294, Type S.

C. HDPE pipes, couplings, inlets, cleanouts and fittings shall be made of polyethylene compounds, and shall meet all applicable requirements of AASHTO M294, current edition, Type S or Type D for pipes and sizes 12 inches in diameter and larger. Polyethylene pipes, couplings, and fittings less than 12 inches in diameter shall meet the requirements of AASHTO M252, current edition. Bends, tees, wyes, etc. shall be standard fabricated fittings. The pipes and fittings shall be free of foreign inclusions and visible defects. Pipe shall be cut squarely. Cracks, creases, unpigmented or nonuniformly pigmented pipe shall not be accepted.

1. The pipe as noted below shall have minim pipe stiffness at five percent deflection when tested in accordance with the requirements of ASTM D-2412:

Diameter (inches)	Pipe Stiffness (psi)
12	50
15	42
18	40
24	34
30	28
36	22
42	19
48	17

D. Joints for all pipe and fittings shall use gasketed soiltight bell/spigot or bell/bell couplers. The gaskets shall meet the requirements of ASTM F477 and the joint system shall be certified to meet ASTM D3212. In addition, the joint system shall provide sufficient longitudinal strength to preserve pipe alignment and prevent separation at the joint.

2.4 REINFORCED CONCRETE PIPE

A. Material – Pipe shall be Class III or Class IV as indicated, reinforced concrete pipe, AASHTO designation M170, in accordance with ASTM C-76. All reinforced concrete pipe shall be stamped with:

1. The name or trademark of the manufacturer.
2. The pipe class, type of wall, and size of pipe.
3. The date of manufacture.

B. Joints: Tongue and groove gasketed joint type complying with ASTM C443.

C. Mortar: Mortar for lift holes shall be composed of materials designated under the concrete specifications. Mortar shall be used within forty-five (45) minutes subsequent to mixing. Mortar that has stiffened shall not be remixed and used.

2.5 VITRIFIED CLAY PIPE

A. Vitrified Clay Pipe shall Conform to PWD Sewer and Water Design Manual specifications.

B. Pipe shall be installed true and in conformance with slope specified on the plans.

C. Connections to structures shall be done with hydraulic cement and be water tight.

D. Connections to existing sewers shall be done by either core drilling or installation of a why branch in accordance with PWD Sewer and water Manual specifications.

E. When connecting VCP laterals that do not require the use of a wye branch to RC Pipe, the openings shall be created with a core drill. The Standard Detail for Saddle Connections to RC Pipe Sewers within the 1985 Standard Details and Standard Specifications for Sewers shall be modified so that rubber saddles shall be substituted for clay saddles. The rubber saddles shall be expanded against the wall of the pipe to provide a watertight connection. The lateral pipe shall be secured within the saddle through the use of a stainless steel clamp. The 2000 psi concrete encasement shall be extended to the cradle of the sewer as shown in the Detail for Resilient Saddle Connection to RC Pipe Sewers affixed to the end of these specifications.

2.6 STORMWATER INLETS

A. Precast Concrete Inlets: Conforming to local municipal construction details, PennDOT Publication 408 and 72M.

B. Inlet Grates: All stormwater inlet grates shall be bicycle safe grates, per PennDOT Publication 408 and 72M.

C. PVC Inlets: Connection joints conforming to ASTM D3212. Conforming to the Philadelphia Plumbing Code, Section P-1001.7.

D. Inlet Steps: Construct steps in manholes that exceed five feet in height. The steps shall be copolymer polypropylene plastic with ½” grade 60 steel reinforcement bar.

2.7 MANHOLES

A. Precast Concrete Manholes: Conforming to local municipal construction details, PennDOT Publication 408 and 72M and ASTM C-478 for “Specifications for Precast Reinforced Concrete Manhole Section”. From flow channels in bases.

1. Masonry Mortar: Conforming to ASTM C 270.

B. Manhole Frames and Covers: Conforming to local municipal construction details, PennDOT Publication 408 and 72M. Frames shall be heavy duty AASHTO Highway Loading Class HS-24. Cover shall have work “STORM SEWER” inscripted with 2” high, raised letters and have 2 pick holes. Coat frames and cover with bituminous paint.

C. Manhole Steps: Construct steps in manholes that exceed five feet in height. The steps shall be copolymer polypropylene plastic with ½" grade 60 steel reinforcement bar.

2.8 CLEANOUTS AND OBSERVATION WELLS

A. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to clean out of same material as sewer piping.

B. Cleanouts shall be PVC structures in all vertical sections, with adapters to horizontal dual wall corrugated HDPE pipe. Drain covers, grates, and frames shall be ductile iron and lockable. See detailed product information below.

1. PVC Schedule pipe - Harvel Plastics or approved equal.
2. PVC Fitting; Universal Bell Adapter - Nyloplast 7001-110-275 or approved equal.
3. PVC Fitting, 8" HDPE 1/8 Bend - Nyloplast 0894ST or approved equal.
4. PVC Fitting, 8" HDPE Wye to 6" PVC - Nyloplast 0802AG or approved equal
5. Frame and cover; East Jordan Iron Works 3675 with grate cover and lockable assembly or approved equal. Frame and/or cover to be stamped "CLEANOUT".
6. Locking bolts: Stainless steel machine head bolts with countersunk hex key.

2.9 BIORETENTION/BIOINFILTRATION BASINS

A. This work consists of installation of above ground stormwater management facility in accordance with the plans. The facility requires earthwork (SEE SPECIFICATIONS), and installation of the following materials and components. All work shall be done in accordance with PWD specifications and requirements.

B. In general, the work to be done under this section consists of construction activities pertaining to stormwater surface features, such as rain gardens, bumpouts, tree pits, and planter boxes. This work may include earthwork and excavation, protection of existing features, preparation of subgrade, check dam construction, grading, sheathing and shoring, construction of stormwater storage structures, installation of velocity dissipators, installation of geotextiles, impermeable liners, and erosion control blankets, connection of distribution and drainage piping, backfilling, installation and grading of soils, and any incidental and related operations.

2.10 REFERENCE STANDARDS

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.
2. PennDOT: Publication 408 current edition of the Commonwealth of Pennsylvania Department of Transportation Specifications.
3. AASHTO: American Association of State Highway and Transportation Officials, current published standards.
4. PTM: Pennsylvania Test Methods, current published standards.
5. NRCS Soils Manual: National Resources Conservation Service of the USDA, Soil Survey Manual and/or Soil Survey Laboratory Methods Manual, current editions.

6. Test Methods for the Examination of Composting and Compost (TMECC), U.S. Composting Council / U.S. Department of Agriculture, current edition.
7. Association of Official Analytical Chemists (AOAC), Official Methods of Analysis, current edition.

2.11 SUBMITTALS

A. Submit a list of materials to be provided for work under this Section including the name and address of the materials producer and the location from which the materials are to be obtained.

B. Submit certificates, signed by the materials producer, stating that materials meet or exceed the specified requirements.

C. Submit samples

1. Aggregate: Samples of loose material in sealed bag labeled with name of material and manufacturer to be submitted for analysis by PWD. Quantity of sample by weight shall be in accordance with ASTM standards, and may be confirmed by contacting BLS directly at (215) 685-1430.

2. Stormwater Soil/Structural Soil:

a. Samples of soil(s) to be submitted to an approved soil testing laboratory for testing in accordance with specifications herein. Test results shall be submitted to PWD for approval in conjunction with soil amendment products in accordance with soil testing laboratory recommendations. Sample test results shall be considered valid from suppliers for 6 months from the date of the test performed, if the supplier is willing to certify them as representative of the soil to be delivered.

b. Samples of soils delivered to the worksite shall be delivered to PWD BLS for testing verification prior to placement. Please note – two (2) weeks lead time is required for any soil testing results from PWD BLS.

3. Samples of any block or stone to be incorporated into the structures shall be approved by PWD (except existing on-site stone to be reused). Samples may be delivered to the worksite or PWD Construction field office at the discretion of the Project Manager.

D. Structural soil mix designs shall be submitted for approval by PWD and shall include soil testing laboratory results for component soils, proposed soil amendments, aggregate composition testing results, and any other documentation of component parts. Samples of material delivered to the worksite shall be submitted to PWD BLS for testing prior to placement.

2.12 QUALITY ASSURANCE

A. All materials, methods of construction, and workmanship shall conform to applicable requirements of ASTM, PTM, PennDOT Standard Specifications and AASHTO Standards, unless otherwise specified.

B. Upon completion of relevant excavation work, and prior to placement of any materials under this section, subgrade shall be inspected by the Project Manager or authorized representative. Survey or acceptable measurement by the Contractor shall verify the finished subgrade elevation in accordance with the construction plans.

C. Soil Testing Laboratory Qualifications (if necessary): The laboratory shall be an independent laboratory, recognized by the State Department of Agriculture, preferably a university or cooperative extension laboratory. The testing laboratory must have experience in performing agronomic testing including physical and chemical properties of soil. Tests shall be made in strict compliance with the standards of the Association of Official Analytical Chemists and follow standards from the NRCS Soils Manual and ASTM testing methods applicable to the specific tests requested. Laboratory shall have staff fully qualified to review test results, and to make recommendations to amend samples based on what is planned to grow in the soil. American Association for Laboratory Accreditation (A2LA) certification is preferred.

D. Upon completion of placement of surface stormwater features, and prior to backfilling or surface restoration, the structure shall be inspected by the Project Manager or authorized representative. Survey or acceptable measurement by the Contractor shall verify the finished elevation(s) of all features in accordance with the construction plans.

2.13 MATERIAL STANDARDS

A. Stone designed for stormwater storage shall be uniformly graded, crushed, clean-washed stone and that it is noted that PWD defines “clean-washed” as having less than 0.5% wash loss, by mass, when tested per the AASHTO T-11 wash loss test. AASHTO no. 3 and no. 57 stone can meet this specification.

B. Sand shall be AASHTO M-6 or ASTM C-33 sand and to have a grain size of 0.02 inches to 0.04 inches.

C. Planting soil medium 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. The ph of the planting soil shall have a range of 5.8 to 7.1. Soluble salts shall be less than 2.0 mmhos/cm (ds/m).

D. The texture of planting soil shall conform to the classification within the united states department of agriculture triangle for sandy loam or loamy sand. Planting soil shall be a mixture of sand, silt, and clay particles as required to meet the classification. Ranges of particle size distribution, as determined by pipette method in compliance with ASTM f-1632, are as follows: sand (0.05 to 2.0 mm): 50 - 85%: silt (0.002 to 0.05mm): 40% maximum: clay (less than 0.002mm): 10% maximum: gravel (2.0 to 12.7 mm): 15% maximum. Organic content of planting soil should have a range of 3% to 15%, by weight.

E. Planting soil shall be screened and free of stones larger than a half-inch (12.7 millimeters) in any dimension. No more than 10% of the soil volume should be composed of soil peds greater than one inch. Clods, or natural clumps of soils, greater than three inches in any dimension shall be absent from the planting soil. Small clods ranging from one to three inches and peds, natural soil clumps under one inch in any

dimension, may be present but should not make up more than 10% of the soil by volume.

F. Mulch shall be free of weeds and consisting of aged, double-shredded hardwood bark mulch or leaf mulch that has been shredded sufficiently to limit risk of matting.

G. Geotextile is specified on the plans to consist of polypropylene fibers and to meet the following specifications (AASHTO class 1 or class 2 geotextile is recommended): grab tensile strength (astm-d4632): ≥ 120 lbs: Mullen burst strength (astm-d3786): ≥ 225 psi: flow rate (astm-d4491): ≥ 95 gal/min/ft2: UV resistance after 500 hrs (astm-d4355): ≥ 70%: heat-set or heat-calendared fabrics are not permitted

H. Native grass/wildflower seed mix, if proposed as an alternative to groundcover planting, shall be free of weed seeds.

I. Plantings shall be as indicated on the plans and shall be non-invasive.

J. Underdrain shall be made of continuously perforated high-density polyethylene (HDPE) plastic piping with a smooth interior and a minimum inner diameter of four inches. HDPE pipe shall meet the specifications of AASHTO M252, type S or AASHTO M294, type S. [section 4.1.4, 12]

K. Cleanouts shall be made of schedule 40 PVC plastic with a smooth interior having a minimum inner diameter of four inches.

L. Subsoil must be free of hard clods, stiff clay, hardpan, ashes, slag, construction debris, petroleum hydrocarbons, and other undesirable materials and must not be frozen or in a muddy state.

M. Outlet structure conforms to requirements in section 2.5 Concrete Inlets. All connections to structures shall be grouted watertight, with non-shrink grouting.

2.14 CONCRETE

A. General: Per PennDOT Publication 408.

2.15 RIPRAP

A. Riprap stone must be angular, graded stone aggregate meeting the specifications of Publication 408, Section 703.2, Coarse Aggregate, Type A.

2.16 GEOTEXTILE

A. Geotextiles used must consist of polypropylene fibers and meet the following specifications (AASHTO Class 1 or Class 2 Geotextile is recommended):

1. Grab Tensile Strength (ASTM-D4632): ≥ 120 lbs
2. Mullen Burst Strength (ASTM-D3786): ≥ 225 psi
3. Flow Rate (ASTM-D4491): ≥ 95 gal/min/ft2
4. UV Resistance after 500 hrs (ASTM-D4355): ≥ 70%
5. Heat-set or heat-calendared fabrics are not permitted.

PART 3 - EXECUTION

3.1 EARTHWORK

A. As specified in Section "Trenching, Backfilling, and Compaction".

3.2 IDENTIFICATION

A. Materials and their installation are specified in Section “Earthwork”. Arrange for installing green warning tapes approximately 12” below finished grade.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.3 INSTALLATION

A. General : No pipe shall be laid on frozen or thawing material or during wet weather conditions. Each pipe shall be subject to observation by the Architect/Engineer, and those not meeting the specified requirements shall be removed from the work site. Delivery slips from the material suppliers shall be kept on the work site and furnished, upon request, to the Architect/Engineer. The Architect/Engineer shall have the right to make changes in the line and grade of all storm sewers as may be necessary and advantageous.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. General Locations and Arrangements: Civil Drawings indicate general location and arrangement of underground storm drainage piping. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

D. Use fittings for branch connections unless direct tap into existing sewer is indicated.

E. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

F. Lines and Grade Checks: the Contractor shall check each section of pipe from the string line and grade board or other approved methods. A variation of one quarter (1/4) inch or more from the design invert grade and a variation of one (1) inch or more from the design line will be sufficient reason for the Architect/Engineer to order the work to be rejected.

G. Install gravity-flow drainage piping according to the following:

1. Install piping pitched down in direction of flow, at a minimum slope or 0.5 percent, unless otherwise indicted per the plan profiles.

2. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
3. Pipe connections to manhole/catch basin using sleeve and flexible boot.

3.4 PIPE LAYING

A. Pipe shall be installed as per notes and details on the drawings and in accordance with the requirements of PennDOT Publication 408, ASTM D2321, and the manufacturer's recommendations, whichever are more stringent. The Contractor should be aware that for different sizes of pipes different requirements shall govern. All connections shall be assembled in accordance with the manufacturer's recommendations to produce secure, tight joints.

B. Join dissimilar pipe materials with pressure-type couplings.

C. All pipes shall be laid and maintained to the required lines and grades shown on the Civil Drawings.

D. A geotextile fabric envelope shall be installed for the perforated storm sewer pipe with sufficient material to completely encapsulate the aggregate.

E. Following the trench preparation, pipe laying shall proceed from the downgrade end. Pipe ends shall be carefully cleaned before pipes are lowered into the trench.

F. Each section of pipe shall be placed so that the full length of its barrel rests on six inches of bedding material. Each section of pipe shall be firmly held in position so that its invert forms a continuous grade with the invert of the previously laid pipe.

G. The end of the pipe shall be protected with a stopper to prevent the entrance of water, earth, stones, or other debris. Any debris entering the pipe shall be removed immediately to the satisfaction of the Architect/Engineer.

H. Walking or working on the completed pipe, except as may be necessary in tamping or backfilling, shall not be permitted until the trench has been backfilled to a height of at least eighteen inches over the top of the pipes.

I. Storm sewer pipe that has its grade or joints disturbed after laying shall be taken up and relaid. Any section of pipe already laid and found to be defective shall be taken up and replaced with new pipe by the Contractor.

J. At manholes and inlet and outlet structures, the pipe shall be installed with a watertight penetration.

K. Joints in HDPE pipe shall be made with the specified soil-tight couplings.

L. Concrete pipe joints shall be assembled in accordance with the manufacture's specifications.

3.5 CLEANOUT INSTALLATION

A. Install cleanouts and riser extension from storm pipe to cleanout at grade. Use PVC pipe fittings in sewer pipes at branches for cleanouts and PVC pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

B. Set cleanout frames and covers in earth flush with grade.

C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.6 INLETS, MANHOLES, & OUTLET STRUCTURES

A. Install all structures, complete with appurtenances, to the lines and grades shown on the Civil Drawings.

B. Cement concrete construction shall comply with the applicable requirements of PennDOT Publication 408 – Section 713, and shall be air entrained.

C. Masonry construction shall comply with the applicable requirements of PennDOT Publication 408 – Section 713.

D. Spaces excavated for but not occupied by these structures, shall be backfilled with acceptable material in uniform loose layers not exceeding four (4) inches in depth and compacted by means approved mechanical tampers.

E. Set tops of frames and covers flush with finished surface.

F. Form continuous concrete channels and benches between inlets and outlets.

G. Patch joints, inside and outside, with non-shrink grout, and finish smooth.

H. Apply Bitumastic waterproofing from outside.

3.7 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.

1. In large, accessible piping, brushes and brooms may be used for cleaning.
2. Place plug in end of incomplete piping at end of day and when work stops.
3. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:
    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.
3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems with 10’ of head for 15 minutes.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate reports for each test.

3.8 ROCK ENERGY DISSIPATERS

A. PREPARATION

1. Perform clearing, grubbing, excavation and/or placing embankment in accordance with Division 31 Sections "Site Clearing" and "Earthwork" as required at location(s) shown on Drawings.
2. Remove unsuitable material below the energy dissipater and replace with acceptable material.

B. INSTALLATION

1. Energy dissipater shall be constructed of such size and configuration as shown on the Drawings.
2. Geotextile fabric shall be placed under the proposed rock energy dissipater in accordance with Section 212.3(c), PennDOT Publication 408 Specifications and the Drawings.
3. Rock shall be carefully placed on the geotextile fabric to produce an even distribution with minimum of voids and without tearing the geotextile fabric. Install rocks in 2 layers.
4. Rock shall be placed in full thickness in one operation in a manner to prevent segregation and rearranged, as necessary to insure uniform distribution.

3.9 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

B. Clean manholes and inlets of all sediment and all sediment control devices and grout seal all pipe penetrations into inlet and manhole boxes.

C. Clean site of all residual pipe trimmings, packaging etc.

3.10 AS-BUILT

A. The contractor shall perform an as-built survey of the basin topography as indicated on the PCSM Plan.

B. The contractor shall provide all as-built information of the underground stormwater management systems and all elevation and pipe data of the entire stormwater conveyance system.

C. All adjustments to stormwater system shall be made to achieve required volumes after review by the design engineer and the municipal engineer.

D. The contractor shall maintain all stormwater systems until as-built confirmation of all aspects of the stormwater system and a Notice of Termination of the NPDES permit has been filed with Pennsylvania DEP and the PCSM Plan and engineer's certification have been recorded.

END OF SECTION 334000

BID PROPOSAL FORM

MAJOR RENOVATIONS

MOTIVATION HIGH SCHOOL

Contract No. B-015C of 2017/18- Mechanical Construction

TO: The School District of Philadelphia — **OWNER**
School Reform Commission

Office of Capital Programs — **ADDRESS**
The School District of Philadelphia
440 North Broad Street
Third Floor - Suite 371
Philadelphia, PA 19130-4015

FROM: _____ **CONTRACTOR**
_____ **ADDRESS**
_____
_____ **CITY/STATE**
_____ **CONTACT NAME**
_____ **PHONE NO.**

BASE CONTRACT PROPOSAL:

1. Having become completely familiar with the local conditions affecting the cost of Work at the place where Work is to be executed, and having carefully examined the site conditions as they currently exist, and having carefully examined the Bidding and Contract Documents prepared for this project, together with any Addenda to such Bidding and Contract Documents as listed hereinafter, the Undersigned hereby proposes and agrees to provide all labor, materials, plant, equipment, transportation and other facilities as necessary and/or required to execute all of the Work described by the Contract Documents for: **Contract No. B-015C of 2017/18-Mechanical Construction**

for the lump sum consideration of: _____
_____ Dollars ($_____), said amount being hereinafter referred to as the Base Proposal Amount. Base proposal Amount includes Unit Price Items listed below, if applicable.

BID ALTERNATES (Not applicable to this Contract – No Alternates)

UNIT PRICES:

The Undersigned hereby proposes and agrees to provide all labor, materials, plant, equipment, transportation and other facilities as necessary and/or required to provide the following items of work on a Unit Price basis, as described in Section 01 1600 UNIT PRICES, and to be paid for the actual quantities, whether more or less than the estimated quantities included in the Base Proposal Amount:

PIPING

UNIT PRICE 1: Add or Deduct Insulated Hydronic piping – welded fittings, 5" to 6" pipe diameter, including fittings per M series drawings and Specification *Section 23 21 13 – Hydronic piping* and Specification Section *23 07 19 – HVAC Piping Insulation.*

1. Remove and replace existing piping including hangers and supports associated with Boilers B-1/B-2 and Pumps P-5/P-6 replacement
   .
2. Unit of Measurement: Linear Foot (LF)

3. Base Bid Quantity:200 LF

4. Unit Price Calculation: 200 LF @ $_____ per LF =

5. $ _____ _____**Total***

*** This amount included in Base Bid**

UNIT PRICE 2: Add or Deduct Insulated Hydronic piping – welded fittings, 2-1/2" to 4" pipe diameter, including fittings and heat tracing per M series drawings and Specification *Section 23 21 13 – Hydronic piping* and Specification Section *23 07 19 – HVAC Piping Insulation.*

1. New chilled water piping on roof including hangers and supports associated and heat tracing associated with new AHU-5 on roof.

2. Unit of Measurement: Linear Foot (LF)

3. Base Bid Quantity:400 LF

4. Unit Price Calculation: 400 LF @ $_____ per LF =

5. $ _____**Total***

*** This amount included in Base Bid**

UNIT PRICE 3: Add or Deduct Insulated Hydronic piping – Screwed fittings, 3/4" to 2" pipe diameter, including fittings and heat tracing per M series drawings and Specification *Section 23 21 13 – Hydronic piping* and Specification Section *23 07*

19 – HVAC Piping Insulation.

1. New chilled water and heating water piping including hangers and supports, and heat tracing associated with new AHU-5/6/7&8 on roof.

2. Unit of Measurement: Linear Foot (LF)

3. Base Bid Quantity: 1200 LF

4. Unit Price Calculation:1200 LF @ $_____ per LF

5. $ _____- **Total***

*** This amount included in Base Bid**

<u>UNIT PRICE 4:</u> Add or Deduct Insulated Hydronic piping – PEX-A tubing, 3/4" to 1-1/2" pipe diameter, including fittings and heat tracing per M series drawings and Specification *Section 23 21 13 – Hydronic piping* and Specification Section *23 07 19 – HVAC Piping Insulation.*

1. New chilled water and heating water piping including hangers and supports, and heat tracing associated with new AHU-5/6/7&8 on roof.

2. Unit of Measurement: Linear Foot (LF)

3. Base Bid Quantity:400 LF

4. Unit Price Calculation:400 LF @ $_____ _____per LF =

5. $ _____ **Total***

*** This amount included in Base Bid**

<u>UNIT PRICE 5:</u> Add or Deduct Insulated Hydronic piping – PEX-A tubing, 2" to 3" pipe diameter, including fittings and heat tracing per M series drawings and Specification *Section 23 21 13 – Hydronic piping* and Specification Section *23 07 19 – HVAC Piping Insulation.*

1. New chilled water piping including hangers and supports associated and heat tracing associated with new AHU-5 on roof.

2. Unit of Measurement: Linear Foot (LF)

3. Base Bid Quantity:200 LF

4. Unit Price Calculation:200 LF @ $_____ per LF=

5. $ _____ **Total***

*** This amount included in Base Bid**

EXISTING INSULATION REPLACEMENT

UNIT PRICE 6: Add or Deduct Hydronic Indoor Fiberglass Piping Insulation for existing piping – 2" average pipe diameter (ranging ¾" to 3" diameter), including fittings per M series drawings and Specification Section *23 07 19 – HVAC Piping Insulation*

1. New insulation associated with replacement of damaged existing piping insulation. Including insulation thru walls
.
2. Unit of Measurement: Linear Foot (LF)

3. Base Bid Quantity:698 LF

4. Unit Price Calculation: 698 LF @ $_____ per LF=

5. $ _____ ___**Total***

*** This amount included in Base Bid**

UNIT PRICE 7: Add or Deduct Hydronic Indoor Fiberglass Piping Insulation for existing pipe fittings, i.e. pipe elbows and Tee's – 2" average pipe diameter (ranging ¾" to 3" diameter), including fittings per M series drawings and Specification Section *23 07 19 – HVAC Piping Insulation*

1. New insulation associated with replacement of damaged existing piping fittings insulation (pipe elbows and Tee's)
.
2. Unit of Measurement: Linear Foot (EA)

3. Base Bid Quantity:123 EA

4. Unit Price Calculation: 123 LF @ $_____ _____per LF =

5. $ _____ **Total***

*** This amount included in Base Bid**

ACKNOWLEDGEMENT OF RECEIPT OF ADDENDA:

2. The Undersigned acknowledges receipt of the following Addenda (list by number and date appearing on Addenda):

Addendum No.	Date	Addendum No.	Date
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

TIME OF COMPLETION:

3. The Undersigned agrees to Substantially Complete all Work under this Contract within the time periods specified in Division 1, General Requirements, Section 00 1300 entitled “Time of Completion, Milestones and Phasing or Sequencing Requirements”.

INSURANCE:

4. All Bidders are instructed to refer to Article GC-11 of the General Conditions. All Contractors or Subcontractors bidding Work on the Project shall include in their bids the costs of Workers Compensation and Employer’s Liability Insurance, Commercial General Liability Insurance, Automobile Liability Insurance, Excess Umbrella Liability Insurance (Commercial Umbrella Liability Insurance) and any other types of insurance identified in Division 1- General Requirements, Section 01200 (or 01 1200) entitled “ Special Insurance Requirements”.

LIQUIDATED DAMAGES:

5. Upon failure by the Contractor to achieve Substantial Completion within the time specified in Article GC-8 of the General Conditions from the Date of Commencement as set forth in the Notice to Proceed, the Contractor shall pay to the School District, as

liquidated damages and not as a penalty, the sum of One Thousand Dollars ($1,000.00) per day for each consecutive calendar day of delay until such time as Substantial Completion of the Work is achieved.

6. In addition, the Contractor shall be responsible for and pay for the cost of completion of construction of the Work, as well as for any and all additional charges of the School District, Architect/Engineer, other Project Contractors, and any other Consultants to the School District relating to the Contractor's failure to achieve Substantial Completion on a timely basis, including, but not limited to, delay damages, disruption damages, acceleration costs or expenses, investigative expenses, consulting fees, experts' fees, and attorneys' fees.

7. The Contractor and the School District agree that the amounts so fixed herein as liquidated damages are reasonable forecasts of just compensation for the harm that will be caused to the School District by the Contractor's breach.

GENERAL STATEMENT:

8. The Undersigned declares that the person or persons signing this Proposal is/are fully authorized to sign on behalf of the firm listed and to fully bind the firm listed to all the Proposal's conditions and provisions thereof.

9. It is agreed that the Undersigned has complied or will comply with all requirements of local, state, and federal laws, and that no legal requirement has been or will be violated in making or accepting this Proposal, in awarding the Contract to it and/or in prosecution of the Work.

10. Bid Security in the amount of ten percent (10%) of the Base Bid, plus all additive Alternates Proposal amounts, is attached hereto and made a part hereof, without endorsement, in the sum of _____ Dollars ($_____), which shall become the property of the School District in the event the Contract and Performance Bond and Labor and Materialmen's Bond are not executed within the time set forth, as liquidated damages.

11. The Undersigned further agrees within five (5) calendar days from date of Notice of Acceptance of this Proposal or Contract award, to sign and deliver to the School District, all required copies of the School District/Contractor Agreement, the Performance Bond, the Labor and Materialmen's Bond, and the Maintenance Bond, in the forms included in the Bidding Documents, and the policies of insurance or insurance certificates as required by the General Conditions. In case the undersigned fails or neglects to deliver within the specified time the School District/Contractor Agreement, the Performance Bond, the Labor and Materialmen's Bond, and the Maintenance Bond, and the insurance policies or certificates, all as aforesaid, the undersigned shall be considered as having abandoned the Contract, and the Bid Bond accompanying this Proposal shall be forfeited to the School District by reason of such failure on the part of the undersigned, as

liquidated damages and not as a penalty.

12. The Undersigned further agrees that the Bid Security may be retained by the School District and shall remain with the School District until the School District/Contractor Agreement has been signed and delivered to the School District and the Performance Bond, the Labor and Materialmen's Bond, and the Maintenance Bond, and insurance policies or certificates have been made and delivered to the School District.

Respectfully submitted this _____day of _____, 201_.

Individual Proprietorship or Partnership

If Contractor is an individual proprietorship or is a partnership, sign here:

_____
(Trade Name of Firm)

By: _____ By: _____ (SEAL)
(Witness) (Owner or Partner)

Corporation

If Contractor is a corporation, sign here:

_____
(Name of Corporation)

ATTEST:

By: _____ By: _____ (SEAL)
(Secretary or Treasurer) (President or Vice President)

(CORPORATE SEAL)

Signature by anyone other than the President or Vice President and the Secretary or Treasurer of the Corporation must be accompanied by a power of attorney, executed by the proper corporate officers under the corporate seal indicating authority to execute this Bid.