SECTION 02 21 10
PROJECT SURVEY & LAYOUT

PART 1 GENERAL

1.1 SUMMARY

A. The contractor shall provide construction stakeout sufficient to construct the proposed improvement in accordance with the approved construction plans.

B. All stakeout services shall be completed under the direct supervision of a Professional Land Surveyor licensed in the State where the project is located.

C. The Owner shall provide the following prior to the commencement of any stake-out services:

1. Approved for construction site plans;

2. Approved for construction dimensional control plans including a fixed relationship to the site boundary or on-site fixed element;

3. Copies of the topographic survey that the approved site plans have been based on when available. The topographic survey shall include a minimum of two benchmarks, which shall be used for vertical control;

4. Copies of the boundary survey that the approved site plans have been based on when available. The boundary survey shall be closed and monumented. These monuments shall be used for horizontal control, or a monumented baseline (minimum of 3 points) related to the site boundary and the dimensional control plan.

1.2 RELATED SECTIONS

A. Related Section Include:

1. Section 31 25 00 – Soil Erosion and Sedimentation

1.3 EXECUTION

A. Work shall be performed by a Professional Land Surveyor, licensed in the State where the project is being completed, or under his direction:

B. Playground Equipment Layout - Offset stakes will be located at post locations.

C. Storm drainage and sanitary sewer lines (including manholes and catch basins). Stakes will be located @ 50 ft. stationing along the centerline of the utility line @ 15 ft. offsets. Manholes and catch basins will have 2 offsets per structure. Cut sheets shall be provided to the contractor by the surveyor.

D. Water Layout - Offset stakes will be located at deflections and at hydrant locations. Hydrant elevations will be to grade ring.

E. Lighting Layout - Centerline of lighting structure with 5 ft. offsets and finished grade elevations.

F. Grade Stakes - Stakes will be located as needed to provide elevation references.

G. Contractor will field verify the utility location, size and invert elevations at points of connection in area of conflict, prior to construction and protect them from damage.

H. Notify engineer, if it is necessary to destroy or remove control points and/or benchmarks due to construction. Contractor shall be responsible for cost of relocation.

I. Advise engineer of any discrepancies between plans and field layout.

1.04 REFERENCE STANDARDS

A. In accordance with local rules and regulations.

1.05 QUALITY ASSURANCE

A. All construction layout work shall be performed under the direction of a Professional Land Surveyor.

B. The survey crew will discuss all layout procedures with the contractor's supervisor prior to commencing work.

C. The survey crew daily report shall be filled out and signed by the contractor's supervisor at the end of that day's layout.

D. Copies of sketches, cut sheets, etc. shall be provided to the contractor by the end of the next workday.

E. All costs related to re-staking due to construction or contractors' work resulting in destruction or movement of stakes shall be paid for by the contractor and at no additional expense to the owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. The contractor/surveyor shall supply all stakeout materials.

2.02 EQUIPMENT

A. The Contractor/Surveyor shall supply all equipment necessary to accomplish the work.

END OF SECTION 02010

SECTION 02 41 00
SITE DEMOLITION

PART 1 GENERAL

1.1 GENERAL

A. The Contract Drawings and all other specification sections along with all provisions included within this Contract package, Instructions to Bidders, and other General Conditions apply to this section. The Contractor must accept the site as is and shall be deemed to have inspected the site and reviewed all Contract Documents prior to submitting a bid.

1.2 SUMMARY

A. Overall work under this Contract shall include all labor, materials, equipment, supervision, coordination efforts, permitting costs, certificate costs, services, filing fees, testing costs, security, insurance and all other associated or related items specified herein that are necessary and are required to complete the Work. Work elements shall include, but not be limited to the following:

1. Installation and maintenance of soil erosion and sediment control measures.

2. Demolition and removal of all existing site structures including but not limited to all fencing, gates and playground equipment, as noted on the drawings. City of Philadelphia reserves the right to save any portions of the existing play equipment that may be able to be re-used on another site.

3. Removal of existing sidewalks, pavers, pavement, fences, benches, curbs, etc. as noted on contract documents and as required to complete the project.

4. Removal/Abandonment of existing above-ground and underground utilities and associated structures. It shall be the responsibility of the Contractor to accurately locate all facilities and to determine their extent. If such facilities obstruct the progress of the work and are not indicated to be removed or relocated, they shall be removed or relocated only as directed by the Owner. Contractor to certify that utilities have been disconnected prior to demolition.

5. Backfill of removed underground utilities.

6. Backfill to grade with compacted suitable on-site soils.

7. Removal from site and disposal of all excess and unusable material.

8. Removal of trees and plant material as noted on the drawings.

1.3 RELATED SECTIONS

A. Section 33 01 10 - Protection of Existing Utilities

B. Section 31 25 00 - Soil Erosion and Sediment Control

C. Section 31 20 10 – Earthwork

D. Section 31 23 10 – Excavation, Backfill and Subgrade Preparation for Pavement

E. Section 31 23 20 - Trench Excavation and Backfill for Utilities

F. Section 32 90 00 - Landscape Planting

1.4 REFERENCE STANDARDS

A. National Association of Demolition Contractors (NADC) - Demolition Safety Manual, latest edition.

B. All applicable OSHA requirements and other Federal, State, and local codes, laws, ordinances, regulations, and guidelines for demolition and related work.

C. Section 3310 of the BOCA Code, latest edition.

1.5 QUALITY ASSURANCE

A. A qualified Engineer, selected and paid by the Owner, shall be retained to perform demolition inspection for the duration of the demolition operations to ensure compliance with this section.

B. An Independent Testing and Inspection Agency shall prepare field reports documenting the progress of the demolition operations and submit said reports to the Owner on a weekly basis.

C. The Owner reserves the right to direct any inspection that is deemed necessary. The Contractor shall provide free access to the site for inspection activities.

D. The Contractor shall provide and maintain a capable and experienced field person representing the Contractor to oversee all demolition operations. The representative shall be on site during all operating hours of the project.

E. The Contractor shall obtain and pay for any permits, bonds, licenses, etc., required for demolition work.

F. The Contractor shall conduct any work within street or highway right-of-ways in accordance with the requirements of the Philadelphia Streets Department or the governmental agencies having jurisdiction and shall not begin until these governing authorities have been notified. The Contractor shall restore to their present conditions any public right-of-way that is disturbed by the work under this section. All pavement

restoration work in public rights-of-way shall be performed to the proper satisfaction of the Philadelphia Streets Department or the governmental agencies having jurisdiction.

1.6 SUBMITTALS

A. PERMITS

Prior to the commencement of work, the Contractor shall submit to the Owner record copies of all required permits and certificates obtained for the work in this section. The Contractor shall incur all fees and other requirements associated with obtaining the required permits and certificates.

1.7 WORKING HOURS

A. The Contractor shall limit all work for this project between 8:00 a.m. and 4:30 p.m. Monday through Friday or as limited by the City or the Owner. No work shall be done on Saturdays, Sundays or Holidays unless permission is given by the City and Owner and work on such days is not in conflict with local ordinance.

1.8 CONTRACT LIMIT LINE

A. The contract limit line for demolition work is shown on the Contract Drawings. No equipment, materials, and/or trailers shall be kept or stored outside the contract limit line.

B. Other trades and work may be ongoing onsite during demolition operations. The Contractor shall coordinate their work so as not to interfere with work of other trades.

1.9 UNACCEPTABLE PERFORMANCE

A. The Contractor shall remove from the project any individual employed by the Contractor who is performing work in an unacceptable manner as determined by the Owner. The Contractor shall not be allowed claims for delays or down time resulting from the removal of such employees.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Noise-producing activities shall be held to a minimum. Internal combustion engines and compressors, etc., shall be equipped with mufflers to reduce noise to a minimum. The Contractor shall comply with all noise abatement ordinances.

B. The work areas shall be sufficiently dampened to prevent dust from rising during demolition activities.

C. The Contractor shall see to it that trucks leaving the site shall do so in such a manner that mud and earth will not be deposited on adjacent street pavements. Any mud or earth deposited on street pavements shall be promptly removed by the Contractor.

1.11 TEMPORARY SHORING AND PROTECTION

A. Any damage done by the Contractor to existing pipe lines, utilities, etc., to remain shall be repaired by the Contractor and at his/her expense in a manner acceptable to the Owner of the damaged property. The Contractor shall report any existing damage prior to his beginning work.

B. The Contractor shall provide necessary temporary shoring, bracing, etc., and maintenance thereto required in accordance with all applicable OSHA Standards for the completion of demolition work.

C. The Contractor shall insure the provisions of adequate bracing, shoring, lamps, fencing, warning signs, and flags as required by agencies having jurisdiction and as directed by the Owner. Remove same when necessity for protection ceases.

PART 2 PRODUCTS

2.1 MATERIALS

A. Materials are as specified on the Contract Drawings when applicable. See related sections for additional product specifications.

PART 3 METHOD OF CONSTRUCTION

3.1 GENERAL

A. The Contractor is responsible for the demolition of existing concrete slabs, walks, curbing, asphalt pavement, utilities, signs and miscellaneous items encountered. Concrete elements shall be subject to an on-site crushing process and asphalt pavement shall be milled. Crushed concrete and asphalt millings may be stockpiled separately on site for reuse on site. All materials that cannot be recycled for reuse on-site shall be disposed off-site in accordance with all applicable Federal, State, County and Local codes and regulation governing legal transportation and disposal of work.

B. The general scope of demolition work is shown on the site Demolition Plan. The Contractor shall include for all demolition work necessary to accomplish the construction project.

C. Backfill all open excavations, including trenching for utility and foundation removal.

3.2 SITE VISIT

A. The Contractor shall visit the site and verify the location of all pertinent items prior to submitting a bid so that the difficulties associated with execution of the contract are fully understood. No additional compensation will be allowed for failure to be so informed.

3.3 SOIL EROSION SEDIMENT CONTROL

A. GENERAL

1. The Contractor shall install all soil erosion and sediment control measures in accordance with the requirements indicated on the Contract Drawings, permit, and specifications. All work shall be performed in accordance with the requirements of the PADEP.

2. The Contractor shall be responsible for maintenance of all soil erosion and sediment control measures during the Contract.

3. The Contractor shall keep all streets clear of dirt and sediment and shall be responsible for any cleaning of the streets necessary during the course of the project.

4. The Contractor shall, if necessary, obtain approval from and comply with all additional directives issued by the Philadelphia Water Department.

B. SEQUENCE OF CONSTRUCTION

1. The Contractor shall, if necessary, submit written notification to the Philadelphia Water Department at least 48 hours prior to the start of construction of any soil erosion and sediment control measures.

2. A temporary rock construction entrance, with wheel cleaning pad, shall be installed at the construction entrance/exits as shown on the Contract Drawings.

3. Filter fabric silt fence shall be installed and maintained at locations shown on the Contract Drawings.

4. All soil erosion and sediment control measures shall be maintained until all work under this Contract is completed.

5. The Contractor shall, as necessary, notify the Philadelphia Water Department upon commencement and completion of the project.

3.4 UTILITIES

A. GENERAL

1. Existing utilities service shall not be interrupted unless authorized in writing by authorities having jurisdiction and the owner of the utility. Any temporary interruption necessary shall be directly coordinated and supervised by utility company personnel. The Contractor shall provide temporary services during interruptions to existing utilities, as acceptable to governing authorities and the affected utility companies.

B. MAINTENANCE

1. The Contractor shall maintain and protect from damage all existing above and below ground utilities that are to remain. Other utilities to remain include, but are not

necessarily limited to, above ground utility lines and transformers within the public right-of-ways. The Contractor shall immediately repair or have repaired by the appropriate utility company any damage incurred by utilities during demolition work at no cost to the utility owner or the Owner. Prior to demolition, the Contractor shall be responsible for notifying and coordinating the shut-off of abandoned utilities with the appropriate utility companies.

C. ABANDONMENT/REMOVAL

1. The Contractor shall disconnect and cap/terminate all services including but not limited to water, storm and sanitary sewers, gas, electric, telephone, cable TV, etc. prior to demolition. The Contractor shall determine if utility laterals are direct and exclusive to the building before disconnection is performed.

2. Prior to removal, all utilities and sewers shall be properly purged and evacuated of all residual gases, oils, etc. or de-energized in the case of electric, telephone or other communications services. All purging and testing shall be approved by local utility companies and governing authorities having jurisdiction.

3. The Contractor or appropriate utility company (if required) shall seal and/or plug the ends of all disconnected utilities where indicated on the plan or, if not indicated, at the Contract limit line with lean concrete, gasketed blank steel seal plates, or other measures as recommended and required by the utility company or Consultant. All plugs shall be inspected by the Consultant and appropriate utility company prior to backfilling.

4. All utility disconnections shall be performed no later than 15 days prior to the scheduled start of demolition and must precede the demolition permit application procedure.

D. RESTORATION

1. All underground utility lateral removals shall be properly backfilled using suitable compacted on-site soils. All disturbed pavements within the public right-of-way shall be restored to their pre-demolition (existing) condition. This includes the restoration of concrete pavement, concrete curbing, and asphalt pavement within the public right-of-way. All pavement and curbing shall be saw cut prior to excavation in order to produce a clean and neat edge. Replacement pavement and curbing shall be equal in design performance to the existing condition and as directed by the Consultant and/or the local authority having jurisdiction. All restoration work shall be performed immediately following utility removal and backfill completion.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. GENERAL

1. The Contractor shall remove from the site all debris, rubbish and other materials resulting from demolition (except concrete and brick which may be re-used as

backfill) and shall safely and legally dispose of all these items in accordance with applicable Federal, State and local codes and regulations.

2. Recycling of demolition debris is strongly encouraged. All recycling must be done in accordance with all currently applicable State waste flow regulations, County and City requirements. All solid waste as defined by PADEP criteria shall be removed from the site in accordance with all currently applicable land disposal regulations of the State, County, and local levels.

3. Burning of any demolished materials on-site shall not be permitted.

B. SUBMITTALS

1. Written permission shall be obtained from the property owner on whose property the demolition material is to be disposed. Copies of the agreements shall be furnished to the Owner prior to removing any materials from the demolition site.

2. The Contractor shall provide manifests for each truck that exits and enters the site with demolition and construction material to Gilmore and Associates and the Owner. These manifests shall indicate the following:
   - Date and time of departure from the demolition site
   - Type of material carted off-site or type of material brought on-site
   - Amount of material (in tons)
   - Truck I.D. number
   - Final destination of the excess material
   - Date and time of entry to the demolition site
   - Amount of material
   - Source of material brought on-site

C. REMOVAL

1. The Contractor shall legally and safely transport and dispose off-site all demolished materials in accordance with local, State and Federal regulations governing such operations.

2. The Contractor shall be responsible for locating and making arrangements for the safe, legal disposal of demolition material off-site during the entire course of the Contract.

END OF SECTION 02 41 00

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.

B. Cast-in-place concrete includes the following:

1. Walls
2. Ramps
3. Steps
4. Curbs
5. Footings

1.2 SUBMITTALS

A. Provide Submittals under the provision of section 01300.

B. Shop Drawings: Indicate profiles, sizes connection attachments, anchorage, size and type of fasteners, finishes and accessories

C. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, curing compounds, and others if requested by Design Consultant.

D. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, bent bar diagrams, arrangement, and supports of concrete reinforcement.

1.3 QUALITY ASSURANCE

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

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

F. Reference Standards: ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete,"

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

3. ACI-211.1, "Standard Practice for Selecting Proportions for Normal and Heavyweight Concrete."

4. ACI-214, “Recommended Practice for Evaluation of Strength Test Results of Concrete.”

5. ACI-304, "Recommended Practice for Measuring, Mixing and Placing Concrete."

6. ACI-305, "Hot Weather Concreting."

7. ACI-306, "Cold Weather Concreting."

8. ACI 308, “Standard Specification for Curing Concrete.”

9. ACI-309, "Standard Practice for Consolidation of Concrete."

10. ACI-318, "Building Code Requirements for Reinforced Concrete."

11. ACI-SP-4, "Formwork for Concrete."

12. ACI-SP-66, "ACI Detailing Manual."

ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural construction.

C. ANSI/ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

D. ASTM C33 - Concrete Aggregates.

E. ASTM C94 - Ready Mix Concrete.

F. ASTM C150 - Portland Cement

G. ASTM C260 - Air-Entraining Admixtures for Concrete.

H. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

I. ASTM C494 - Chemical Admixtures for Concrete.

J. FS TT-C-800 - Curing Compound Concrete for New and Existing Surfaces.

K. ANSI/ASTM A185 Welded Steel Wire Fabric for Concrete.

G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.4 PROJECT CONDITIONS

A. Do not place concrete footings until substrate has been approved by the Soils Engineer, in writing.

B. Protection of Footings Against Freezing; Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against possibility of freezing; maintain cover for time period as necessary.

C. Protect adjacent finish materials against spatter during concrete placement.

1.5 VERIFICATION OF CONDITIONS

A. Visit site and verify all conditions and dimensions. Examine all drawings affecting work of this section.

B. Check all work or surfaces to receive work of this section.

C. Beginning concrete work will constitute acceptance of base or adjoining work and other conditions as satisfactory in every respect.

1.6 COORDINATION WITH OTHER TRADES

A. Coordinate concrete work with work of other trades. Afford other trades full cooperation and access for installation of inserts, bolts, and other embedded items in concrete. Suitable templates or instructions, or both, shall be provided for setting items not placed in forms. All items to be embedded in concrete, and all items to be placed by other trades, shall have been inspected; their locations and positions in conjunction with work shall have been inspected, and their locations and positions shall have been verified by all parties involved in the work.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Forms for Exposed Finished Concrete: Sonotube for round columns, overlaid plywood complying with U. S. Product Standard PS-1 “A-C or B-B High Density Overlaid Concrete Form”, Class 1 to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, sonotube or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Form Liner: GrayLastic Extended-Use Elastometric Formliner as manufactured by Fitzgerald Formliners, or approved equivalent. Model/Pattern to be 16989 Split Slate.

D. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 g/L volatile organic compounds (VOCS) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

E. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches to the plane of the exposed concrete surface.

1. Provide ties that, when removed, will leave holes not larger than 1 inch in diameter in the concrete surface.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615 Grade 60, deformed.

B. Supports for Reinforcement: Bolsters, chairs, spacers, concrete masonry units and other devices for spacing, supporting, and fastening reinforcing bars.

2.3 CONCRETE MATERIALS

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

1. Portland Cement: ASTM C 150, Type I.
2. Fly Ash: ASTM C 618, Class F.
3. Ground Granulated Blast Furnace Slag: ASTM C 939, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C33, Provide aggregates from a single source.

1. Coarse-Aggregate Gradation: ASTM C33 Size #57.
2. Coarse-Aggregate Class: As required by ASTM C33 for each type of concrete in severe weathering regions, but not less than 3S.
3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
4. Water: ASTM C94/C94M and potable.

2.4 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

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

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

2.4 RELATED MATERIALS

A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd., complying with AASHTO M 182, Class 2.

B. Moisture-Retaining Cover: ASTM C171 polyethylene film or white burlap-polyethylene sheet.

C. Clear Curing and Sealing Compound (A.I.M. Regulations - VOC Compliant, 350 g/L): Liquid type membrane-forming curing compound, clear styrene acrylate type, complying with ASTM C1315, Type I, Class A, 30% solids content minimum. Moisture loss shall be not more than 0.40 Kg/m2 when applied at 300 sq. ft./gal. Manufacturer's certification is required.

1. Products: Subject to compliance with requirements:

   a. "Super Diamond Clear VOX" Euclid Chemical Co.
   b. Lumiseal WB Plus L & M Construction Chemicals, Inc.
   c. Vocomp-30 W. R. Meadows, Inc.
   d. Or approved equal

2. Sodium silicate compounds are not permitted.

2.5 PROPORTIONING AND DESIGNING MIXES

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

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures but not the same agency as for field quality control testing.

B. Cementitious Materials: Limit percentage, by weight, of cementatious materials other than Portland Cement in concrete as follows:

1. Fly Ash: 25 percent.

2. Ground Granulated Blast Furnace Slag: 40 percent.

3. Combined Fly Ash and Ground Granulated Blast Furnace Slag: 60 percent Portland Cement minimum, with fly ash or pozzolan not exceeding 25 percent.

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

D. Admixtures: Use admixtures according to manufacturer's written instructions.
Delete or revise four subparagraphs below to suit Project.

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

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

3. Use high-range water-reducing admixture in pumped concrete, and concrete with a water-cementitious materials ratio below 0.50.

2.6 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Proportion concrete mixtures to comply with strength, slump, and air-content requirements indicated.

1. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases.

2. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.

2.7 FABRICATING REINFORCEMENT

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

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements of ASTM C94, and as specified.

1. When air temperature is between 85 deg. F. and 90 Deg. F., reduce mixing and delivery time from 90 minutes to 75 minutes, and when air temperature is above 90 deg. F., reduce mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.1 GENERAL

A. Coordinate the installation of forms and reinforcing steel.

3.2 FORMS

A. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits:
   1. Provide Class A tolerances for concrete surfaces exposed to view.

   2. Provide Class C tolerances for other concrete surfaces.

B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.

C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.

D. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

E. Install Form Liners in accordance with manufacturer's instructions.

F. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

G. Allowable Tolerances: Construct formwork to provide completed cast-in-place concrete surfaces complying with tolerances specified in ACI 347, and as follows:

   1. Variation from position of linear building lines and related columns, walls and partitions, ½-inch in any bay or 20-feet maximum, and one inch in 40-feet or more.

   2. Before concrete placement, check lines and levels of erected formwork. Make corrections and adjustments to ensure proper size and location of concrete members and stability of forming systems.

   3. During concrete placement, check formwork and related supports to ensure that forms are not displaced and that completed work will be within specified tolerances.

3.3 EMBEDDED ITEMS

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

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

2. Engage a licensed surveyor to verify that the work is within specified allowable tolerances. Surveyor shall report in writing to the Architect with copy to Contractor, certifying the work as acceptable or indicating deviations from allowable tolerances.

3.4 PLACING REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Architect.

D. Place reinforcement to maintain minimum coverage as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

3.5 PREPARING FORM SURFACES

A. General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form coating compound before placing reinforcement.

B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.

1. Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3.6 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness.

If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into proceeding layer. Do not insert vibrators into lower layers of concrete that have begun to set. RE-tempering of concrete shall not be permitted. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.

E. Cold-Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.

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

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

F. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F. Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.

3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.

4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Architect.

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces not exposed to view in the finished Work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.

B. Grout-Cleaned Finish: Provide grout-cleaned finish on exposed concrete surfaces that have received smooth-formed finish treatment.

1. Combine one part Portland cement to one and one-half parts fine sand by volume, and a 50:50 mixture of acrylic or styrene butadiene-based bonding admixture and water to form the consistency of thick paint. Blend standard Portland cement and white Portland cement in amounts determined by trial patches so that final color of dry grout will match adjacent surfaces.

2. Thoroughly wet concrete surfaces, apply grout to coat surfaces, and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

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

D. Clean form lined concrete as recommended by the manufacturer. Do not begin cleaning until mortar joints are properly cured. Allow a minimum of 24 to 72 hours. Soak mortar joints before applying cleaner.

3.8 CONCRETE PROTECTION

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

3.9 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Design Consultant.

B. Mix dry-pack mortar, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.

1. Cut out honeycombs, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.

2. For surfaces exposed to view, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

C. Repairing Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of the Design Consultant. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.

D. Perform structural repairs with prior approval of Architect for method and procedure.

3.10 CODE REGULATIONS

A. These specifications are hereby supplemented by the Local Building Code and other laws. Rules and regulation promulgated by departments having jurisdiction thereof, and by the ACI Standard Building Code “Requirements for Reinforced Concrete” (ACI 318). Requirements for these codes shall be followed the same as if especially noted in these specifications. Where conflict occurs, the Local Building Code shall take precedence.

END OF SECTION 03300

SECTION 090000
LANDSCAPE BOULDERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and/or Supplementary Conditions and Division 1 Specification Sections, apply to the work of all technical sections.

1.2 SUMMARY

A. Work under this Section consists of furnishing and placement of landscape boulders including all excavation, finish grading, labor, materials, and equipment required or inferred from Drawings, Details and Specifications to complete the work of this Section.

1.3 REVIEWS

A. Contractor shall stake or mark all locations and sizes of boulders to be installed for review by Owner Representative prior to excavation.

B. Contractor shall rough position boulders at excavated locations shown on the Drawings for review by the Owner Representative prior to final installation. Adjust positioning as directed.

C. Owner Representative shall approve final positioning of boulders at time of installation.

D. Notify the Owner Representative minimum of 48 hours before boulder installation.

1.4 QUALITY ASSURANCE

A. Work shall be performed by those experienced in landscape boulder placement.

B. Provide boulders from recognized stone industry supplier that is experienced in supplying, lifting, palletizing, shipping and unloading landscape boulders of the sizes, and weights for this Project.

C. Inspection/selection of boulders prior to delivery. The Contractor shall locate all landscape boulders for the job and inform Owner Representative in writing within 7 days of award of Contract to General Contractor, of the Boulder Supplier; include address, contact name, phone number and email address. Within 14 days of receipt of Boulder Supplier sources, Owner Representative will begin selection of the boulders required for the job at the contractor's sources. In the event boulders are found to be unacceptable, the contractor will pursue other sources until acceptable boulders are found, at no additional cost to the Owner. Approval at the supplier source does not impair the right of inspection and rejection during progress of the work for mishandling boulders whereby boulders have been chipped, broken, defaced or otherwise aesthetically or structurally damaged.

D. Acceptable sample boulders have been found at:

- Delaware Quarries*
  1868 West Super Highway (Route 1)
  Langhorne, PA 19047
  Phone: 215-757-2208
  Fax: 215-757-1119
  CONTACT:

  *Or approved equal

1.5 SUBMITTALS

A. Boulders Supplier: See Sub-Section 1.4

B. Boulder Photographs: Furnish digital color photos of each type of boulder. Photographs shall be taken from different viewpoints for review and approval by Owner Representative prior to onsite boulder source selection.

C. Mockup: Build mockups to demonstrate aesthetic effects and execution of installation. Mockup shall be the standard from which the work will be judged. Repeat mockups until acceptable standard mockup is established. Remove rejected mockups. Acceptable mockups can remain as part of the Project.
   1. Build multi-tier (in-place) boulder mockups in sizes approximately 4 boulders wide by full height (from toe of creek slope to top of creek bank) by full depth, including backup and bedding.

PART 2 - PRODUCTS

2.1 LANDSCAPE BOULDERS

A. Landscape boulders shall be of local origin, either Jericho or PA Fieldstone. Or approved equal.

B. The individual dimensions of landscape boulders shall "roughly" conform to the following sizes:

WIDTH LENGTH THICKNESS

WIDTH	LENGTH	THICKNESS	APPROX. QUANTITY*
2'	3'	1.5' TO 2'	26

*Quantities should reflect plan drawings and be field verified. To be approved by the Landscape Architect.

C. Boulders shall be of such shape as to form a stable formation when stacked in the required locations. Flat top and bottom surfaces are preferred for stability and seating surfaces.

D. All landscape boulders shall match the color of adjoining boulders in each grouping to the greatest extent possible.

2.2 MORTAR

Mortar shall conform to ASTM C1319 – Standard Specification for Mortar Cement. Any exposed mortar joints shall be tinted to match boulders, submit color chart of mortar for approval.

2.3 CLEANERS

Remove all soil, mortar, etc. from exposed stone faces as work progresses. Any cleaners used shall be non-toxic to adjoining water bodies and biodegradable. Submit product literature for approval.

PART 3 - EXECUTION

3.1 DELIVERY AND STORAGE

Selected boulders shall be loaded on individual pallets at stone supplier's yard and pallets shall be used to lift and move boulders, avoiding contact with boulder faces at all times during loading, shipping and unloading.

3.2 EXCAVATION

Excavation shall stair step into existing bank as shown in detail. Install geotextile fabric and #57 stone prior to boulder placement.

1. Boulders shall be placed with weathered side up and placed so as to conform to #57 stone at initial first boulder course.

2. Boulders shall be placed flush to sawcut concrete as best as possible to ensure minimal gaps between boulder and concrete. Gaps between adjoining boulders shall be minimized. Any gaps between boulder and existing concrete shall be filled with mortar.

3. Boulders shall be placed as to provide minimum of exposed rough or fractured edges.

4. Protect surfaces of boulders set into or adjacent to concrete paving to remain free of concrete splashing or staining.

5. At all times, lift boulders from pallets and place using slings to prevent marring of the rocks by equipment.

6. Boulders shall be set to remain stable and in place after placement.

7. Boulder surfaces to be set in contact with mortar shall be cleaned and saturated with

water and shall be damp while being set.

C. Boulders adjoining concrete landings

1. Concrete shall neatly flush to boulder face.

D. Grading around boulders

1. Install soil separator around stone. Backfill uphill side of boulders with compacted topsoil to finish grade. Side conditions of boulders will require modification of backfill procedure to site conditions.

2. Finish grade surrounding boulders shall be fine graded to neat line so that dips, ponding and erosion will not occur.

END OF SECTION 09 00 00

SECTION 02860
PLAY AREA EQUIPMENT

PART 1 - GENERAL

1.1 Description:

Furnish all labor, materials and equipment required to install the play equipment and structures as indicated on the drawings or as approved and specified herein. The work shall include any incidentals required to provide a finished job. The play equipment is being provided by the City of Philadelphia. The contractor shall take delivery of such equipment, store it, and protect it until it is installed by the contractor.

1.2 Related Sections:

A. Applicable Sections: Division 1

B. Section 02861 - Poured-In-Place Safety Surfacing

C. Section 03300 - Cast-In-Place Concrete

1.3 Submittals:

A. None.

1.4 Guarantee:

A. The contractor shall guarantee the materials and workmanship for the installation of the play equipment for 12 months.

1.5 Safety Guidelines and Standards:

A. All materials and equipment shall conform to the current issue of the "*Handbook for Public Playground Safety*" published by the Consumer Product Safety Commission (C.P.S.C.) and ASTM F1487-01. The manufacturer and installation contractor shall be responsible for correcting any product violations of the C.P.S.C. Guidelines and ASTM F1487-01, to the satisfaction of the Engineer, should they be found after installation.

B. ADA Accessibility Guidelines (ADAAG) Section 15.6 Play Areas.

1.6 Quality Assurance:

A. The Contractor installing the play equipment and structures must be experienced in the installation of play equipment with the personnel, facilities, and equipment adequate for the work specified, and shall, within 48 hours of the Design Professional’s request, produce written proof of such.

PART 2 - PRODUCTS

2.1 General:

A. Play equipment is to be provided by the City of Philadelphia.

2.2 Concrete:

A. Furnish and install concrete footings for the play equipment structures as indicated on the drawings.

B. Concrete footings shall have a minimum strength of 3,000 psi at 28-days.

2.3 Additional Hardware:

A. Additional hardware shall be provided in sufficient quantity to complete assembly of the play equipment. All hardware shall be non-ferrous or if ferrous material is used shall be galvanized, electrostatic zinc plated or polyester powder coated in accordance with the approved manufacturer's standard. Provide the Design Professional with any and all maintenance and repair supplies installation manuals, tool kits and materials shipped with each product for the Owner’s inventory.

PART 3 - EXECUTION

3.1 Play Equipment Delivery and Storage:

A. The play equipment as noted on the drawings is being provided by the City of Philadelphia.

B. The Contractor will take receive and take delivery of the play equipment and associated accessories from the manufacturer.

C. The Contractor, after receiving the play equipment, will store and protect the play equipment and accessories until such time as it can be installed at the project site. If the play equipment is to be stored at a location off of the project site, the contractor shall include the delivery of the play equipment and accessories from the storage location to the project site.

3.2 Examination of work area - Examine the areas and conditions under which work of this Section will be performed. Verify safety zones of all equipment before setting posts in concrete footings. Do not proceed until conditions detrimental to proper and timely completion of the work have been satisfactorily corrected and thus meet the manufacturer's instructions and the requirements of paragraph 1.5 above. Beginning work constitutes acceptance of conditions as satisfactory.

3.3 Installation of Compound Structures and Independent Activities:

A. Conform strictly to manufacturer's instructions using all appropriate materials, tools, and accessories as required. Use only experienced personnel trained in play equipment construction. Layout all equipment prior to construction to insure compliance with safety zone clearances.

B. Provide all concrete footings as required to properly place the equipment components. It is the Contractor's responsibility to adjust drainage pipe or other new utility locations to accommodate the equipment footings.

3.4 Protection:

A. During construction of the play equipment structures, provide PVC web fence material in sufficient quantities and wrap the structures to prevent public access onto the equipment. Maintain the fencing wrap after completion of the play equipment and safety surfacing installation through Physical Completion of the project.

3.5 Inspection:

A. Following the Design Professional's inspection of the completed play equipment installation, perform repairs as necessary to meet or exceed the Design Professional's requirements for fit and finish and the specifications and guidelines as referenced in 1.5 Safety Guidelines and Standards, above.

3.6 Guarantees:

A. The Contractor shall guarantee that all work performed under this section shall be free from any defects in materials and workmanship. Upon notice in writing from the Design Professional to the Contractor within two (2) years of Physical Completion of the project, the Contractor shall, at no cost to the Owner, make all necessary repairs or replacements of the defective work in question. During this period of guarantee, the Owner shall perform normal maintenance and cleaning of the play area equipment.

END OF SECTION 11 95 00

SECTION 12 93 00
SITE FURNISHINGS

PART 1 GENERAL

1.1 SUMMARY

A. This work required under this section consists of furnishing all labor, materials, equipment, services and items necessary to install all site furnishings as noted on the construction plan set. These site furnishings include: Pedestal Tables, Trash Receptacles, Benches and Bollards.

1.2 REALATED SECTIONS

A. 32 13 20 - Concrete Paving
B. 31 10 00 – Site Preparation

1.3 SUBMITTALS

A. Product data for each item specified, including construction details relative to materials, dimensions, gages, profiles, mounting method, and finishes.

B. Physical component samples of materials and finishes for each type of site furnishing.

C. Samples of trash receptacles with modifications as indicated on drawings if a selected alternate.

1.4 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish accessory manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry for freestanding benches and trash receptacles. Coordinate delivery with other work to avoid delay.

B. Single-Source Responsibility: Provide products of same manufacturer for each type of site furnishing.

1.5 PROJECT CONDITIONS

A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of items.

PART 2 PRODUCTS

2.1 BENCHES

A. 6’ BACKED BENCHES - Model #69-860-3-ART, with custom “Fairmount Park Panel” in center armrest, as manufactured by DuMor, Inc, Mifflintown, PA, Phone: (800) 598-4018, www.dumor.com, or approved equal. Color to be black. Provide as shown on plans and details. Benches shall be embedded in manufacturer’s recommended concrete footing. Steel shall be polyester powder coated as indicated on plans.

2.2 TRASH RECEPTACLES

A. 32 GALLON TRASH RECEPTACLE – Model #438-32, as manufactured by by DuMor, Inc, Mifflintown, PA, Phone: (800) 598-4018, www.dumor.com, or approved equal. Color to be black. Provide as shown on plans and details. Trash receptacles shall be embedded in manufacturer’s recommended concrete footing.

FABRICATION

A. No names or labels are permitted on exposed faces of units. On either interior surface not exposed to view or on back surface, provide identification of item either by a printed, waterproof label or a stamped nameplate indicating manufacturer’s name and product model number.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install site furnishings according to manufacturers’ instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.

3.2 ADJUSTING AND CLEANING

A. Adjust site furnishings for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces strictly according to manufacturer’s recommendations after removing temporary labels and protective coatings.

END OF SECTION 12 93 00

SECTION 31 10 00
SITE PREPARATION

PART 1 GENERAL

1.1 SUMMARY

A. The work in this section includes:
   1. Protecting existing vegetation to remain
   2. Removing existing vegetation
   3. Clearing and grubbing
   4. Stripping and stockpiling topsoil for
   5. Removal and disposal of above grade site improvements
   6. Salvage of above and below grade site improvements
   7. Coordinate wit the owner disconnecting, capping or sealing, removing site utilities or abandoning site utilities in place

1.2 RELATED SECTIONS

A. Section 31 22 10 - Topsoiling and Finish Grading
B. Section 31 23 10 - Excavation, Backfill and Subgrade Preparation for Paving
C. Section 32 13 10 Asphalt Paving
D. Section 32 13 20 Concrete Paving
E. Section 32 93 00 Landscape Planting
F. Section 33 01 10 Protection of Existing Utilities

1.3 JOB CONDITIONS

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

   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where directed.

C. Do not commence site preparation operations until temporary erosion and sediment control and plant protection measures are in place.

1.4 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in- place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 1 inch in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.

D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

F. Demolish: Completely remove and legally dispose of off-site.

G. Recycle: Recovery of demolition waste for subsequent processing in preparation for reuse.

H. Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.

PART 2 PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "Earth Moving.".

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 EXECUTION

3.1 PREPARATION

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

B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Flag each tree trunk at 54 inches above the ground.

B. Protect existing site improvements to remain from damage during construction.
1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE AND PLANT PROTECTION

A. Erect and maintain temporary fencing around plant protection zones before starting site clearing. Remove fence when construction is complete

1. Comply with City of Philadlephia Landscape Standards.

2. Maintain fenced area is free of weeds and trash.

C. Do no excavate within tree protection zones, unless otherwise indicated.

D. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

1. Cover exposed roots with burlap and water regularly.

2. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.

3. Coat cut faces of roots more than 1-1/2 inches in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.

4. Backfill with soil as soon as possible.

E. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Landscape Architect.

1. Employ an Arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.

2. Replace trees that cannot be repaired and restored to full-growth status, as determined by Landscape Architect.

3.3 EXISTING UTILITES

A. Coordinate the work of other Contracts with the Owner regarding disconnecting and abandoning existing utilities.

1. Coordinate with the Owner and utility companies to deactivate utilities affected by the work of this Contract.

2. Confirm the Owner has coordinated with Facilities Management, The City of Vermillion and private utility companies to shut off all other utilities which may be indirectly impacted by the work of this contract.

3. Owner will arrange to shut off indicated utilities when requested by Contractor.

B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after

arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than [seven (7) days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's written permission.
3. Coordinate with the Owner the relocation of the existing utilities which run under the building slab.
4. Coordinate with the Owner the relocation of electrical service to the well house; relocated service will be provided by the Owner.

C. Excavate for and remove underground utilities indicated to be removed.

3.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
   1. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 below exposed subgrade for existing plants occurring in areas outside of proposed building and paving areas.
   2. All stumps and roots occurring in areas of the proposed building and pavements are to be completely removed.
   3. Chip removed woody materials and dispose of off-site, or to an on-site stockpile location identified by the Owner.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
   1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground

3.5 TOPSOIL STRIPPING

A. After mowing the area within the Contract Limits to a height of 3 inches and removing accumulated organics from the site.

C. Strip topsoil to a minimum depth of twelve inches (12").
   1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.
   2. Stockpile topsoil adequate to install a compacted, uniform depth of eight inches (8") of topsoil in all finished lawn areas and all designated plant bed areas.

D. Stockpile topsoil materials away from the edge of excavations.
   1. Do not intermix topsoil with subsoil
   2. Grade and shape topsoil stockpiles to drain surface water
   3. Install silt fence around stockpile and cover stockpile to prevent wind erosion.
   4. Limit height to width ratio of topsoil stockpiles to prevent sloughing
   5. Do not stockpile topsoil within tree protection zones
   6. Coordinate removal of excess topsoil with owner
      a. Transport excess topsoil to site designated by Owner
      b. Or dispose of excess topsoil as specified for waste material disposal

3.6 SITE IMPROVEMENTS

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

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions.

3.7 SALVAGE

A. Salvage existing above- and below-grade improvements as indicated on the drawings.

B. Deliver all savaged above- and below-grade improvements to a storage location designated by the Owner.

3.8 DISPOSAL OR SURPLUS AND WASTE MATERIALS

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

B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 31 10 00

SECTION 31 20 10
EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Earthwork, excavation, fill placement and grading to required lines, dimensions, contours and elevations for proposed improvements.

B. Scarifying, compaction, moisture content control and removal of unsuitable material to ensure proper preparation of areas for the proposed improvements.

1.2 RELATED SECTIONS

A. Section 33 01 10 – Protection of Existing Utilities

B. Section 31 22 10 – Topsoiling and Finish Grading

C. Section 31 23 10 – Excavation, Backfill and Subgrade Preparation for Pavement

D. Section 31 23 20 – Trench Excavation and Backfill for Utilities

E. Section 31 25 00 – Soil Erosion and Sediment Control

1.3 REFERENCE STANDARDS

A. ASTM International - latest edition

1. ASTM Standard D422, "Standard Test Method for Particle Size Analysis of Soils," ASTM International West Conshohocken, PA, www.astm.org.
2. ASTM Standard D698, "Standard Test Methods for Laboratory Compaction Characteristics of Soils using Standard Effort (12,400 ft-lb/ft^3 (600 kN-m/m^3))," ASTM International, West Conshohocken, PA, www.astm.org.
3. ASTM Standard D1557 "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700kN-m/m^3))," ASTM International, West Conshohocken, PA, www.astm.org.
4. ASTM Standard D2216 "Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass," ASTM International, West Conshohocken, PA, www.astm.org.
5. ASTM Standard D2487 "Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)," ASTM International, West Conshohocken, PA, www.astm.org.
6. ASTM Standard D4253 "Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table," ASTM International, West Conshohocken, PA, www.astm.org.

7. ASTM Standard D4254 “Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density,” ASTM International, West Conshohocken, PA, www.astm.org.

8. ASTM Standard D4318 “Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils,” ASTM International, West Conshohocken, PA, www.astm.org.

9. ASTM Standard D6938 “Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth),” ASTM International, West Conshohocken, PA, www.astm.org.

1.4 QUALITY ASSURANCE

A. The Contractor shall provide at least one supervisory person who shall be present at all times during execution of the work and who is thoroughly familiar with the type of work being performed and its best methods for completion. This person shall have the authority act on behalf of the Contractor.

B. The Contractor shall comply with any provisions of all applicable codes, regulations and standards.

C. A Geotechnical Engineer, selected and paid by the Owner, shall be retained to perform construction inspection on site based on field testing, visual observation, and judgment. This inspection will not relieve the Contractor from his responsibility to complete the work in accordance with the plans, specifications and recommendations presented in the geotechnical engineering study.

D. Visual field confirmation and density testing of subgrade preparation and fill placement procedures shall be performed by the field Geotechnical Engineer as part of the construction testing requirements.

E. The Geotechnical Engineer shall prepare field reports that indicate compaction test location, elevation data, testing results and acceptability. The Owner, Architect, and Contractor shall be provided with copies of reports within 96 hours of time test was performed.

F. All costs related to re-inspection due to failures shall be paid for by the Contractor at no additional expense to Owner. The Owner reserves the right to direct any inspection that is deemed necessary. Contractor shall provide free access to site for inspection activities.

1.5 SUBMITTALS

A. Within ten days after award of the contract, the Contractor shall submit to the Owner and Engineer a schedule detailing the sequence, and time of completion of all phases of work under this section.

B. At least two weeks in advance of imported fill use, the Contractor shall submit either the following laboratory test data or a 50-pound soil sample to the Geotechnical Engineer for each type of imported soil/gravel material to be used as compacted fill.

1. Moisture and Density Relationship: ASTM D1557.
2. Mechanical Analysis: ASTM D422

3. Plasticity Index: ASTM D 4318

C. Together with the above test data, the Contractor shall submit a 5-pound sample of each type of off-site fill material in an air tight container for the approval of the Geotechnical Engineer.

F. Submit the name of each material supplier and specific type and source of each material. The intended use of each material submitted shall be clearly identified on the Contractor submittal record (i.e. structural fill for building pads, drainage fill for site, general fill for landscaping, etc.). Any change in source or soil type throughout the job requires approval of the Owner and the Geotechnical Engineer.

1.6 ENVIRONMENTAL CONSIDERATIONS

A. Install erosion control measures in the sequence shown on the plans or as directed by either the engineer or regulatory agencies to protect adjacent properties and water resources from erosion and sediment damage. Erosion and control measures shall also comply with both the technical specifications and the Construction Drawings.

PART 2 PRODUCTS

2.1 MATERIALS

A. On-site fill

1. On-site materials for use as fill may consist of excavated soil from other portions of the site. Refer to the geotechnical engineering study for appropriate uses of on-site materials for fill during construction.

2. Excavated material containing rock or stone greater than 4 inches in largest dimension is unacceptable as fill within the proposed building area.

3. Rock or stone greater than 2 inches in its largest dimension may be mixed with suitable material and used as fill up to 2 feet below beneath the proposed pavement subgrade elevation at the discretion of the Geotechnical Engineer. The fill must be mixed, placed and compacted such that voids will be minimized. All structural fill placed in the final 2 feet of building pads and roadways shall not contain any materials larger than 2 inches in its largest dimension.

4. Particle-size distribution, maximum dry density, plasticity index, and optimum water content soils' laboratory testing should be made on representative samples of all onsite materials proposed for use as structural, drainage and general fill onsite by the Contractor. All onsite fill is subject to inspection and approval by the on-site geotechnical engineer prior to reuse onsite. Components of the native soils deemed unsuitable by the on-site geotechnical engineer should only be used as directed by the geotechnical engineer.

5. Rock may be broken and/or crushed on-site to meet the above size requirements.

6. Prior to placement, on-site fill shall not contain:

a. Debris other than crushed concrete and brick meeting the above requirements.

b. Timber or Railroad Ties.
c. Organic Soils.
d. Hazardous substances, pollutants, and contaminants.
e. Other deleterious materials such as steel rails, rebar, trash, etc.

7. Unsuitable and deleterious materials and debris shall be disposed of off-site in accordance with all applicable regulations, at no cost to the Owner.

B. Off-site imported fill

1. If necessary, off-site fill shall be obtained and provided by the Contractor. Particle-size distribution, maximum dry density, plasticity index, and optimum water content soils' laboratory testing should be made on representative samples of all imported fill materials proposed by the Contractor. The Contractor should provide the Owner with proper certification that all imported fill is environmentally clean in accordance with appropriate and applicable local, state, and Federal statutes.

2. Material imported for use as "structural fill" should consist of a well-graded sand and/or gravel having less than 15% by dry weight passing the No. 200 sieve, have a maximum particle size of 2 inches, and be free of clay clods, organic materials, waste debris, or other deleterious material.

3. Materials imported for use as "general fill" should be granular soils with less than 25% by dry weight passing the No. 200 sieve, have a maximum particle size of 4 inches, and be free of clay clods, organic materials, waste debris, or other deleterious material.

4. "Drainage fill" should consist of clean ¾-inch crushed stone and be free of other deleterious materials. Excavated rock which has been crushed and processed on-site is not permitted for use as drainage fill.

5. A sample of any off-site fill material shall be provided to the Owner or his representative along with laboratory testing results and the Contractor shall obtain approval prior to moving material on-site.

6. Imported fill shall be free of all hazardous substances as listed by the Pennsylvania Department of Environmental Protection. Certification of compliance and, if requested, test results substantiating compliance shall be furnished to the Owner and Geotechnical Engineer by the Contractor not less than one week prior to its intended use.

7. The Owner reserves the right to test off-site imported fill material for conformance with these specifications.

C. Topsoil fill as specified in Section 02920 –Soil Preparation and Mixes.

2.2 EQUIPMENT

A. Compactor - Minimum 5 ton static drum weight vibratory roller (Hypac C830C, Caterpillar CS-54, Bomag BW177D-40, or approved equal).

B. Compactor – Smaller compaction equipment may be used where access or maneuverability is limited. However, the loose lift thickness of the fill must be reduced commensurate to the type

and size of the compactor. The final lift thickness shall be determined by the on-site geotechnical engineer.

PART 3 EXECUTION

3.1 PREPARATION

A. Prior to all work of this section, the Contractor shall become thoroughly familiar with the site, site conditions, and all portions of the work falling within this section.

B. The Contractor shall refer to the soil erosion and sediment control plans for staging of earthwork operations and for erosion control measures to be implemented prior to commencement of earthwork.

C. Identify existing utilities that are to remain and protect them from damage.

D. Notify utility companies to permit removal and/or relocation of any utilities that are in conflict with the proposed improvements.

E. Protect fences, structures, sidewalks, paving, curbs, etc. to remain from equipment and vehicular traffic.

F. Protect benchmarks, property corners and all other survey monuments from damage. If a marker needs to be relocated it shall be referenced by a licensed land surveyor and replaced, as necessary, by the same licensed land surveyor at no additional cost to the Owner.

G. Remove from the site, material encountered in grading operations that, in opinion of Owner or Owners Site/Civil Engineer, is unsuitable or undesirable for backfilling in subgrade or foundation purposes. Dispose of in a manner satisfactory to Owner and in accordance with all applicable regulations. Backfill areas with layers of suitable material and compact as specified.

3.2 GENERAL

A. Identify required lines, levels, contours and datum to bring site grades to the proposed subgrade conditions indicated on the drawings.

B. Do not allow or cause any of the work performed or installed to be covered by work of this section prior to all inspections, tests and approvals.

C. By submitting his bid, the Contractor represents that he has reviewed the information provided and investigated the site to determine type, quantity, quality, and character of excavation work to be performed. All excavation shall be considered unclassified excavation.

D. Perform excavation using capable, well maintained machinery and equipment using methods acceptable to the Owner and governing agencies.

E. The Contractor shall provide adequate soil moisture to properly compact the soil. This may require either adding moisture if the soil is deficient or discing the soil if moisture is excessive.

F. Protect persons and property from damage and discomfort caused by dust. Water as necessary to subdue dust.

G. Allow no debris to accumulate on-site. Haul debris away from the site and dispose of at no cost to the Owner.

H. Dispose of excess earth material from the site at no cost to the Owner.

3.3 COMPACTION OF SUBGRADE SURFACES

A. All existing grades below building areas shall be proof-rolled and compacted with a minimum of 2 passes using a fully-loaded tri-axle dump truck with a carrying capacity of 12 to 15 cubic yards roller prior to placement of any subgrade fill, concrete footings, or slab-on-grade. Existing areas which exhibit "pumping" or "rutting" under the action of the dump truck shall be removed and replaced with suitable fill material, as directed by the Geotechnical Engineer.

B. Prior to preparing the subgrade in low-lying areas or deep excavations, perform the following procedures:

1. Drain standing water by gravity or with a pump. Drainage using wells/well points may be required where the water table is high. Water should not be discharged directly to a storm drain system.

2. After drainage of low area is complete, remove muck, mud, debris, and other unsuitable material using equipment and methods that will minimize disturbance to the underlying soils.

3. Thoroughly compact subgrade as described above.

4. If proposed for re-use as on-site fill, all muck, mud and other materials removed from above low areas shall be dried on-site by spreading in thin layers for observation by Owner or Owner's representative. Material shall be inspected and, if found to be suitable for use as fill material, shall be incorporated into lowest elevation of site filling operation, but not under the building area, within 30 feet of the perimeter of the building pad, or within 3 feet of the paving subgrade elevation. If, after observation by Owner or Site/Civil Engineer, material is found to be unsuitable, it shall be removed from the site at no cost to the Owner.

3.4 FILL PLACEMENT AND COMPACTION

A. No fill materials shall be placed during unfavorable weather conditions. When work is interrupted by heavy rains, fill operations shall not be resumed until all saturated surficial soils are returned to satisfactory moisture content as determined by the Geotechnical Engineer.

B. Place and compact approved fill materials in 12-inch thick maximum loose lifts using a minimum of 6 passes with the previously specified 5-ton static drum weight compactor and achieve the minimum in-place density specified above. Smaller compaction equipment, together with thinner lifts, may be necessary at areas of limited maneuverability.

C. Visual confirmation of fill quality, lift thickness and compaction procedures, together with in-place density testing, shall determine the acceptability of fill. Any unsatisfactory material or soft areas exhibiting excessive weaving shall be immediately removed, replaced and re-compacted as stated above to the satisfaction of the Geotechnical Engineer.

D. No fill material shall be placed in areas that have not been approved by the Geotechnical Engineer.

3.5 MAINTENANCE OF SUBGRADE

A. Finished subgrades shall be verified by the Contractor to ensure proper elevation and conditions for construction above subgrade. Grade lawns, walks, and unpaved subgrades to tolerances of plus or minus 1 inch and pavements to plus or minus ½ inch.

B. Protect subgrade from excessive construction traffic and wheel loading. Protect subgrade from unfavorable weather such as precipitation or cold temperatures that will soften or freeze subgrades.

C. Remove areas of finished subgrade judged to be unsatisfactory to the depth necessary and replace in a manner that will comply with compaction requirements by use of material equal to or better than the best subgrade material on site. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross-section. See section 02920 Soil Preparation and Mixes for subgrade scarifying requirements in planting areas

3.6 FINISH GRADING

A. For setting and establishing finish elevations and lines, the Contractor will secure the services of a licensed land surveyor acceptable to the Owner and Engineer.

B. Provide elevation grade stakes and any other surveying necessary for the layout of the work. The Contractor shall conduct his work in such a manner that survey stakes will be protected as long as their need exists. Grade stakes, which are damaged or stolen, shall be replaced by the Contractor's surveyor at the Contractor's expense.

C. Graded areas shall be uniform, hard and smooth, free from rock, debris, or irregular surface changes. Finished subgrade surface shall not be more than ½-inch above or below the design finished subgrade elevation; any deviation shall not result in changes in drainage areas or ponding. All ground surfaces shall vary uniformly between indicated elevations. Finish drainage ditches shall be graded to allow for proper drainage without ponding and in a manner that will minimize the potential for erosion.

D. Areas having drainage slopes of one-quarter inch per foot or more shall have grade stakes, set with an instrument, at grid intervals of fifty (50) feet.

E. Areas having drainage slopes of one-quarter inch per foot or less shall have grade stakes, set with an instrument, at grid intervals of twenty-five (25) feet.

F. Correct all settlement and eroded areas for one year after date of project completion at no additional expense to Owner. Bring paved and landscaped areas to proper elevation. Replant or replace any grass, shrubs, bushes, or other vegetation disturbed by construction using corrective measures.

END OF SECTION 31 20 10

SECTION 31 22 10

TOPSOILING AND FINISH GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. The work of this Section includes, but is not limited to preparation of subgrade to receive topsoil, placing topsoil, and finish grading in preparation for lawn seeding, sodding, or planting.

1.2 RELATED SECTIONS

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

B. Related Specification Sections include:

1. Applicable Sections of Division 01
2. Section 31 20 10 - Earthwork
3. Section 31 25 00 - Erosion and Sediment Control
4. Section 31 10 00 - Site Preparation
5. Section 31 23 00 - Trench Excavation and Backfill for Utilities
6. Section 31 23 10 - Excavation, Backfill & Subgrade Preparation for Pavement
7. Section 32 90 00 - Landscape Planting
8. Section 32 92 00 - Lawns and Grasses

1.3 QUALITY ASSURANCE

A. Testing Agency:

1. The Contractor has the option to use soil testing to justify decreasing lime and fertilizer rates. When soil testing is selected by the Contractor, the soil and soil supplement testing shall be performed by a Soils Testing Laboratory engaged and paid for by the Contractor and approved by the Landscape Architect.

1.4 REFERENCE STANDARDS

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

1. ASTM D5268 – Standard Specification for Topsoil Used for Landscaping Purposes

B. Pennsylvania Department of Transportation:

1. Publication 408 Specifications

C. Commonwealth of Pennsylvania:

1. Agricultural Liming Materials Act of 1978, P.L. 15, No. 9 (3P.S. 132-1), as amended.
2. Pennsylvania Soil Conditioner and Plant Growth Substance Law, Act of December 1, 1977, P.L. 258, No. 86 (3P.S.68.2), as amended.'

1.5 SUBMITTALS

A. Samples:

1. When directed, furnish three strips of sod, 4-1/2 feet long by 12" wide, laid on 3" of topsoil and tamped in place in accordance with Section 01 33 00. The samples shall be representative of the sod and workmanship to be provided.

B. Certificates:

1. Prior to use or placement of material, submit certifications of material composition of the following for approval:

(a) Topsoil analysis

(b) If soil tests are performed to justify decreased liming and fertilizer rates, submit certified soil sample analyses, including laboratory's recommend soil supplement formulation.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Imported topsoil shall be installed within (3) days of delivery to the site. Protect imported topsoil stockpile from weather. Comply with erosion control requirements.

B. Section 01 60 00, also addresses Storage and Protection of Materials and Equipment.

PART 2 - PRODUCTS

2.1 TOPSOIL SOURCES

A. Existing on project site topsoil may be used for lawns, planting and transplanting work. Existing on project site topsoil shall be prepared as specified in other paragraphs in the Section or other related Sections.

B. Contractor shall determine if quantities of existing on site topsoil are sufficient to meet specified depths for proposed work. If quantities are insufficient contractor shall import screened topsoil as required to complete work from an off-site source approved by the Landscape Architect. Off project site topsoil shall meet the requirements as specified under paragraph 2.02.

2.2 TOPSOIL

A. Existing on project site topsoil: Natural, fertile soil not in frozen or muddy condition. Free from subsoil, clay, stones greater than 1-inch in diameter, lumps, live plants, foreign matter, and any material that may be harmful to plant growth.

B. Imported topsoil: Natural, friable loam typical of productive soils in the locality, capable of sustaining vigorous plant growth, from a well drained site free of flooding, not in frozen or muddy condition. Imported topsoil shall also meet the following criteria:

1. Not less than 2% nor more than 10% organic matter content as determined by AASHTO T194.

2. Have a pH value of 6.0 to 7.0.

3. Free from subsoil, slag, clay, stones, lumps, live plants, roots, sticks, foreign matter and any material that may be harmful to plant growth.

4. Free of pests, pest larvae, and matter toxic to plants.

5. Contains no stones greater than 1 inch in diameter.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADE

A. "Hard pan" or heavy shale:

1. Plow to minimum depth of 6".
2. Loosen and grade by harrowing, discing, or dragging.
3. Hand rake subgrade. Remove stones over 1 inch in diameter and other debris.

B. Loose loam, sandy loam, or light clay:

1. Loosen and grade by harrowing, discing, or dragging.
2. Hand rake subgrade. Remove rocks over 1 inch in diameter and other debris.

3.2 PLACING TOPSOIL

A. Topsoil shall not be placed while the topsoil is in a frozen or muddy condition, when the subsoil is excessively wet or in a condition that may otherwise be detrimental to proper finish grading and seedbed preparation.

B. Replace topsoil and spread over the prepared subgrade to obtain the required depth and grade elevation. Final compacted thickness shall be the following:

1. Seeded lawn: 6 inches.
2. Sodded lawn: 4 inches.
3. Vegetative planting beds: 6 inches.

C. Hand rake topsoil and remove all materials unsuitable or harmful to plant growth.

D. Do not place topsoil when the subgrade is frozen, excessively wet, or extremely dry.

E. Do not handle topsoil when frozen or muddy.

3.3 FINISH GRADING

A. Remove unsuitable material larger than 1 inch in any dimension.

B. Uniformly grade surface to the required contours without the formation of water pockets.

C. Rework and re-rake areas which puddle by the addition of topsoil.

END OF SECTION

SECTION 31 23 10
EXCAVATION, BACKFILL & SUBGRADE PREPARATION FOR PAVEMENT

PART 1 GENERAL

1.1 SUMMARY

A. Excavate and backfill to line, grade and configuration as shown in the plans and as described in these specifications for proposed pavement areas.

B. Proofrolling and removal of unsuitable material beneath proposed paved areas.

C. Remove existing pavement when necessary within the Work Area.

D. Proper compaction of subgrade materials as in accordance with Section 31 20 10 - Earthwork.

1.2 RELATED SECTIONS

A. Section 31 25 00 - Soil Erosion and Sediment Control

B. Section 33 01 10 – Protection of Existing Utilities

C. Section 31 20 10 - Earthwork

D. Section 32 12 10 – Poured in Place Safety Surface

E. Section 32 13 10 – Asphalt Paving

F. Section 32 13 20 – Concrete Paving

1.3 REFERENCE STANDARDS

A. ASTM International - latest edition

1. ASTM Standard D422, “Standard Test Method for Particle Size Analysis of Soils,” ASTM International West Conshohocken, PA, www.astm.org.

2. ASTM Standard D698, “Standard Test Methods for Laboratory Compaction Characteristics of Soils using Standard Effort (12,400 ft-lb/ft^3 (600 kN-m/m^3)),” ASTM International, West Conshohocken, PA, www.astm.org.

3. ASTM Standard D1557 “Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700kN-m/m^3)),” ASTM International, West Conshohocken, PA, www.astm.org.

4. ASTM Standard D2216 “Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass,” ASTM International, West Conshohocken, PA, www.astm.org.

5. ASTM Standard D2487 “Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System),” ASTM International, West Conshohocken, PA, www.astm.org.

6. ASTM Standard D4253 “Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table,” ASTM International, West Conshohocken, PA, www.astm.org.

7. ASTM Standard D4254 “Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density,” ASTM International, West Conshohocken, PA, www.astm.org.

8. ASTM Standard D4318 “Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils,” ASTM International, West Conshohocken, PA, www.astm.org.

9. ASTM Standard D6938 “Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth),” ASTM International, West Conshohocken, PA, www.astm.org.

1.4 QUALITY ASSURANCE

A. An Owner's Geotechnical Engineer may perform construction testing on filling operations and subgrade preparation as specified in section 31 20 10 and described herein. Refer to Item 1.04 of Section 31 20 10for specific quality assurance requirements. This inspection will not relieve the Contractor from his responsibility to complete the work in accordance with the plans and specifications.

1.5 SUBMITTALS

A. Shop drawings or details pertaining to excavating and filling for structures are not required unless procedures contrary to the project documents are proposed.

B. Submit soil sample or laboratory test information of each type of off-site fill material that is to be used in backfilling as specified in Section 31 20 10 - Earthwork.

PART 2 PRODUCTS

2.1 MATERIALS

A. The fill material must meet the requirements of Section 31 20 10 – Earthwork and be approved by the Geotechnical Engineer.

2.2 EQUIPMENT

A. Excavation is to be performed using capable, well maintained equipment and methods acceptable to the Owner and the Contract Document requirements and schedule.

B. Compactor – Minimum 5 ton static drum weight vibratory (Hypac C830C, Caterpillar CS-54, Bomag BW177D-40, or approved equal).

C. Smaller compaction equipment may be used where access or maneuverability is limited. However, the loose lift thickness of the fill must be reduced commensurate to the type and size of the compactor. The final lift thickness shall be determined by the on-site Geotechnical Engineer.

PART 3 EXECUTION

3.1 GENERAL

A. The Contractor shall cut or fill to the proposed subgrade elevations based on finished grades and the pavement thicknesses as shown on the Contract Drawings. Subgrade elevations shall be constructed to within ±0.1 feet of the proposed grades specified. Any deviation shall not result in changes to drainage areas or ponding.

3.2 EXCAVATION

A. Where existing grades are above proposed subgrade elevation, excavate materials in the pavement areas to line and grade as shown in the plans being careful not to over excavate beyond the elevations needed.

B. Excavated on-site organic soils shall be disposed of off-site in accordance with all Division 1 Specifications and jurisdictional regulations.

C. Excavated on-site soils, which meet the requirements of specification Section 31 20 10 of these Specifications and approved by the Owner's Geotechnical Engineer may be used as fill on-site.

D. Unsuitable material, such as wood and any other deleterious materials determined to be unsuitable by the Owner or Engineer for use as on-site fill shall be disposed of in accordance with all Division 1 Specifications and jurisdictional regulations

3.3 SUBGRADE PREPARATION

A. Existing grades below areas of proposed pavement shall be leveled prior to fill placement. The Contractor shall remove existing lawn and top soil in these areas prior to placement of any fill and dispose of this material off-site in accordance with all Division 1 Specifications and jurisdictional regulations.

B. All existing grades below areas of proposed pavement shall be proofrolled and compacted with a minimum of 6 passes using the vibratory drum roller specified in part 2.2 of this Section prior to placement of pavement subbase. Refer to Section 31 20 10 - Earthwork, for specific pavement subgrade preparation requirements. Existing areas which exhibit "pumping" or "rutting" under the action of the roller shall be removed and replaced with suitable fill material as specified in Section 31 20 10 of these Specifications, or as directed by the Engineer.

3.4 SUBGRADE FILL PLACEMENT AND COMPACTION

A. Rock larger than two inches (2") in any dimension shall not be part of pavement subgrade fill within 3 feet of pavement subgrade.

B. Fill material shall not be placed in areas that have not been approved by the Geotechnical Engineer.

C. Fill materials shall not be placed during unfavorable weather conditions. When work is interrupted by heavy rains, fill operations shall not be resumed until all saturated surficial soils are returned to satisfactory moisture content as determined by the Geotechnical Engineer.

D. Moisture content of the fill material during placement shall be as specified by Section 31 20 10.

E. When significant precipitation is forecast, fill lift surfaces shall be made smooth and free from ruts or indentations at the end of any work day to prevent saturation of surficial fill material. Fill surfaces shall be graded to drain and sealed with a smooth drum roller at the completion of each work day.

F. Subgrade fill in paved areas shall be placed in uniform loose lifts and compacted in accordance with Section 31 20 10.

G. Wet, saturated material shall be removed and replaced or scarified and air dried as necessary to achieve the field densities specified in this Section. Drying may be assisted by discing, harrowing, or pulverizing until moisture content is reduced.

H. Prior to paving, the subgrade shall be proofrolled with a minimum of 6 overlapping coverages using a 5-ton static drum weight vibratory roller.

I. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace with suitable compacted fill as approved by the Owner or Owner's Geotechnical Engineer. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross-section.

3.5 QUALITY CONTROL

A. Compaction tests shall be performed as specified in Section 31 20 10 together with the following for areas of proposed pavement:

1. In cut areas, not less than one compaction test for every 10,000 square feet.
2. In fill areas, two tests for every 4,500 square feet for each lift.

B. Prior to paving, the finished subgrades shall be verified by the Contractor to ensure proper elevation and conditions for construction above subgrade.

C. Grading of paving areas shall be checked by string line from grade stakes set at not more than 50 feet, center to center. The subgrade tolerance is plus or minus 0.10 feet. Any deviation from the design grades shall not result in changes in drainage areas or ponding. The Contractor shall provide engineering and field staking necessary for verification of lines, grades, and elevations.

END OF SECTION 02227

SECTION 31 23 20
TRENCH EXCAVATION AND BACKFILL FOR UTILITIES

PART 1 GENERAL

1.1 SUMMARY

A. Excavating trenches for the installation of utilities.

B. Backfilling trench with bedding material as specified and finish filling trenches with suitable material to either proposed subgrade or proposed finished grade.

C. Compacting subgrade, bedding, and backfill materials in an acceptable manner.

D. Compliance with all environmental and health and safety regulations.+

1.2 RELATED SECTIONS

A. Section 31 20 10 – Earthwork

B. Section 31 25 00 – Soil Erosion and Sedimentation Control

C. Section 33 11 00 – Water Service

D. Section 33 30 10 – Storm Sewers

1.3 REFERENCES

A. ASTM International - latest edition

1. ASTM Standard D422, “Standard Test Method for Particle Size Analysis of Soils,” ASTM International West Conshohocken, PA, www.astm.org.
2. ASTM Standard D698, “Standard Test Methods for Laboratory Compaction Characteristics of Soils using Standard Effort (12,400 ft-lb/ft^3 (600 kN-m/m^3)),” ASTM International, West Conshohocken, PA, www.astm.org.
3. ASTM Standard D1557 “Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700kN-m/m^3)),” ASTM International, West Conshohocken, PA, www.astm.org.
4. ASTM Standard D2216 “Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass,” ASTM International, West Conshohocken, PA, www.astm.org.
5. ASTM Standard D2487 “Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System),” ASTM International, West Conshohocken, PA, www.astm.org.
6. ASTM Standard D4253 “Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table,” ASTM International, West Conshohocken, PA, www.astm.org.

7. ASTM Standard D4254 “Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density,” ASTM International, West Conshohocken, PA, www.astm.org.

8. ASTM Standard D4318 “Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils,” ASTM International, West Conshohocken, PA, www.astm.org.

9. ASTM Standard D6938 “Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth),” ASTM International, West Conshohocken, PA, www.astm.org.

1.4 QUALITY ASSURANCE

A Geotechnical Engineer, selected and paid by the Owner, shall be retained to perform construction inspection on site based on field testing, visual observation, and judgment. This inspection will not relieve the Contractor from his responsibility to complete the work in accordance with the plans, specifications and recommendations presented in the geotechnical engineering study.

1.5 SUBMITTALS

A. Shop Drawings or details pertaining to Site Utilities are not required unless use of materials, methods, equipment, or procedures contrary to the Construction Drawings or these specifications are proposed. No work shall be performed until shop drawings, if required, have been accepted by the Owner and Engineer.

B. The Contractor shall contact all utility companies and identify their requirements for protecting their utility. Contractor shall provide written confirmation of the status of all utility construction to the Owner at the time of the preconstruction conference or no later than 30 days following the project possession date.

C. Submit a sample of each type of offsite fill and/or bedding material that is to be used in backfilling in accordance with specification Section 31 20 10 - Earthwork.

1.6 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of all subsurface utilities, structures and obstructions encountered.

B. Accurately record any as-built variation from the construction plans and specifications. The Contractor shall provide as-built drawings to the Owner within 30 days of project completion.

PART 2 PRODUCTS

2.1 MATERIALS

A. Bedding material shall be aggregate number 67 as defined in ASTM Standard D448, “Standard Classification for Sizes of Aggregate for Road and Bridge Construction (current edition),” ASTM International, West Conshohocken, PA, www.astm.org.

B. Backfill material as specified in specification Section 31 20 10 - Earthwork and approved by the Owner and/or the Geotechnical Engineer.

2.2 EQUIPMENT

A. Excavation is to be performed using capable, well maintained equipment and methods acceptable to the Owner and the Contract Document requirements and schedule.

B. Compactors

1. Minimum 2.5-ton total-weight walk-behind vibratory roller (Wacker WDH-86-110, Ramax or equivalent).

2. Minimum 5 ton static drum weight vibratory roller (Hypac C830C, Caterpillar CS-54, Bomag BW177D-40, or approved equal).

C. Smaller compaction equipment may be used where access or maneuverability is limited. However, the loose lift thickness of the fill must be reduced commensurate to the type and size of the compactor. The final lift thickness shall be determined by the on-site geotechnical engineer.

PART 3 EXECUTION

3.1 GENERAL

A. Set all lines, elevations, and grades for utility and drainage system work and maintain for the duration of Work. Provide careful maintenance of benchmarks, property corners, monuments, or other reference points. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same at no cost to the Owner.

B. Protect and maintain in operating condition existing utilities encountered during utility installation. Repair any damage to surface or subsurface improvements shown on Drawings.

C. Verify location, size, elevation, and other pertinent data required to make connections between existing utilities and drainage systems, and proposed construction indicated on Drawings. Coordinate all building utility connection locations and elevations with site-civil, structural, landscape, lighting and architectural plans. Contractor shall comply with all Local codes and regulations.

D. Over-excavate and properly prepare areas of subgrade that are not capable of supporting the proposed systems. These areas shall be stabilized by using acceptable backfill materials and/or additional bedding material placed and compacted as specified to the satisfaction of Owner’s Geotechnical Engineer.

3.2 EXCAVATION

A. Contact local utility companies before excavation begins. Dig trenches at proper width and depth for laying pipe, conduit, or cable and in accordance with utility company requirements. Cut trench banks for safety and remove stones as necessary to avoid point-bearing.

B. All trench excavation side walls shall be sloped, shored, sheeted, braced or otherwise supported by means of sufficient strength to protect the workmen within them in accordance with the applicable rules and regulations established for construction by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by Local ordinances.

C. Trench width requirements below the top of the pipe shall not be less than 12 inches nor more than 2 feet wider than outside surface of any pipe or conduit that is to be installed. All other trench width requirements for pipe, conduit, or cable shall be the minimum practical width that will allow for proper compaction of trench backfill and satisfy safety and utility company regulations.

D. Accurately grade trench bottom to an elevation 6 inches below the pipe, as per bedding details in construction drawings. Provide uniform bearing and support for each section of pipe on bedding material at every point along the entire length, except where necessary to excavate for bell holes, pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer, or wider than needed to make the joint connection properly.

E. During excavation, stockpile excavated material suitable for backfilling in an orderly manner far enough from the trench to avoid overloading, slides, or cave-ins.

F. Stockpile excavated materials deemed by Geotechnical Engineer and Owner's Engineer to be geotechnical or environmentally unsuitable for backfill, as indicated Section 31 20 10 - Earthwork of these Technical Specifications.

G. Any abandoned structures, utilities or debris discovered during excavation shall be removed and disposed of, abandoned in place by complete filling with grout or sand, or capped subject to review and approval by Owner's Geotechnical Engineer on a case-by-case basis.

H. Utility alignments have been designed to avoid expected obstructions wherever possible. If unanticipated significant obstructions are encountered during utility installation Work immediately notify Owner and Engineer.

I. Prevent surface water from flowing into trenches or other excavations by temporary grading or other methods, as required. Remove accumulated water in trenches or other excavations by pumping or other acceptable methods. Coordinate dewatering with any established dewatering effluent limitations.

J. Utility installation shall meet the following minimum pipe installation depths, or applicable codes and ordinances, measured from finished grade or the paved surface.

1. Water Mains: Refer to Construction Drawings and also coordinate with the Philadelphia Water Department

2. Storm Sewer: Refer to Construction Drawings and also coordinate with the Philadelphia Water Department

3.3 LATERALS

A. All utilities shall be extended to in the direction and elevation to connect at those geometrical locations indicated or inferred on the drawings. All utility ends will be plugged and marked by a 2” x 4” piece of wood extending from the utility invert to 4 feet above final grade.

3.4 PIPE BEDDING

A. Accurately cut trenches for pipe or conduit to designated line and grade appropriate to accommodate the bedding thickness specified in the bedding details on Construction Drawings. Compact the disturbed surface of the subgrade. Use a minimum 2.5-ton total-weight walk-behind vibratory roller (Wacker WDH-86-110, Ramax or equivalent) Compaction should be performed under the direct supervision of the Owner’s Geotechnical Engineer.

B. Any loose, soft, or unstable areas shall be over-excavated and replaced with compacted structural fill as directed by the Geotechnical Engineer to provide a suitable base for continuous and uniform bedding.

C. Place bedding material and compact in 6 inch loose lifts to obtain at least 95% of the maximum dry density. Accurately shape bedding material to conform to lower portion of pipe barrel. After pipe installation, place and compact bedding material as specified above in maximum 6 inch loose layers to the height above the pipe, as shown on the plans.

3.5 BACKFILLING

A. After pipe or conduit has been installed, bedded and tested as necessary, backfill trench to finish grade in 8 inch thick loose lifts of approved fill soils, compacting and testing each lift as specified above and in specification Section 31 20 10 - Earthwork.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces. Should these conditions exist, the areas should be removed, replaced and re-compacted per specification Section 31 20 10 - Earthwork.

3.6 COMPACTION

A. All off-site materials used for backfill shall be tested in accordance with Section 31 20 10 - Earthwork.

B. Exercise proper caution when compacting immediately over top of pipes or conduits.

C. Maintain optimum moisture content of fill materials to attain required compaction density.

D. Compaction of backfill shall be performed in accordance with the requirements of Section 31 20 10 - Earthwork.

END OF SECTION 02222

SECTION 31 25 00
SOIL EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.1 SUMMARY

A. Temporary and permanent soil erosion control systems.

B. Slope Protection Systems.

1.2 RELATED SECTIONS

A. Section 31 20 10 – Earthwork

B. Section 32 93 00 – Landscape Planting

C. Section 32 92 00 – Lawn and Grasses

D. Construction Drawings

1.3 REFERENCE STANDARDS

A. The PADEP, Erosion Sediment and Pollution Control, April 2000.

B. Philadelphia Water Department (PWD), Stormwater Management Guidance Manual, Version 2.0

1.4 QUALITY ASSURANCE

A. The Contractor shall implement soil erosion controls in a timely manner.

B. The Contractor shall carefully adhere to the construction sequence that is shown on the construction drawings.

C. The Contractor shall follow Soil Erosion and Sediment Control Notes that are shown on the construction drawings and which are dictated by the PADEP and/or the PWD.

D. The Contractor shall make frequent inspection of temporary soil erosion controls and maintain them in working order until permanent soil erosion controls are established.

1.5 ENVIRONMENTAL REQUIREMENTS

A. The contractor shall protect adjacent properties and water resources from soil erosion and

sediment damage throughout construction.

B. Discharge from dewatering operations shall not be directed to surface waters.

PART 2 PRODUCTS

2.1 MATERIALS

A. Tree protection fencing as specified on Construction Drawings

B. Fibrous blankets by North American Green SC150BN, biodegradable (unless noted otherwise on Construction Drawings) or approved equal

C. Silt fence, Filtrexx Siltsoxx or Straw bale barrier siltation control as specified on the Construction Drawings

D. Filter fabric as specified on the Construction Drawings

PART 3 EXECUTION

3.1 PREPARATION

A. Review site conditions and sediment control plans.

B. Review the soil erosion and sediment control plans as they apply to current conditions. Any proposed deviation from the plans must be submitted to the engineer in writing 72 hours prior to commencing that work.

C. Notify the PADEP and the PWD by mail at least 48 hours prior to initial land disturbance.

3.2 SOIL EROSION CONTROL AND SLOPE PROTECTION IMPLEMENTATION

A. Place soil erosion control systems in accordance with the staging and features shown on the sediment control plans prior to any earthwork construction and immediately following the construction of any storm drainage devices.

B. Limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations by following construction phasing in the sediment control plans.

C. The Contractor will be required to incorporate all permanent soil erosion control features into the project at the earliest practical time to minimize the need for temporary controls. Cut slopes shall be permanently seeded and mulched as the excavation proceeds to the extent considered desirable and practical. Equip catch basins with filter fabric inlet

protection immediately upon construction.

D. The temporary soil erosion control systems installed by the Contractor shall be maintained as directed by the engineer to control siltation at all times during the life of the contract. The Contractor must respond to any maintenance or additional work ordered by the Engineer within a 48 hour period.

E. Slopes that erode easily shall be temporary seeded as the work progresses with quick-growing grass grains of wheat, rye or oats (See Section 02930) unless otherwise specified.

F. All soil erosion control measures shall be maintained until all permanent improvements to the site are complete unless otherwise directed by the Engineer.

END OF SECTION 31 25 00

SECTION 32 12 10
POURED IN PLACE SAFETY SURFACE

PART 1 GENERAL

1.01 SUMMARY

A. Poured-in-place safety surface shall consist of a polyurethane binder mixed with 100% recycled, shredded buffing which will make up the cushion layer. The cushion layer is capped with a TPV or Thermoplastic Aliphatic Urethane (TAU) rubber granules mixed with a polyurethane binder creating the wear course.

B. Provide labor, materials, equipment, services to install poured in place safety surface on aggregate base as indicated on the drawings and specified herein.

1.02 RELATED SECTIONS

A. Section 31 23 10 – Excavation and Backfill & Subgrade Preparation for Paving

B. Section 32 13 10 – Asphalt Paving

C. Section 32 13 20 –Concrete Paving

1.03 REFERENCES

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

1. ASTM-F1292 (Latest Edition) - Standard Specification for Impact Attenuation of Surfacing Materials within the Use Zone of Playground Equipment

2. ASTM-F2223 (Latest Edition) – Standard Guide for ASTM Standards on Playground Surfacing

3. ASTM-F1951 (Latest Edition) – Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment

4. ASTM-D2047 (Latest Edition) – Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine

5. ASTM E303 (Latest Edition) – Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester

6. ASTM D2859 (Latest Edition) – Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials

7. ASTM D412 (Latest Edition) – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

8. ASTM D624 (Latest Edition) – Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers

9. ASTM C67 (Latest Edition) – Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile

10. ASTM D573 (Latest Edition) – Standard Test Method for Rubber—Deterioration in an Air Oven

B. U.S. Consumer Product Safety Commission (CPSC):

1. CPSC Handbook for Public Playground Safety

2. CPSC Document # 1005 – Playground Surfacing Materials

C. Americans With Disabilities Act (ADA)

1. Americans with Disabilities Act Accessibility Guidelines (ADAAG)

D. American National Standards Institute (ANSI)

E. International Play Equipment Manufacturers Association (IPEMA)

1.04 PERFORMANCE REQUIREMENTS

A. Area Safety: Poured in place surfaces within playground equipment use zones shall meet, or exceed, the performance requirements of the CPSC, ADA and, where applicable, Fall Height Test ASTM F 1292. The surface must yield both peak deceleration of no more than 200 G-max and a Head Injury Criteria (HIC) value of no more than 1,000 for a head-first fall from the highest accessible point of play equipment being installed, as shown on the drawings.

B. Accessibility: NOTE: Children’s outdoor play areas shall be in compliance with the requirements of the Americans with Disabilities Act Accessibility Guidelines (ADAAG).

C. Poured in place surfaces intended to serve as accessible paths of travel for persons with disabilities shall be firm, stable and slip resistant, and shall meet the requirements of ASTM F 1951 and ASTM F 1292.

D. The finished Poured-In-Place Rubber surface shall meet the following ASTM requirements:

1. Dry Static Coefficient of Friction (ASTM D2047): 1.0

2. Wet Static Coefficient of Friction (ASTM D2047): 0.9

3. Dry Skid Resistance (ASTM E303): 89

4. Wet Skid Resistance (ASTM E303): 57

5. Flammability (ASTM D2859): Pass

6. Tensile Strength (ASTM D412): 60 psi

7. Tear Resistance (ASTM D624): 40% Elongation at break point (140% Original Size)

8. Weathering criteria - After being subject to a freeze/thaw cycle in accordance with ASTM C67 and after being subject to 200 degrees Fahrenheit for 7 days in accordance with ASTM D573, the same sample shall be retested in accordance with ASTM F1292 at 72 degrees Fahrenhiet only. Test values shall not exceed 200 g-max and 1000 HIC.

1.05 QUALITY ASSURANCE

A. Installers/Applicators: Minimum of 3 years successful experience in the installation of the type of equipment specified.

B. Safety surface shall be warranted by the manufacturer for a period of 5 years from the date of final acceptance by the Owner. Safety surface shall maintain required impact attenuation characteristics and be guaranteed against defects in workmanship and material. Warranty will be specific to maintenance requirements and performance standards of completed product.

C. Conditions of all substrates with respect to structural performance shall be evaluated and approved by the applicator prior to applying the system.

D. Contractor/applicator shall provide a minimum of one Fall Height Test per ASTM F 1292 from the highest accessible point of each piece of play equipment being installed.

1.06 SUBMITTALS

A. Three (3) original hard copies of the submittal package will be provided (Additional hard copies shall be made available upon request). This package shall include, but not be limited to, all specifications, manufacturer’s name and product code for all materials (Cushion Layer, Binders and Wear Course), MSDS sheets for all products, details and testing data.

B. Certificate of Material Compliance should be provided to the owner before delivery and installation of the safety surface. Certificate should be sent to Owner directly by the manufacturer. See sample of Certificate at end of this Section.

C. Manufacturer’s details showing depths of Wear Course and Cushion Layer together with sub-base materials, anchoring systems and edge details.

D. Upon request, a listing of at least five installations where products similar to those proposed for use have been installed and have been in service for a minimum period of 2 years. The list shall include owners and/or purchaser’s name, address of installation, date of installation, contact person and contact information.

E. A signed statement from the manufacturer of the poured-in-place surfacing attesting that all materials under this section shall be installed only by the Manufacturer’s Trained Installers.

F. A certificate of Insurance shall be provided by the manufacturer for poured in place surfacing for uses as a playground safety surfacing, with the limits equal to, or exceeding, levels as indicated in the specifications.

G. Three (3) 4-inch x 4-inch samples of the each color combination of the Wear Course as specified on the plan for approval.

H. Test report, from an independent testing laboratory, showing that the safety surfacing system meets or exceeds the test requirements and standards specified herein.

I. Certification by manufacturer's authorized representative that safety surfacing has been properly furnished and installed.

J. Maintenance Literature for all products used.

K. Installation instructions for all products used.

L. Technical data and product literature for all items used.

M. Product Warranties.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle products of this Section as recommended by the Manufacturer, to prevent damage.

B. All materials shall be delivered in good conditions in original unopened packages with labels intact.

C. All materials shall be protected from weather and the binder shall be stored in temperatures 40°F (4°C) or higher.

1.08 SEQUENCING AND SCHEDULING

A. Poured in place surfacing must be installed after all playground equipment and other structural elements, such shade structures, signs and barriers. Surface installation shall be coordination by a manufacturer’s representative.

1.09 PROJECT SITE/JOB CONDITIONS

A. Poured in place surfacing must be installed on a dry sub-surface, with no prospect of rain within the initial drying period, and within the recommended temperature range of the manufacturer.

B. Installation in weather conditions where the temperature is less than 55 degrees Fahrenheit, and/or high humidity, may affect cure time, and the structural integrity of the final product. Contractor shall consult manufacturer for recommendations on installation during these conditions and adjust types and/or quantities of binding agents to compensate for weather conditions. At no time during the installation/application and curing period shall be less

than 40 degrees Fahrenheit and shall remain above 40 degrees Fahrenheit for at least 72 hours after completion.

C. Immediate surrounding sites must be reasonably free of dust conditions or this could affect the final look.

D. All materials shall be protected from weather and other damage prior to application, during application and while curing.

E. Barricade area to prohibit foot traffic on surface for the time specified by manufacturer, minimum of 48 hours after placement.

PART 2 PRODUCTS

2.01 GENERAL

A. Poured in Place Surface: The poured in place surface shall consist of 100% recycled shredded tire material mixed with a polyurethane and capped with either a TPV or Thermoplastic Aliphatic Urethane (TAU) granule and mixed with polyurethane.

B. It shall consist of a uniform material manufactured in such a way that the top portion meets the requirements specified herein for wear surface.

C. The type of safety surfacing shall be a poured-in-place system and shall be as indicated on the drawings.

D. Finished surface shall have been tested for shock attenuation under ASTM F 1292 G-Max and HIC

E. Finished surface shall be non-slip and porous.

2.02 CUSHION LAYER

A. Impact Attenuating Cushion Layer: Cushion layer consists of shredded styrene butadiene rubber (SBR) adhered with a 100% solids polyurethane binder to form a resilient porous surface.

B. Strands of SBR may vary from 0.5mm – 2.00mm in thickness and 3.0mm – 20mm in length. Binder will be 16% of the total weight of the granules used in the Cushion Layer and shall provide 100% coating of the particles.

C. Substitution of SBR Cushion Layer is noted to be a standard but must be pre-approved.

D. The Cushion Layer must be compatible with the Wear Course and must meet requirements herein for impact attenuation.

E. Cushion Layer must be guaranteed to be 100% metal free.

F. Depth of Cushion Layer shall be per the requirements of ASTM F1292.

2.03 WEARING COURSE

A. Wear Course shall consist of Colored Thermoplastic Plastic Vulcanized (TPV) or Thermo Plastic Aliphatic Urethane (TAU) granules with polyurethane binder formulated to produce an even, uniform, seamless surface. Approved TPV/TAU manufacturer(s):

1. Rosehill Polymers Ltd. – licensed United States manufacturer is American Recycling Center, Inc. - 655 Wabassee Drive, Owosso, MI 48867, Phone: (989) 725-5100, Fax: (989) 725-5122, Web: http://www.americanrecycling.com.

2. Approved equal.

B. TPV and TUA granules shall be angular or round in shape with a particle size of 1 – 4mm. Binder shall be not less than 19% of total weight of granules used in the wear surface, and shall provide 100% coating of the particles.

C. Thickness of Wearing Course shall be a minimum of ½ inch under all areas of the playground, except for the following:

1. Under swing zone for swing sets: ¾ inch minimum.

2. Under safety zone for all non-stationary or spinning play equipment: 3/4 inch minimum.

D. Color Mixtures:

1. As specified on the plans.

2. Use of Black is not permitted in Wearing Course.

2.04 POLYURETHANE PRIMER AND BINDER

A. Primer and Binder shall be a single component Polyurethane pre-polymer formulated using a polymeric foam of Dephenylmethane Diisocyanate (MDI).

B. No Toluene Diphenel Isocyanate (TDI) shall be used.

B. No filler materials shall be used in urethane such as plasticizers and the catalyzing agent shall contain no heavy metals.

C. Approved manufacturer’s and products:

1. Dow Chemical Company - Polyurethane Systems - North American Headquarters, 1881 West Oak Parkway, Marietta, Georgia 30062, Phone: (770) 428-2684, Fax: (770) 421-3216.

a. VORAMER® MDI Polyurethane Binders.

2. Stockmeier Urethanes USA, Inc., 20 Columbia Boulevard, Clarksburg, WV 26302 - 1456, USA, Phone: (304) 624 7002, Fax: (304) 624 7020, Web: www.stockmeier.com.

   a. Stobielast® MDI Polyurethane Binders.

3. Rosehill Polymers Ltd. – licensed United States manufacturer is American Recycling Center, Inc. - 655 Wabassee Drive, Owosso, MI 48867, Phone: (989) 725-5100, Fax: (989) 725-5122, Web: http://www.americanrecycling.com.

   a. FLEXILON MDI Polyurethane Binders.

4. Approved equal.

D. Weight of polyurethane shall be no less than 8.5 pounds/gallon and no more than 9.5 pounds/gallon.

E. Manufacturer is permitted to modify the type of urethane required to match the weather conditions, Substitutions must be equal to, or exceed, Voramer quality as manufactured by DOW Chemical. Substitutions will not be accepted unless pre-approved by the Owner.

2.05 GRAVEL SUBBASE

A. PennDOT 2A Modified Gravel compacted to 95%.

PART 3 EXECUTION

3.01 INSPECTION

A. Prior to application of the system, the substrate's structural performance shall be evaluated. Notify all contractors and architect of all discrepancies. Work shall not proceed until unsatisfactory conditions are corrected.

B. Finished grade: Verify that finished elevations of adjacent areas are as indicated on the drawings, that the appropriate sub-grade elevation has been established for the particular safety surface to be installed, and that the subsurface has been installed in a true, even plane, and sloped to drain as indicated in drawings

C. Sub Base: Tolerance of concrete or bituminous sub base shall be within 1/8 inch in 10 feet. Tolerance of aggregate sub base shall be within 3/8 inch in 10 feet. Verify that aggregate sub base has been fully compacted in 2" watered lifts to 95% or greater.

D. Curing of Asphalt and Concrete: If poured in place surfacing is installed, verify that concrete sub base has cured and that all concrete curing compounds and other deleterious substances that might adversely affect adhesion have been removed. Surface shall be clean and dry.

E. Drainage: Verify that subsurface drainage, if required, has been installed to provide positive drainage.

3.02 INSTALLATION

A. Perimeter of Safety Surfacing area shall meet flush with adjacent curbs and paving.

B. Safety Surfacing shall extend a minimum distance of 6'-0" in all directions from perimeter of playground equipment, and additional distance as indicated on the Drawings and as required to conform with specified standards, including guidelines contained in the CPSC Handbook for Public Playground Safety. Sloped border shall not be considered as part of the minimum safety surfacing area.

C. Poured in Place Surfacing: Components of the poured in place surfacing shall be mixed on site in a rotating tumbler to ensure components are thoroughly mixed and are in accordance with the manufacturer's recommendations and meet with the ratios indicated in section 2.07 above. Whenever practical, Installation of the surfacing shall be seamless up to 1,200 square feet per day and completely bonded to concrete of sub base. Material shall cover all foundations and fill around all elements penetrating the surface.

D. Cushion Layer: Whenever practical, cushion layer of surfacing material shall be installed in one continuous pour on the same day of up to 2,000 square feet. When the second pour is required, step the seam and fully coat the step of the previous work with polyurethane binder primer to ensure 100% bond with new work. Apply adhesive in small quantities so that new cushion layer can be placed before adhesive dries

E. Wear Course: Wear course must be either high quality peroxide cured TPV or TAU granules. Wear surface should be bonded to Cushion Layer. Additional primer will be used between the Cushion Layer and Wear Course. Apply adhesive to Cushion Layer in small quantities allowing the Wear Course to be applied before the adhesive dries. Surface shall be hand troweled to a smooth, even finish. Except where the Wear Course is composed of differing color patterns, pour shall be continuous and seamless whenever practical up to 1,200 square feet per day. Where seams are required due to color change, size or adverse weather, a step configuration will be constructed to maintain Wear Course integrity. The edge of the initial pour shall be coated with adhesive primer and wearing surface mixture immediately applied. Pads with multiple seams are encouraged to include a top cost of urethane before being placed into use. Butt joint seams are not acceptable except for repairs. Under special conditions and with the owner's written approval, seams may be permitted in same color pad.

F. Perimeter: Concrete/asphalt perimeter must be saw-cut to size indicated on plans, or formed during pour, with surfacing rolled down inside void. Primer adhesive must be applied to all sides of the void. When connecting to a concrete curb or border, the hardened edge shall be primed with adhesive and the final 2" shall be tapered to allow the Wear Surface material to be a minimum of 1" thick where it joins the concrete edge.

G. Thickness: Construction methods, such as the use of measured screeds thicker than the required surfacing depth, shall be employed to ensure that full depth of specified surfacing material is installed. Surfacing system thickness throughout the playground area shall be as required to meet the impact attenuation requirements specified herein.

H. Manufacturer's installers shall work to minimize excessive adhesive on adjacent surfaces or play equipment. Spills of excess adhesive shall be promptly cleaned.

J. Manufacturers/Installers Services: For poured in place safety surfacing, a manufacturer's and/or installer's representative who is experienced in the installation of playground safety surfacing shall be provided. The representative shall supervise the installation to ensure that the system meets impact attenuation requirements and has been installed using specified materials in the ratios indicated herein

3.03 CLEANING

A. Upon completion of installation of safety surfacing, clean all work thoroughly.

B. Remove debris and excess soil and pavement removals from site.

3.04 PROTECTION

A. The synthetic safety surface shall be allowed to fully cure in accordance with the manufacturer's recommendations.

B. The surface shall be protected by the General Contractor from all traffic during the curing period of 48 hours or as instructed by the manufacturer. Barricade area to prohibit foot traffic on surface for the time specified by manufacturer, minimum of 48 hours after placement.

3.05 FIELD TESTING

A. General Contractor to submit written Audit of the completed installed SAFETY SURFACE by an independent Certified Playground Safety Inspector (CPSI), after safety surface is completely installed. No additional compensation will be given for any necessary corrective work.

B. Audit parameters: The surface must yield both peak deceleration of no more than 200 G-max and a Head Injury Criteria (HIC) value of no more than 1,000 for a head-first fall from the highest accessible point of play equipment being installed, as shown on the drawings. Provide a minimum of three (3) drop tests in the safety zone of each play equipment.

END OF SECTION 32 12 10

Certificate of Material Compliance _____

Site Location:_____

Total Sq Footage: _____

Material Ship Date: _____ Installation Date:_____

The installing contractor certifies to the owner _____ that all materials used in the installation of the pour in place (PIP) surface noted below are of the same components and manufacturer that was approved by _____.

These materials consist of the following:

Cap Surface Material: _____ Binder Type_____
(Fill in product Name & Reference Number)

Cushion Material:_____ Binder Type_____
(Fill in product Name & Reference Number)

Color Percentages & Sq Footages

1.	2.
3.	4.

Binder % Ratios

CAP	Cushion

Contractor:

_____

Address:

_____

Contact Phone Number:

_____ Ext _____

Sign_____Date_____

Print _____

Material Supplier:

_____

Address:

_____

Contact Phone Number:

_____ Ext _____

Sign_____Date_____

Print_____

Authorization / Accepted (Sign)_____ Date_____

(Owner Representative) (Print Name) _____

SECTION 32 13 10
ASPHALT PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Asphaltic concrete paving; surface course, binder course and base course.

1.2 RELATED SECTIONS

A. Section 31 23 10 - Excavation, Backfill and Subgrade Preparation for Paving

B. Section 32 13 20 - Concrete Paving

1.3 SUBMITTALS

A. Design Mix: Before any asphaltic concrete paving is constructed, submit actual design mix to the Owner's Civil Engineer for review and/or approval. Design mix submittal shall follow the format as indicated in the Asphalt Institute Manual MS-2, Marshall Stability Method; and shall include the type/name of the mix, gradation analysis, grade of asphalt cement used, Marshall Stability (lbs.), flow, effective asphalt content (percent), and direct references to the Standard Specifications sections for each material. The design shall be for a mixture listed in the current edition of the Standard Specifications. Mix designs over three years old will not be accepted by the owner.

B. Material Certificates: Submit materials certificate to the Owner's Civil Engineer which is signed by material producer and Contractor, certifying that materials comply with, or exceed, the requirements herein.

1.4 JOB CONDITIONS

A. Weather Limitations:

1. Apply prime and tack coats when ambient temperature is above 40°F, and when temperature has been above 35°F for 12 hours immediately prior to application. Do not apply when base is wet, contains excess moisture, or during rain.

2. Construct asphaltic paving when atmospheric temperature is above 40°F.

1.5 REFERENCES

A. MS-2-Mix design methods for asphaltic concrete and other hot mix types per The Asphalt Institute (AI)

B. MS-3-Asphalt Plant Manual per The Asphalt Institute (AI)

C. Hot Mix Asphalt Paving Handbook per US Army Corp of Engineers, UN-13 (CE MP-ET)

D. MS-19-Basic Asphalt Emulsion Manual per The Asphalt Institute (AI)

E. ASTM D946 - Penetration - Graded Asphalt Cement for use in Pavement Construction

F. AASHTO M-226/ASTM D3381 Asphalt Cement

G. AASHTO M-140/ASTM D997 or AASHTO M-208/ASTM D-2397 Tack Coat

H. AASHTO M-117/ASTM D242 Mineral Filler

I. AASHTO T-245/ASTM D1559 Marshall Mix Design

PART 2 PRODUCTS

2.1 MATERIALS

A. Provide asphalt-aggregate mixture as shown on drawings. Use locally available materials and gradations, which meet the Standard Specifications and exhibit satisfactory records of previous installations.

B. Asphalt Cement: Comply with AASHTO M-226/ASTM D 3381; Table 2 AC-10, AC-20, or AC-30, viscosity grade, depending on local mean annual air temperature. (See chart below):

Temperature Condition	Asphalt Grades
Cold, mean annual air temperature at 7 degrees C (45 degrees F) or lower	AC-10 85/100 pen.
Warm, mean annual air temperature between 7 degrees C (45 degrees F) and 24 degrees C (75 degrees F)	AC-20 60/70 pen.
Hot, mean annual air temperature at 24 degrees C (75 degrees F) or higher	AC-30

C. Prime Coat: A medium curing cut-back asphalt or an asphalt penetrating prime coat consisting of either MC-30 or SS-1h.

D. Tack Coat: Emulsified asphalt; AASHTO M-140/ASTM D 997 or AASHTO M 208/ASTM D 2397, SS-1h, CSS-1, or CSS-1h, diluted with one part water to one part emulsified asphalt.

E. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with AASHTO M-17/ASTM D 242, if recommended by applicable state highway standards.

F. Asphalt-Aggregate Mixture: Unless otherwise noted on the Drawings, the Design Mix shall have a minimum stability based on a 50-blow Marshall Mix Design Procedure complying with ASTM D 1559 of 1000 lb with a flow between 8 and 16. The Design Mix shall be within sieve analysis and bitumen ranges below:
SIEVE ANALYSIS OF MIX

Square Sieve	Total Percent Passing	Percent Tolerance
3/4”	100	7%

1/2”	80 - 100%	5%
3/8”	65 - 93%	4%
#8	40 - 55%	4%
#50	12 - 27%	2%
#200	0 - 10%	0%

Percent bitumen by weight of total mix: 5.0 - 8.5.
Air voids: 3-6%
Percent aggregate voids filled with asphalt cement: 70 - 82%.
Allowable variance of percent bitumen by weight of total mix = 0.4

2.2 EQUIPMENT

Maintain equipment in satisfactory operating condition and correct breakdowns in a manner that will not delay or be detrimental to progress of paving operations.

PART 3 EXECUTION

3.1 PREPARATION

A. Remove loose material from compacted base material surface immediately before applying prime coat.

B. Proof roll prepared base material surface to check for areas requiring additional compaction and areas requiring removal and recompaction.

C. Do not begin paving work until deficient base material areas have been corrected and are ready to receive paving.

3.2 APPLICATIONS

A. Prime Coat:

1. Apply bituminous prime coat to all base material surfaces where asphaltic concrete paving will be constructed.

2. Apply bituminous prime coat in accordance with APWA Section 2204 and applicable Standard Specifications.

3. Apply at minimum rate of 0.25 gallon per square yard over compacted base material. Apply to penetrate and seal, but not flood surface.

4. Make necessary precautions to protect adjacent areas from overspray.

5. Cure and dry as long as necessary to attain penetration of compacted base and evaporation of volatile substances.

B. Tack Coat:

1. Apply to contact surfaces of previously constructed asphaltic concrete base courses or Portland cement concrete and surfaces abutting or projecting into asphaltic concrete or into asphaltic concrete pavement.

2. Apply tack coat to asphaltic concrete base course or sand asphalt base course. Apply emulsified asphalt tack coat between each lift or layer of full depth asphaltic concrete and sand asphalt bases and on surface of all such bases where asphaltic concrete paving will be constructed.

3. Apply emulsified asphalt tack coat in accordance with APWA Section 2204 and Pennsylvania highway specifications.

4. Apply at minimum rate of 0.05 gallon per square yard of surface.

5. Allow to dry until at proper condition to receive paving.

3.3 ASPHALTIC CONCRETE PLACEMENT

A. Place asphaltic concrete mixtures on completed compacted subgrade surface, spread, and strike off. Spread mixture at following minimum temperatures:

1. When ambient temperature is between 40°F and 50°F, mixture temp. = 285°F

2. When ambient temperature is between 50°F and 60°F, mixture temp. = 280°F

3. When ambient temperature is higher than 60°F, mixture temp. = 275°F

B. Whenever possible, all pavement shall be spread by a finishing machine; however, inaccessible or irregular areas may be placed by hand methods. The hot mixture shall be spread uniformly to the required depth with hot shovels and rakes. After spreading, the hot mixture shall be carefully smoothed to remove all segregated course aggregate and rake marks. Rakes and lutes used for hand spreading shall be of the type designed for use on asphalt mixtures. Loads shall not be dumped faster that than can be properly spread. Workers shall not stand on the loose mixture while spreading.

C. Paving Machine Placement: Apply successive lifts of asphaltic concrete in transverse directions with the surface course placed in the direction of surface-water flow. Place in typical strips not less than 10’-0” wide.

D. Joints: Make joints between old and new pavements, or between successive days and work in a manner that will provide a continuous bond between adjoining work. Construction joints shall have same texture, density, and smoothness as other sections of asphaltic concrete course. Clean contact surfaces of all joints and apply tack coat.

3.4 ROLLING AND COMPACTION

A. The mixture, after being spread, shall be thoroughly compacted by rolling as soon as it will bear the weight of the rollers without undue displacement. The number, weight, and types of rollers and sequences of rolling operations shall be such that the required density and surface are consistently attained while the mixture is in a workable condition.

B. The bituminous concrete pavement shall have a minimum thickness as specified on the contract drawings and should be compacted to a minimum of 96% of the maximum unit weight as determined by the Marshall Mix Design Procedures in accordance with ASTM D-1559.

C. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

D. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling with hot material.

E. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

F. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

G. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot asphaltic concrete. Compact by rolling to maximum surface density and smoothness.

H. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.5 FIELD QUALITY CONTROL

A. The Owner's Civil Engineer shall perform construction testing of in-place asphaltic concrete courses for compliance with requirements for thickness, compaction and surface smoothness. Asphaltic surface and base courses shall be randomly cored at a minimum rate of one core for
every 20,000 square feet of paving. However, no less than three cores in light duty areas and three cores in heavy-duty areas shall be obtained. Coring holes shall be immediately filled with full-depth asphalt or with concrete. Asphaltic Concrete pavement samples shall be tested for conformance with the mix design.

B. Grade Control: Establish and maintain required lines and elevations.

C. Temperature: The Owner's Civil Engineer shall monitor the asphaltic concrete mixture on the paver immediately prior to spreading asphalt mixture to certify that the minimum temperature requirements of this section are met. Temperature measurement shall be taken on the average of one test per 20 tons of material.

D. Thickness: In-place compacted thickness shall not be less than thickness specified on the drawings. Areas of deficient paving thickness shall receive a tack coat and a minimum 1" overlay; or shall be removed and replaced to the proper thickness, at the discretion of the Owner; until specified thickness of the course is met or exceeded at no additional expense to the Owner.

E. Surface Smoothness: The Contractor shall perform testing on the finished surface of each asphalt concrete course for smoothness, using 10'-0" straightedge applied parallel with, and at right angles to centerline of paved area. These tests shall be performed under the observation of the Owner's Civil Engineer. Surfaces will not be acceptable if the following 10' straightedge tolerances for smoothness are exceeded.

Base Course Surface: 1/4"
Wearing Course Surface: 3/16"

F. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable paving as directed by Owner.

G. Compaction: The Owner's Civil Engineer shall perform in place density tests as part of the construction testing requirements using the Nuclear Method in accordance with ASTM D-2922 Method B direct transmission. Field density tests shall be performed at the rate of one test per 20,000 square feet of pavement.

H. Laboratory Confirmation of Field Compaction: Density tests for in place materials shall be performed by examination of field cores in accordance with one of the following standards:

1. Bulk specific gravity of paraffin-coated specimens: ASTM D-1188.

2. Bulk specific gravity using saturated surface-dry specimens: ASTM D-2726.

Rate of testing shall be one core per 20,000 square feet of pavement, with a minimum of 3 cores from heavy-duty areas and 3 cores from standard-duty areas. Cores shall be cut from areas representative of the project.

Areas of insufficient compaction shall be delineated, removed, and replaced in compliance with the specifications at no expense to the Owner.

END OF SECTION 02510

SECTION 32 13 20
CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. The work required under this Section consists of furnishing all labor, materials, equipment, services and related items necessary to complete all Dry-shake colored hardener applied to pavements where indicated on Drawings AND curing of colored concrete.

1.2 RELATED SECTIONS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. The following related items of work are included under other sections:

1. Section 03 30 00 - Cast-In-Place Concrete

2. Section 07 92 10 - Joint Sealants

3. Section 31 10 00 – Site Preparation

4. Section 31 20 10 - Earthwork

5. Section 32 23 10 – Excavation, Backfill and Subgrade Preparation for Pavement

1.3 QUALITY ASSURANCE

A. All definitions, details, or other factors entering into this work shall conform to the "Philadelphia Building Code Requirements Reinforced Concrete" (ACI-301 and "Manual of Standard Practice for Detailing Reinforced Concrete Structures" (ACI-315) of the American Concrete Institute, except where otherwise specified herein. Where these regulations or specifications conflict, the more stringent requirements will govern.

B. Codes and Standards

1. Comply with local governing regulations if more stringent than herein specified.
2. Comply with applicable standards of the American Concrete Institute.

C. Submittals

1. Furnish samples, submit data for all materials and items, including forming accessories, admixtures, patching compounds, joint systems, curing compounds, dry-shake finish materials, and others as required by the Owner.

D. Job Conditions

1. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize flagmen, barricades, warning signs and warning lights as required.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Forms for Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

1. Use plywood with smooth plastic facing, “Finnply”, Class I, Exterior Grade or better, edge-sealed.

B. Form Coatings: Provide commercial formulation form-coating compounds on non-plastic faced plywood, that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

2.2 MATERIALS

A. Portland Cement: ASTM C 150, Type I, unless otherwise acceptable to the Project Consultant. The cement used in concrete below grade shall have a tricalcium aluminate content (C3A) of between 4% (min.) and 10% (max.).

1. Use one brand of cement throughout project, unless otherwise acceptable to the Project Consultant.

B. Normal Weight Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.

1. Local aggregates not complying with ASTM C 33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to the Project Consultant.

C. Water: Potable.

D. Air-Entraining Admixture: ASTM C 260.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
   a. "WRDA 19"; W.R. Grace.
   b. "Super P"; Anti-Hydro.
   c. "Sikament"; Sika Chemical Corp.
   d. "Eucon Super 37"; Euclid Chemical Corp.
   e. "Pozzolith 400"; Master Builders.

E. Water Reducing, Non-Chlorine Accelerator Admixture: ASTM C 494, Type E, and contain not more than 0.05% chloride ions.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
   a. "Accelguard 80"; Euclid Chemical Co.
   b. "Pozzolith 500"; Master Builders.

F. Water-Reducing, Retarding Admixture: ASTM C 494, Type D, and contain not more than 0.05% chloride ions.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
   a. "Pozzolith 300-R"; Master Builders.
   b. "Eucon Retarder 75"; Euclid Chemical Co.
   c. "Daratard"; W.R. Grace.
   d. "Plastiment"; Sika Chemical Co.

G. Bonding compound: Acrylic or Styrene Butadiene

1. Products: Subject to compliance with requirements provide one of the following:
   a. J-40 Bonding Agent; Dayton Superior Corp
   b. Everbond; LM Construction Chemicals
   c. Hornweld; A.C. Horn, Inc.
   d. Sonocrete, Sonneborn-Rexnord
   e. Acrylic Bondcrete; The Burke Co
   f. SBR Latex; Euclid Chemical
   g. Daraweld C; W.R. Grace
2. Prohibited admixtures: Calcium chloride thyocyanates or admixtures containing more than 0.1 per cent chloride ions.

H. Certifications: Provide admixture manufacturer's written certification that chloride ion content complies with specified requirements.

I. Calcium chloride.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Remove loose material from compacted gravel base course surface immediately before placing concrete.

B. Proof-roll prepared gravel base course surface to check for unstable areas and need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

C. All subgrades under paving and other work of this Section must be brought to maximum density before placement of any paving work or materials. Do not place any paving materials until all subgrades over which they are to be installed have been brought to satisfactory density.

3.2 FORM CONSTRUCTION

A. Set forms to required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

B. Formwork for curved surfaces shall be set to form smooth continuous curves as indicated on the plans. Contractor shall score back of formwork, if required, to achieve and form smooth radii and curves as indicated on the plans. Contractor shall request approval from Landscape Architect of finished curved formwork prior to concrete pour. Contractor shall provide Landscape Architect a minimum of 24 hours notice.

C. Check completed formwork for grade and alignment to following tolerances:

1. Top of forms not more than 1/8" in 10'.
2. Vertical face on longitudinal axis, not more than 1/4" in 10'.

D. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.

3.3 CONCRETE PLACEMENT

A. Pre-placement Inspection: Notify the owner's representative at least 24 hours before placing concrete, allow inspection and complete form work installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

B. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

C. General: Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as herein specified.

D. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

E. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid included construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

F. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practice.

G. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

H. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operations, within limits of construction joints, until the placing of a panel or section is completed.

I. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

J. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

K. Maintain reinforcing in proper position during concrete placement operations.

L. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified. When air temperature has fallen to or is expected to fall below 40 F (4 C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 F l0 C), and not more than 80 F (27 C) at point of placement.

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

N. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

O. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

P. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 F (32 C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.

Q. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

R. Use water-reducing retarding mixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

S. Do not place concrete until gravel base course and forms have been checked for line and grade. Moisten gravel base course if required to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

T. Place concrete using methods which prevent segregation of mix.

U. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocation of dowels and joint devices.

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

W. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2-hour, place a construction joint.

3.4 JOINTS

A. General: Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of concrete.

Construct transverse joints at right angles to the centerline, unless otherwise indicated. When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into areas as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows:

1. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finish edges with a jointer.

C. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for a period of more than 1/2-hour, except where such placements terminate at expansion joints. Construct joints as shown or, if not shown, use standard metal keyway-section forms.

D. Expansion Joints:

1. Provide closed cell polyethylene foam expansion joint filler and sealant backers for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks and other fixed objects, unless otherwise indicated.
2. Place expansion joints at 20'o/c maximum in sidewalk areas.
3. Extend joint fillers full-width and depth of joint, and trim to be slightly below finished concrete surface.
4. Furnish and install joint fillers as per manufacturer's recommendations.

5. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.

3.5 CONCRETE FINISHING

A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

B. After floating, test surface for trueness with a 10' straight-edge. Distribute concrete as required to relieve surface irregularities, and refloat repaired areas to provide a continuous smooth finish.

C. Work edges of slabs, back top edge of curb, and formed joints with an edging tool, and round to 1/2" radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

D. After completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing, with a magnesium float finish. Provide steel trowel edging where shown on drawings.

E. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Project Consultant.

3.6 CONCRETE CURING AND PROTECTION

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

1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 30l procedures. Avoid rapid drying at end of final curing period.

B. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.

1. Provide moisture curing by following methods:
   a. Keep concrete surface continuously wet by covering with water.
   b. Continuous water-fog spray.
   c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

C. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing

period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

D. Use membrane-forming curing and sealing compound or approved moist curing methods.

3.7 REPAIRS AND PROTECTIONS

A. Repair and replace broken or defective concrete, as directed by Project Consultant.
B. Drill test cores where directed by Project Consultant, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.
C. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
D. Sweep concrete pavement and wash free of stains, discoloration's, dirt and other foreign material just prior to final inspection.

- END -

SECTION 32 31 10
CHAIN LINK FENCING

PART 1 - GENERAL

1.1 SUMMARY

A. The work required under this section consists of furnishing all labor, materials, equipment, services, and related items necessary to complete all the Chain Link Fencing work as indicated on the drawings and described in the specifications. The work includes, but is not limited to Chain Link Fencing.

1.2 RELATED SECTIONS

A. Section 31 20 10 - Earthwork

1.3 QUALITY ASSURANCE

A. Provide chain link fences and gates from a single source including necessary erection accessories, fittings, and fastenings.

B. Perform work in compliance with applicable requirements of governing authorities having jurisdiction.

C. All material specified herein shall be full weight and first class in every respect. All fittings necessary to produce a complete installation shall be included even though not specifically mentioned.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for metal fencing, fabric, and accessories.

B. Shop drawings showing layout, fabrication, assembly, color, and erection details in accordance with the supplementary conditions shall be submitted to the Project Consultant for approval.

PART 2 - PRODUCTS

2.1 GENERAL

A. Dimensions indicated, for pipe, roll-formed, and H-sections are outside dimensions, exclusive of coatings.

B. Available Manufacturers: Subject to compliance with requirements, provide products of one of the following:

1. Allied Tube and Conduit Corp.
2. American Fence Corp.
3. Anchor Fence, Inc.

2.2 STEEL FABRIC

A. Fabric: 1-1/4” BLACK & 2" BLACK mesh, with both top and bottom selvages to be knuckled. See drawings for call out of type.

1. Furnish one-piece fabric width.
2. Fabric Finish (See Drawings for type)
   a. 6 gauge Galvanized for all surfaces including cut ends, ASTM A 392, Class II, with not less than 2.0 oz. zinc per sq. ft. of surface.
   b. 6 gauge Aluminum-coated for all surfaces including cut ends, ASTM A491-63T. Weight of coating shall be determined in accordance with current ASTM Specification A 428.
   c. PVC-coated over galvanized wire: ASTM F 668, Class 2b, 7 mil (0.18 mm) thermally fused polyvinyl chloride in Black and Blue color. ASTM A 641, galvanized steel core wire, tensile strength 75,000 psi (571 MPa), with 9 gauge core wire.
3. All fabric shall have a tensile strength of 80,000 psi minimum, unless otherwise indicated on the drawings.
4. Certification of fabric is required.

2.3 FRAMING AND ACCESSORIES

A. Steel Framework, General (See Drawings for Type):

1. Galvanized steel, ASTM A 120 or A 123, with not less than 1-8 oz. zinc per sq. ft. of surface.
   a. Fittings and Accessories: Galvanized, ASTM A 153, with zinc weights per Table I.
2. Materials for aluminum-coated steel chain link fence shall conform to the requirements specified in the AASHTO. Designation M181-60, with the following amendments:
   a. Aluminum for coating shall conform to the requirements specified therefore in ASTM, Specification A491-63T. Weight of coating shall be determined in accordance with current ASTM, Specification A428.
3. PVC-Coated finish: In accordance with ASTM F1043, apply supplemental color coating of 10-15 mils (0.254 - 0.38 mm) of thermally fused PVC in Black

color to match fabric. In areas where blue fabric is being used, framework will be galvanized steel and not PVC-Coated.

4. All coatings to be applied inside and out after welding.

B. Line, End, Corner and Pull Posts: Standard O.D. (as per schedule 40) pipe of nominal diameters shown on Standard Chain Link Fencing Table included at the end of this section.

C. Top Rail and Bottom Rail: Manufacturer's longest lengths, with expansion type couplings, approximately 6" long, for each joint.

1. 1 5/8" O.D. pipe, .140" minimum pipe wall thickness; 2.27 lbs. per lin. ft.

D. Wire Ties: Shall be of nine (9) gauge galvanized steel spaced 1 ft. 2 in. apart on line posts and 2 ft. apart on top, bottom, and middle rails. Each end shall be wrapped around the chain link fabric at least 540 degrees.

E. Post Tops: Shall be a pressed steel or malleable iron, weather tight, closure cap. Provide one (1) through riveted cap for each tubular post.

F. Stretcher Bars: One-piece lengths equal to full height of fabric, with minimum cross-section of 3/16" x 3/4". Provide one stretcher bar for each gate corner and pull post, except where fabric is integrally woven into post.

G. Stretcher Bar Bands: Bands shall be 11 gauge spaced not over 14" o.c., to secure stretcher bars to end, corner, pull, and gate posts. Install stretcher bars at vertical edges and at top and bottom edges. Attach stretcher bars to gate frame at not more than 14" o.c.

2.4 CHAIN LINK SWING GATES (See Drawings for Type)

A. Gate frames: Fabricate chain link swing gates in accordance with ASTM F 900 using galvanized steel tubular members, 2@ (50 mm) square, weighing 2.60 lb/ft (3.87 kg/m). Weld connections forming rigid one-piece unit.(no substitution) Vinyl coated frames thermally fused with 10 to 15 mils (0.254 mm to 0.38 mm) of PVC per ASTM 1043.

B. Chain link fence fabric: PVC thermally fused to metallic coated steel wire, ASTM F 668, Class 2b, in Black color, mesh, and gauge to match fence. Install fabric with hook bolts and tension bars at all 4 sides. Attach to gate frame at not more than 15@ (381 mm) on center.

C. Hardware materials: Hot dipped galvanized steel or malleable iron shapes to suit gate size. Field coat moveable parts (e.g. hinges, latch, keeper, and drop bar) with PVC touch up paint, provided by manufacturer, to match adjacent finishes.

D. Hinges: As recommended by the fence manufacturer and structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate to swing 180° inward or 180° outward. Provide 2 per gate leaf.

E. Latch w/ Padlock: Fulcrum type capable of retaining gate in closed position and have provision for padlock. Latch shall permit operation from either side of gate. Padlock & 4 keys – Master keyed for #2126

F. Transom: Provide a transom over gate to complete height of fence, using one top and bottom rail and fabric to match balance of fence.

2.5 PVC COATED ACCESSORIES (Where vinyl-coated fencing specified)

A. Chain link fence accessories: (ASTM F 626) Provide items required to complete fence system. Galvanize each ferrous metal item and finish to match framing.

B. Post caps: Formed steel, cast malleable iron, or aluminum alloy weathertight closure cap for tubular posts. For each line post provide tops to permit passage of top rail.

C. Top rail and brace ends: Pressed steel per ASTM F626, for connection of rail and brace to terminal posts.

D. Top rail sleeves: 7@ (178 mm) expansion sleeve with spring, allowing for expansion and contraction of top rail.

E. Wire ties and clips: 10 gauge 0.135@ galvanized steel wire for attachment of fabric to line posts. Double wrap 13 gauge 0.092@ for rails and braces.

F. Brace and tension (stretcher bar) bands: Pressed steel. At square post provide tension bar clips.

G. Tension (stretcher) bars: One piece lengths equal to 2@ (50 mm) less than full height of fabric with a minimum cross-section of 3/16@ x 3/4@ (4.76 mm x 19 mm) or equivalent fiberglass rod. Provide tension (stretcher) bars where chain link fabric meets terminal posts.

H. Truss rods & tightener: Steel rods with minimum diameter of 5/16@ (7.9 mm). Capable of withstanding a tension of minimum 2,000 lbs.

I. Nuts and bolts are galvanized but not vinyl coated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Coordinate setting of posts with construction activities of other trades.

B. Line Posts: Posts shall be spaced not more than eight (8) feet on centers in line of fence. They shall be plumb with tops properly aligned, and embedded securely in concrete foundations as shown on drawings.

C. End, Corner and Pull Posts: Provide terminal post at each termination and change in horizontal or vertical direction of 30 degrees or more. All posts shall be plumb with tops properly aligned, and embedded securely in concrete foundations as shown on drawings.

D. Post Footings:

1. Drill holes in firm, undisturbed or compact soil. Gate post footings shall have a diameter not less than 12" in diameter. Holes shall have a depth approximately 6" deeper than post bottom. Excavate deeper, as required, for adequate support in soft and loose soils and heavy lateral loads.
2. Place concrete around posts in a continuous pour. Trowel finish tops of footings and slope or dome to direct water away from posts.

E. Stretcher Bars: Provide one stretcher bar for each corner and end post. Thread tension bar through or clamp to fabric 4" o.c., and secure to posts with metal bands spaced 15" o.c.

F. Top Rails: Run rails continuously through post caps. Provide expansion couplings as recommended by fencing manufacturer.

G. Bottom Rails: Attach to line or end posts with galvanized steel boulevard clamps.

H. Fabric:

1. Fabric shall be tied in such a manner as to be flush with the top of the top rails and the bottom of the bottom rails. The bottom rails shall be installed two inches above finish grade. Pull fabric taut and tie to posts, rails, and tension wires. Fabric shall be pulled tight in accordance with standard practice using "come along" or other approved method.
2. Where fencing encloses court game areas such as tennis or basketball, the fabric shall be installed on the inside, facing the court game area. In all other areas, unless otherwise indicated on the drawings or directed by the Project Consultant, the fabric shall be installed on the outside.

I. Tie Wires: Use U-shaped wire, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least 2 full turns. Bend ends or wire to minimize hazard to persons or clothing:

1. Tie fabric to line posts, with wire ties spaced 14" o.c.
2. Tie fabric to rails and braces, with wire ties spaced 24".

J. Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

K. Cleaning Up: The contractor shall remove from the vicinity of the completed work all unused material and debris of any nature.

L. Handling: Care shall be taken when handling and installing fence materials to avoid damage to materials. Any materials damaged shall be rejected from use in the finished installation.

END OF SECTION 02831

SECTION 22 53 00
SPRAYGROUND EQUIPMENT

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. Contractor shall furnish all labor, materials, equipment and perform all operations necessary for the completion of the work as shown on the drawings. This includes all excavation, concrete footings, sand backfill, hardware, fittings, nozzles, water piping, and accessories, including the controller, and finishes as required, in accordance with the drawings, specifications and directions of the Owner's Representative.

B. Contractor shall coordinate work with Electrical Contractor for the installation of the controller and electrical wiring and conduit for the sprayground equipment.

1.2 RELATED SECTIONS

A. Applicable Sections: Division 1

B. Section 31 23 20 – Trench Excavation and Backfill for Utilities

C. Section 31 23 10 – Excavation and Backfill for Pavement

D. Section 32 13 20 – Concrete Paving

E. Section 33 11 00 – Water Service

F. Section 33 30 10 – Storm Sewers

G. Section 03 30 00 – Cast In Place Concrete

1.3 REFERENCES

A. Work and materials shall conform to the latest editions of the following standards:

1. City of Philadelphia – Plumbing Code – Latest Edition

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2. ASTM C478 – Standard Specification for Precast Reinforced Concrete Manhole Sections and Catch Basins.

1.4 SUBMITTALS

A. Product Submittals:

1. Contractor shall submit 6 copies for approval before beginning work.
2. Submit manufacturer's product data for water spray fixtures and system components including vault, activator(s), pipes, fittings and valves.
3. Submit drawings to indicate layout of water park components and location of anchors and footings. Clearly indicate, to scale the spatial relationship of each piece of equipment to each other and to other existing or proposed features including adjacent surfaces or

vegetation. Indicate to a scale the limits of spray zones and non-encroachment areas to clearly demonstrate conformance with specified standards.

4. Submit shop drawings of the spray fixtures including spray nozzles and colors, for approval.

B. Closeout Submittals:

1. Comply with requirements as noted in Division 1.
2. All Spray fixtures are to carry a minimum warranty of two (2) year on all workmanship and materials. Submit warranty to Owner.
3. Provide maintenance and winterizing data.

1.5 QUALITY ASSURANCE

A. The installation shall be as indicated on the drawings, and in accordance with the manufacturer's recommendation as reviewed and approved by the owner. The installation shall be accomplished by skilled work personnel.

B. It shall be the obligation of the Contractor to insure that all criteria are satisfied and the burden or proof of conformance shall rest with the contractor. The Engineer shall require complete calculation, past performance records, and if required, inspection trips of similar facilities to substantiate conformance with these criteria. The Engineer shall be the sole judge of conformance and the Contractor is cautioned that he will be required to Bid and provide a finished product meeting all stated criteria. It is recommended that the contractor or project manager follow an inspection and approval process, as provided by manufacturer.

C. Manufacturer's Qualifications:

1. Manufacturer shall have a minimum 10 years experience in the manufacture of water spray fixtures and components. The person(s) responsible for installation shall have supervised/installed a minimum of 3 (three) installations in the State of Pennsylvania
2. The person(s) responsible for installation shall be on-site performing such service.
3. Licensed plumbers and electricians shall be used as required by local codes.

C. Storage and Protection:

1. Protect pre-finished metal from abrasion and corrosion during storage and assembly.
2. DO NOT remove packaging from components prior to pouring final slab.

D. Product Delivery:

1. Deliver materials to job site in an undamaged condition.
2. Inspect all items for abraded surfaces and other unacceptable deliver conditions. Return damaged or non-conforming items to manufacturer for replacement.

1.6 SITE CONDITIONS

A. Temperature and Weather Requirements:

1. Do not install spray equipment when temperatures are 40 degrees and/or decreasing below 40 degrees.

B. Substrate Requirements:
   1. Do not place concrete on muddy or frozen substrate.
   2. Remove mud, dirt, and ice from formwork surfaces.

C. Existing Conditions:
   1. Locate underground utility systems and other below grade site improvements in area of surface and footing excavations.

D. Sequencing:
   1. Order materials and start fabrication of fixtures and components after approval of shop drawings by the Owner's Representative.

PART 2 PRODUCTS

2.1 MANUFACTURER:

A. Interactive Water Features and Water Management Systems shall be Aquatix® named designs and model numbers, as manufactured by Landscape Structures, 1101 McKinley Parkway, Telephone: 1-763-972-5200 or approved equal. The local Landscape Structures/Aquatix representative is Mr. Will Hemler Will@gen-rec.com , Telephone: 610-304-1973.

B. For products specified by naming only one product and manufacturer, there will be no substitutions unless the substitution is approved as an equal or better, 2 weeks prior to bid opening.

C. All equipment shall be installed in accordance with the installation specifications. The contractor shall use due care when installing the features. Protective wrapping shall be left intact throughout the installation and be removed only upon completion. Structures shall be installed in accurate locations, square, centered, plumbed, and at the required elevation relative to final grade on footings as per the layout.

D. All phases of the installation shall be inspected by the owner, or an authorized representative of the owner, up to and including the final inspection as laid out in the Waterplay Project Inspection Checklist.

2.3 SCHEDULE OF WATER SPRAY COMPONENTS:

A. The following is a schedule of the spray fixtures to be provided and installed. All fixtures are to be stainless steel unless otherwise noted:

FIXTURE	QUANTITY
1. Arch Jet	4
2 Water Jewel	2
3 Stream Jet	1

2.4 PRODUCT CONSTRUCTION: Interactive Water Features

A. Above ground spray fixtures shall be constructed of Stainless Steel Type A304, A304L or

A316, schedule 40 or 10. Stainless steel base plate materials will be 2B finish at ½" thick. Each spray fixture shall have a 1 ½" NPT coupling water inlet.

B. In-ground spray fixtures shall be 2 ½" schedule 40 or 6" schedule 40, type A304 stainless steel canisters with a machined nozzle seat. Each fixture will have a 1" NPT coupler water inlet. Each fixture shall have a 8" x 4" x ¼" base plate with two ½ " holes to accommodate two (2) stainless steel 3/8"-10 NC by 5" long L-type anchor bolts to be set in a concrete footing.

C. Spray fixtures are to meet ADA compliance for handicap accessibility, and meet or exceed current ASTM playground safety standards.

D. Spray fixtures will be supplied with all necessary anchoring hardware and installation templates to accommodate site work. For In-ground spray features, anchor templates shall include wooden template, stainless L bolts 3/8" diameter x 5", complete with 4 x 3/8" stainless steel flat washers and 4 x 3/8" stainless steel nuts.

E. All spray fixtures shall have fittings that allow for winter close off.

F. All spray fixtures of below grade design shall address winterization.

2.5 NOZZLES

A. Spray fixture nozzles shall be constructed of Delrin by Dupont®, non-corrosive, impervious to galling, precision machined, and interchangeable. Brass and Nylon are not acceptable. Nozzles shall be capable of providing varying water displays and consumptions to meet the hydraulic requirements of the spray fixtures and the individual park. A mechanical workbook must be supplied to show individual flow rates for each feature including maximum and average flow for each pre-programmed sequence step.

B. Nozzles shall be tamper resistant and shall be secured using tamper resistant fasteners.

2.4 COATINGS

A. Fixtures shall receive a coat of weather-resistant super durable polyester powder, baked application, by Tiger Drylac U.S.A. Inc. or approved equal. Standard powder coatings are not acceptable.

B. Powder coatings shall be weather resistant and have ultraviolet inhibitors. Coatings shall have a high gloss finish, have ultraviolet inhibitors, withstand 1/10th no removal @160 in/lb, exceed all specifications of organic coatings, and a film thickness of between 1.5 to 3.0 mils (determined by color and finish). Where theme graphics are applied, use a base coat clear coat system. Supply aerosol touch up paint, color code as specified for spray fixtures.

C. Equipment must be packaged in a three step packaging process as follows:

1. The first layer is an open cell 1/8" foam wrapping
2. The second layer is a corrugated cardboard
3. The final layer is a waterproof polyethylene tarp wrap

D. Product must be shipped in dedicated nose load shipments secured with strapping.

2.5 WATER DISTRIBUTION AND MANAGEMENT SYSTEM:

A. Main line pipe and fittings to be schedule 40 PVC or greater. The distribution laterals and fittings are to be schedule 40 PVC or greater. Insure that a proper slope is consistently applied to all piping to ensure positive gravity-assisted drainage of the entire system. Ensure all fittings are secured to close openings (off season) to protect from water entry of water back into the piping system. (See nozzles section.)

B. Solenoid valves must be PVC, and of type having 24V AC, 0.250 mA max. holding current coil rating with flow control (Rainbird PGA series or equal). Valve wire shall be #18 AWG type R90, one per valve, plus one common back to the controller location.

2.6 CONTROL SYSTEMS:

A. All control systems shall be manufactured by Waterplay Solutions Corp., British Columbia, Canada or approved equal.

B. All activation mechanisms shall have no moving parts and be made accessible only with use of manufacturer supplied tamper resistant, stainless steel security hardware.

C. All Waterplay® components shall be grounded using bare #6 AWG wire and an approved ground lug in the 3/8” hole provided in the base plates. Consult local electrical inspector for local codes and final inspection.

2.7 ACCESSORIES:

A. All hardware, fittings and fastenings shall be as indicated on the shop drawings and may be required to complete the installation. Anchor fasteners to be stainless steel.

B. Lag bolts shall be stainless steel with flat type vandal-proof head in size indicated on plans. Anchors shall be stainless steel in size required. (tamper proof hardware shall be stainless steel, complete with owner supplied hardware security tools).

2.8 SPARE PARTS/EQUIPMENT:

A. Contractor shall provide the City of Philadelphia a spare set (18) of solenoid control valves for the water supply manifold. Contractor shall turn over spare parts to the City of Philadelphia project manager.

C. Contractor shall provide the City of Philadelphia a spare set of spray nozzles for the spray features specified. Contractor shall turn over spare parts to the City of Philadelphia project manager.

PART 3 EXECUTION

3.1 ACCEPTABLE INSTALLERS

A. Acceptable Installers:
   1. Firm with minimum 5 years experience in installing similar equipment.
   2. Pre-approved general contractor as identified by the owner
   3. The installation shall be accomplished by skilled work personnel. The installation of all water pipe and fittings, and the installation of all electrical wiring and conduit, shall be under the direct full-time supervision of a licensed corresponding trade, as approved by the owner. (See Manufacturer Inspection and Approval)

3.2 PERFORMANCE

A. Verification of Conditions:
   1. Examine all fixtures and components and verify that equipment is undamaged and ready for field assembly.
   2. Return damaged and non-conforming products to the manufacturer.
   3. Identify location of underground utility lines on surface.

B. Protection:
   1. Protect adjacent facilities, plants, trees, ground covers, grass, paved surfaces, and other site improvements from damage during assembly and installation.

C. Layout and Excavation:
   1. Lay out spray fixtures, components and supply and drain lines within pool areas.
   2. Excavation for Foundation: All excavation shall be cut accurately to required lines and dimensions for work on drawings, and shall be large enough to provide adequate clearance for the proper execution of the work within them.

E. Concrete Placement and Cast in Place Footings:
   1. Obtain approval from Owner's Representative prior to pouring concrete.
   2. Inspection: When the excavation has been carried to the required depth as shown on the drawings, the Contractor shall do no more work until after the inspection by the Engineer, who shall order the foundation work to proceed, or further excavation as the conditions indicate, and no other work shall be done until the excavation has been approved by the Engineer.

F. Installation
   1. Spray fixtures shall be installed in accordance with the manufacturer's specification, and approved by the owner. The contractor shall use extreme care when installing spray fixtures. All wrappings are to be left intact through installation and then to be removed upon completion.
   2. Entire assemblies shall be installed in accurate location, square and plumb, and in required location to surrounding finished grade, on footings, as shown on the plans.

3.3 COMPLETION

A. Testing: All Spray fixture lead lines shall be water pressure tested before backfilling and pouring of concrete slabs. The contractor is to ensure all water supply lines are free of debris, and flushed of any foreign material, prior to the hook-up of any spray fixtures, and the contractor shall have

inspected the entire system (including all electronic systems) in the presence of the Owners Representative.

B. Prior to the back- filling of any supply lines joints or connections, the lead lines to the components shall be pressure tested as directed by local specification. (The contractor is to ensure all nozzles are adjusted and secured to the owner's satisfaction.) The contractor is to test all drainage systems of the spray fixtures.

END OF SECTION 02665

SECTION 32 92 00
LAWNS AND GRASSES

PART 1 - GENERAL

1.1 SECTION SUMMARY

A. Provide seed, sod and related items. Seeding shall be where indicated and at a time allowed by environmental conditions, by adjacent construction operations, and as specified.

B. Review of conditions and materials affecting seed installations.

C. Maintenance of seeded or sodded areas.

1.2 RELATED SECTIONS

A. Applicable Sections: Division 1

B. Section 01 57 10 – Environmental Controls

C. Section 31 20 10 – Earthwork

D. Section 32 93 00 – Landscape Planting

1.3 SUBMITTALS

B. Notices and Scheduling

1. Submit a schedule itemizing lawn and meadow work to be performed. This schedule shall be in addition to Project Contract Schedule(s) required by General Conditions and shall be submitted within 45 calendar days after Contract Notice to Proceed.

a. Include in this schedule anticipated dates for commencement and sequencing of lawn and meadow seeding, including but not limited to seed bed fertilizer and water applications, seeding, sodding and commencement of maintenance period.

b. Schedule shall also include, and relate to, work specified in other sections, such as subgrade preparations; landscape soil placements and grading; utility installations paving and site wall installations; and other elements of site. Obtain related scheduling information from General Contractor.

2. Prior to seed and sod installation, submit confirmation of understanding that the following elements of work have been inspected and approved prior to start of any work of this Section:

a. Complete placement of planting soil mix including verification of acceptability of grades, quality of soil mixes, and quality of material placement.

b. Confirm, also, that no construction access will be required across lawn or meadow areas.

C. Product Data:

1. Submit manufacturers or supplier's literature or tear sheets giving name of product, manufacturers or supplier's name and evidence of compliance with Contract Documents.

2. Commercial fertilizer

3. Herbicides, pesticides and fungicides

4. Mulch(s)

D. Certificates:

1. Submit certified analysis for each treatment, amendment, and fertilizer material specified and as used. Include guaranteed analysis and weight for packaged material.

2. Prior to the use on site of any chemical weed control materials, submit a list of the weed control materials and quantities per acre intended for use in controlling the weed types expected on the site. Submittal shall include data demonstrating the compatibility of the weed control materials and methods of installation or application with the intended planting and seed or sod varieties.

E. Test Reports: Submit written reports of each grass and meadow seed mixture or sod composition. Each report shall include the following as a minimum and such other information required specific to material tested:

1. Date issued;

2. Project Title and names of Contractor and supplier;

3. Testing laboratory name, address and telephone number, and name(s), as applicable, of each field and laboratory inspector;

4. Date, place, and time of sampling and test;

5. Location of material source;

6. Type of test;

7. Recommendations for soil additives, mix proportions, and methods of preparation, as applicable, for optimum lawn and meadow conditions;

8. Test for purity, proportion by weight, weed seed content and germination percentage of seed mixtures proposed for use.

9. No seed shall be delivered until the test reports are approved. Seed shall be tested within six months immediately proceeding date of sowing. Owner reserves the right to have seed tested independently.

F. Samples:

1. Mulch: Two-pound bag of each type, with manufacture's recommendations on application rate for Hydro mulch.

G. Statement(s) of Qualifications: Submit to confirm qualifications as specified in Article 1.4, herein.

H. Maintenance Program: Submit a program for continued maintenance of lawn and meadow areas after Substantial Completion. Program shall include a report of conditions unique to site that has been identified during Contractor's maintenance of lawn and meadow work (Article 3.6, herein). Refer also to Article 1.4, herein.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Installation and maintenance foreman on the job shall be competent English-speaking supervisor(s), experienced in landscape installation and maintenance. Perform work with personnel totally familiar with lawn and meadow preparations and installations under the supervision of an experienced landscape foreman.

2. Exhibit and identify a record of at least three (3) lawn and meadow installations of similar scope or size to this Project.

B. Pre-installation Review of Related Work: Within 45 calendar days after Contract Notice to Proceed for seeding work or such later date as approved by Owner's Representative, but prior to first Pre-installation Conference, obtain data as necessary and review plant mix materials and soil amendments to be used for lawn and meadow areas of this Project. Become familiar with proposed plant mixes and on-site grading conditions. Reference Section 02920, Soil Preparation and Mixes, and design drawings.

1. Submit a report of acceptance of soil mixes as being appropriate for seed and sod installation and, if deemed necessary, recommendations for possible SOC adjustment of amendments.

2. Review conditions and coordinate findings of report at Pre-installation Conference.

C. Pre-Installation Conference: Prior to commencement of any of the work of this section, Contractor shall arrange a conference at the site of this Project with the Owner's

Representative, Construction Manager, and Landscape Architect. At least five-(5) working days notice shall be given prior to the conference.

1. Conference attendance will include the Contractor, the foreman appointed to oversee the work of this Section, the foreman responsible for soil preparation and mixes and soil placement, other representatives of Owner, and other persons as deemed appropriate for coordination of work and quality control.

2. At the conference, review lawn and meadow installation and sequence schedules, specification criteria and installation, procedures, outstanding submittals and approvals, and such other subjects necessary for coordination of Work.

3. Establish follow up meeting(s) as necessary including but not limited to a final pre-installation review of lawn and meadow area plant mix soil placement.

D. Inspection for Substantial Completion

1. Maintain all lawn and meadow areas until Substantial Completion. Maintenance will be in accordance with requirements specified in Article 3.6 of this Section.

2. The Landscape Architect will make an inspection for Substantial Completion of the work of this Section at the time of Substantial Completion of the entire Contract. The Contractor shall submit a full and complete written program for maintenance of the lawns and meadows for review by the Landscape Architect and Owner's Representative at the time of the request for substantial completion.

   a. Submit a written request for inspection at least 14 calendar days prior to the day on which the inspection is requested.

   b. Contractor shall prepare a list with status of items to be completed or corrected for review by the Landscape Architect, prior to inspection.

   c. At time of the Landscape Architect's inspection, all lawns and meadows shall show a uniform, thick, well-developed stand of plants. If the stand is unsatisfactory, as determined by the Landscape Architect, the Contractor's maintenance responsibility shall continue until an acceptable stand of plants is achieved.

   d. Upon completion of the inspection, the Landscape Architect will amend Contractor's list of items to be completed or corrected as determined necessary and will indicate the anticipated time period for their completion or correction.

3. Lawns and meadows will not be accepted until all items of lawn and meadow work have been completed or corrected. The Landscape Architect, after Contractor's completion of outstanding work, will recommend to the Owner, in writing, the Substantial Completion of the lawn and grasses work of this Section.

a. The Contractor's responsibility for maintenance, however, shall terminate only upon issuance of acceptance by Owner for Substantial Completion.

1.5 REFERENCES

A. SPN: "Standardized Plant Names," latest edition, by the American Joint Committee on Horticultural Nomenclature.

B. Association of Official Agricultural Chemists.

C. ASTM: American Society for Testing and Materials using test criteria as specified or required by other references.

D. AASHTO: American Association of State Highway and Transportation Officials.

1.6 REGULATORY REQUIREMENTS

A. Comply with all rules, regulations, laws and ordinances of local, state and federal authorities having jurisdiction. Provide labor, materials, equipment and services necessary to make Work comply with such requirements without additional cost to Owner.

B. Procure and pay for permits and licenses required for work of this section.

1.7 PROJECT/SITE CONDITIONS

A. Acquaintance With Existing Site Conditions:

1. Through study of all Contract Documents, and by careful examination of the site, become informed as to the nature and location of the Work, the nature of surface and subsurface soil conditions, the character, quality and quantity of the materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the Work, the general and local conditions, and all other matters which can in any way affect the Work.

2. Investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to, ingress and egress of this work site. Conform to all governmental regulations in regard to the transportation of materials to, from, and at the job site, and secure in advance such permits as may be necessary.

B. Should the Contractor, in the course of Work, find any discrepancies between Contract Drawings and physical conditions or any omissions or errors in Drawings, or in layout as furnished by the Owner, it will be Contractors duty to inform the Landscape Architect (Design Consultant) immediately in writing for clarification. Work done after such discovery, unless authorized by the Landscape Architect, shall be done at the Contractor's risk.

C. Sequencing and Scheduling:

1. Adjust, relate together, and otherwise coordinate work of this Section with Work of Project and all other Sections of Specification.

2. Seed installations shall not begin until all other constructions, including installation of all utilities and placement of planting soil mixes, are complete and possibility from damage caused by operations does not exist.

D. Environmental Requirements:

1. Perform soil work only during suitable weather conditions. Do not disc, rototill, or work soil when frozen, excessively wet, or in otherwise unsatisfactory condition.

2. Place grass seed or sod only at seasonal times within appropriate temperature range and wind conditions for plant development as approved by Landscape Architect:

a. Acceptable Seeding Seasons/Times:

1) Spring: April 1st - June 15th

2) Fall: September 1st - October 15th

b. Seeding or sodding at any time other than within the above seasons shall be allowed only when the Contractor submits a written request for permission to do so and permission is granted in writing by the Owner. Newly seeded or sodded areas, if installed out of season, must be continuously watered according to best recommended and Landscape Architect approved practice. Contractor shall be responsible for providing an acceptable stand of grass as specified.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in unopened bags or containers, each clearly bearing the name, guarantee, and trademark of the producer, material composition, manufacturers' certified analysis, and the weight of the material.

B. Bulk Materials

1. Deliver bulk materials with each individual shipment accompanied by an affidavit from the vendor (supplier), countersigned by the Contractor upon receipt, identifying the material type, composition, analysis, and weight and certifying that the material furnished complies with specification requirements of this Project.

2. Affidavits shall be furnished in duplicate with one copy submitted to Construction Manager at the end of day of shipment receipt at the Project site and the second copy retained with material or on file with Contractor.

C. Mulch, amendment materials, or soil stored on site temporarily in stockpiles prior to placement shall be protected from intrusion of contaminants, erosion and from mechanical or environmental damage.

PART 2 - PRODUCTS

2.1 TEMPORARY TURF

A. Temporary turf seed mix shall be as specified on the Erosion Control Plans, Notes, and Details.

2.2 PERMANENT TURF

A. Permanent turf seed mix shall be the following:

Seed Type	Proportion by Weight	Minimum Purity	Minimum Germination
1. Turf-Type Tall Fescue	60%	95%	80%
2. Perennial Rye Grass	30%	95%	85%
3. Kentucky Blue Grass	10%	90%	80%

2.3 SOD

A. Nursery-grown and cultivated from certified seed containing seed mix as specified for Permanent Turf. Sod shall be from 11 to 36 months in age before lifting, uniform in density, natural green color, free of noxious weeds. Cut sod to a 3/4 inch depth. 1/8 inch tolerance plus or minus, with grass height at 1 1/2 inches to 2 inches, wetted before cutting. Obtain approval of sod and certify its grass types and percentages before cutting or delivery to Project Site.

2.4 TOPSOIL

A. Existing topsoil stripped from the project site, disturbed areas only, may be used for lawns, planting and transplanting work. Contractor shall verify if available project site topsoil is sufficient in quantity to perform the required work. If project site topsoil is insufficient the contractor shall provide topsoil from an approved off project site source(s) as required to complete work.

B. Topsoil to be imported to the project site shall be a sandy loam topsoil (as defined in USDA Soil Texture Classification) and be fertile, friable, well-drained, pH range of 6.0 to 6.5, free of subsoil, toxic substances harmful to plant growth, without clay lumps, stones, roots or debris. The imported topsoil shall have a mechanical analysis as follows:

1. Sand: 35 percent to 40 percent.
2. Clay: 15 percent to 20 percent.
3. Organic Matter: 2.5 percent.
4. Silt: Balance

2.5 FERTILIZER

A. Conforming to standards of Association of Official Analytical Chemists, delivered to Project Site in sealed and labeled bags, or in bulk with certification as to quality and analysis. Nitrogen source shall be at least 33 percent water insoluble. Fertilizer shall have the following formulations:

1. Basic Fertilizer: 10-10-10 or 10-6- 4 analysis.
2. Starter Fertilizer: 5-10-10 or 10-20-20 analysis.

B. Fertilizer shall be delivered to the site, mixed as specified, in the original unopened standard size bags showing weight, analysis and name of manufacturer. Containers shall bear the manufacturer's guaranteed statement of analysis or a manufacturer's certificate of compliance covering analysis shall be furnished to the Landscape Architect. Store fertilizer in a weatherproof place and in such a manner that it shall be kept dry and its effectiveness shall not be impaired.

2.6 LIMESTONE

A. Ground agricultural dolomitic limestone, 90 percent calcium carbonate equivalent, conforming to standards of Association of Official Analytical Chemists and applicable State and Federal Regulations. Material shall have a total of 100% passing the 10 mesh sieve, minimum of 90% passing the 20 mesh sieve, and a minimum of 60% passing the 100 mesh sieve.

2.7 SOIL-STABILIZING AGENT

A. For use in hydroseed mix only. Material shall be one (1) of the following:

1. "Verdyol Complex": Weyerhaeuser Company,
2. "Curasol": Wolbert Master Associates,
3. "Terra-Tack": Grass Growers, Inc,
4. "J-Tac": Reclamare Company,
5. Approved Equal.

2.8 MULCH MATERIALS

A. General Use: Straw, salt marsh hay, or a combination of both. Material shall be:

1. Reasonably weed free, not brittle or overly decomposed.
2. Cured to less than 20% moisture content by weight.
3. Contain no stems of tobacco, soybeans, or other coarse or woody material.

2.9 HYDROSEEDING MATERIALS

A. Fiber mulch shall be biodegradable, non-toxic green dyed-wood cellulose-fiber mulch; nontoxic; free of plant-growth or germination inhibitors; with maximum mixture content of 15 percent and a pH range of 4.5 to 6.5.

B. Nonasphaltic tactifier shall be a colloidal tactifier recommended by the fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors. Material shall be one (1) of the following:

1. "Verdyol Complex": Weyerhaeuser Company,
2. "Curasol": Wolbert Master Associates,
3. "Terra-Tack": Grass Growers, Inc,
4. "J-Tac": Reclamare Company,
5. Approved Equal.

2.10 EROSION CONTROL BLANKET/FABRIC NETTING

A. Contractor shall provide and install where indicated on civil drawings “Curlex” blankets: by American Excelsior Company; “Polyjute” Style465 CT: by Synthetic Industries or approved equal.

B. The area to be covered shall be properly prepared, fertilized, and seeded before blanket is applied. When blanket is unrolled, the netting shall be on top and the fibers in contact with the soil over the entire area. In ditches, the blanket shall be applied in the direction of the flow of water, butted snugly at ends and side and stapled. On slopes, the blankets shall be applied either horizontally or vertically to the slope. Ends and sides shall be butted snugly and stapled. Staple to manufacturer’s recommendations.

2.11 WATER

A. Potable, clean, fresh and free from harmful material. Water shall be furnished by Owner as necessary for lawn installation and maintenance. Include all hoses and other irrigation equipment required for correct use of water without waste.

2.12 ACCESSORY MATERIALS

A. Herbicides: For possible use if there is seed germination in lawn areas after plant soil mix placement and prior to seed installation. Herbicides shall be approved before use for type and rate of application by the Landscape Architect and by local and state agencies with jurisdiction.

1. Post-emergent shall be Roundup, as manufactured by Monsanto Agricultural Products Company, C3NJ, St. Louis, MO 63166, or an approved equal.

B. Sod Stables: 11 Gauge steel wire staples, one (1) inch wide and six (6) inches long for securing sod to slopes 4:1 (25%) or greater.

A. Lawn areas shall have fertilizer applied in two (2) applications with a thorough watering immediately following application. The first application shall be one (1) week before the seeding at the rate of 35 pounds per 1,000 square feet harrowed into the top two inches (2”) of seedbed. The second application shall be done at the rate of 25 pounds per 1,000 square feet, immediately following the second mowing.

B. Commercial fertilizer for temporary turf seed areas shall be a 10-10-10-grade fertilizer (600lbs/acre).

PART 3 - EXECUTION

3.1 VERIFICATIONS

A. Prior to construction of lawn and meadow areas, ascertain the location of all electric cables, conduits, underdrainage systems and utility lines. Take proper precautions so as not to disturb or damage sub-surface elements. Contractor failing to take these precautions shall be responsible for making requisite repairs to damaged utilities at Contractors own expense.

B. Verify that required underground utilities are available, in proper location and ready for use. Coordinate with other trades.

C. Verify that all final grades blend with adjacent grades and that area(s) to be seeded is free from depressions and abrupt changes in slope and that all grades as placed have been approved by, and remain satisfactory to Landscape Architect.

D. Verify that all tree planting in lawn areas and all shrub beds adjacent to lawn areas have been installed, will remain as approved, and no further construction work will occur which will or may require access through lawns and meadows.

3.2 SUBSOIL PREPARATION

A. Inspect rough grade subsoil. Eliminate uneven areas and low spots. Remove, for example, debris, roots, branches and stones in excess of 2 inches in size. Remove subsoil which has been contaminated with petroleum, concrete spills, and toxic substances.

B. Bring subsoil to required levels, profiles and contours. Cut out areas to receive topsoil specified in this Section, and otherwise to subgrade elevations as specified in Section 02200 – Earthwork.

C. Cultivate subgrade to a depth of 6 inches where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.

D. Maintain during grading operations the specified compaction, restore previously compacted areas and test soil compaction according to Section 02200 - Earthwork.

3.3 TOPSOIL PLACEMENT AND LAWN BED PREPARATION

A. Inspect subsoil prior to placing topsoil to confirm subsoil conditions meet the requirements of this specification. If subsoil conditions do not meet the requirements repeat subsoil preparation work as specified under this Section.

B. Place topsoil in areas where seeding, sodding and planting are to be performed. Place to the following minimum depths, up to finished grade elevations: Six (6) Inches for seeded and sodded areas.

C. Incorporate the following materials uniformly throughout entire depth of topsoil:

1. Limestone: 100 pounds per 1,000 square feet or as determined by agricultural soil test reports.
2. Basic Fertilizer: 3 pounds per 1,000 square feet or as determined by agricultural soil test reports.

D. Use topsoil in relatively dry state. Place during dry weather. Do not spread wet or clumpy topsoil.

E. Fine grade topsoil to the required levels, profiles and contours. Eliminate rough and low areas to ensure positive drainage. Establish proper flowline gradients and profiles for swales and other storm management features. Drag smooth and hand rake topsoil to final grade elevations. Roll if necessary to stabilize in order to commence seeding. Remove all ruts, mounds, and ridges on surface of topsoil. Remove all stones greater than 1 inch, roots, weeds, or other debris visible on soil surface. Resulting holes shall be filled with specified topsoil, leaving a uniform planar surface. Grade uniformly so soil surface does not have low spots which may collect water. Finish grades shall be within ¼ inch +/- tolerance of finish grades indicated on the plans.

F. Manually spread topsoil around trees, plants, and other construction to prevent possible damage by grading equipment.

G. Blend topsoil smoothly into undisturbed areas. Do not place topsoil on existing vegetation in undisturbed areas. Maintain required depth of topsoil at limit of grading line.

H. Lightly compact and roll placed topsoil.

I. Clean all paved and building surfaces and remove soil to maintain quality of finished surface.

J. Allow for and verify that planting soils of lawn and meadow areas, completed in placement with deficiencies corrected as necessary, to settle for a minimum fourteen (14) days prior to beginning of lawn and meadow installation.

K. Coordinated sequencing of work shall allow immediate seed and sod installation after completion of verifications and preparations. \

3.4 ADDITIONAL SEED AND SOIL AMENDMENTS

A. Starter fertilizer: Add starter fertilizer at the following rates to surface of seed bed or include as an ingredient in hydroseed mix: 40 pounds per 1,000 square feet.

3.5 SEEDING

A. Seeding shall be done between the following dates:

1. Permanent Seeding:

a. Spring Seeding: April 1 to June 15.
b. Fall Seeding: August 15 to November 1.

2. Temporary (Non-Permanent) Seeding:

a. January 1 to December 31.

B. Prior to seeding contractor shall inspect surface soil bed conditions to assure they meet the requirements for receiveing seed. At minimum the soil bed surface shall be roughened to break-up large clods and surface crust, to scarify and fine rake to remove irregularities that will hold water.

C. Manual or mechanical sowing of seed may be by the following optional methods:

1. Mechanical Power-Drawn Seeder: Combination grass planter and land packer or pulverizer. Plant seed not deeper than [1/4 inch] {6 mm}. Keep seeding operation as close as possible to contours and not up and down slopes. After seeding, compact with land roller, such as a cultipacker. With proper equipment, sowing seed and cultipacking in one (1) operation is satisfactory.

2. Hopper Type Spreader: Manually-propelled or power-drawn hopper devices. Uniformly distribute seed by sowing half seed in one (1) direction and remainder at right angles to direction of first sowing. Cover seed an average depth of [1/4 inch] {6 mm} by means of chain harrow, cultipacker, or other approved method.

D. Hydroseeding: Mix specified seed, fertilizer and fiber mulch in water using clean, washed equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into a homogenous slurry suitable for hydraulic application. Hydraulic broadcasting of prepared material.

1. Hydroseed at the following rates per acre:

a. Water: As specified.
b. 1,500 pounds of wood cellulose, plus 15 percent for slopes 5 percent and steeper.
c. Fertilizer: As specified for starter fertilizer. Starter fertilizer may be added to surface of seed bed.
d. Soil stabilizer of type and at rate recommended in writing by manufacturer.
e. Seed Mix: As specified.
f. For a 3,000 gallon tank, multiply specified quantities by 0.75. Mix and agitate all materials, except wood cellulose, in 2,200 gallons of water; then add wood cellulose, fill tank with water and continue agitation. Seed promptly, under constant agitation of mix, beginning when

complete mix is a uniform slurry. Limit coverage for 3,000 gallon tank to 0.75 acre.

g. Take precautions against overspray onto roads, curbs, sidewalks, building walls, and other surfaces except ground areas. Contractor shall promptly clean all areas of overspray to satisfaction of Owner's Representative and Landscape Architect.

3.6 SODDING

A. Provide sod as indicated on Drawings.

B. Place sod on topsoil bed prepared as indicated for seeded areas, including lime, basic fertilizer and starter fertilizer applied to bed surface. At time sod is placed, topsoil shall be in a damp, friable, loose condition, with no surface crust.

C. Retain sod on slopes equal to or steeper than four (4) horizontal to one (1) vertical and in drainage swales, using sod staples driven into sod until top is flush with sod.

D. In placing sod, keep rows parallel with contour lines. Keep Work true to finished grade, and tamp or roll to establish firm contact with topsoil bed. Butt pads tightly and stagger ends with those in adjacent rows. If sod separates less than [1/2 inch] {13 mm}, backfill with topsoil flush with sod and overseed. If sod separates [1/2 inch] {13 mm} or greater, overlay with sod and spade cut to fit.

3.7 MULCHING

A. Except hydroseeded areas, seeded areas sloped four (4) horizontal to one (1) vertical or greater, and areas where lawn would be difficult to establish, shall be mulched at rate of 1.5 tons per acre.

B. Use wood fiber mulch or soil stabilizing agents, hydraulically applied in water at rate of 1,500 pounds of wood fiber per acre, plus l5 percent on slopes greater than four (4) to one (1).

C. For dry-mulched areas, spray with soil-stabilizing agent/tackifier material immediately after spreading straw or salt marsh hay or both, at rate of 200 gallons of asphalt per acre, in a method to bind mulch to soil and inhibit wind loss of mulch. Do not apply soil-stabilizing agent/tackifier material within when ambient temperature is below 55 degrees F. Clean off misplaced spray from building walks, paving, light standards and bases, and other surfaces to satisfaction of Owner's Representative or Landscape Architect.

3.8 WATERING

A. Keep newly sodded areas moistened until grass becomes well established and have shown signs of knitting with topsoil.

B. In event of insufficient rainfall, moisten areas every two (2) or three (3) days until sod becomes established. Thereafter, water in absence of rain every seven (7) to ten (10) days. When watering sod, make sure that water soaks through sod into topsoil bed below.

3.9 PROTECTIVE WORK

A. Provide materials and Work necessary to protect Work from damage. Prevent damage to Owner's property and Work specified in other Sections during these operations.

B. Protective Work shall include wire line and stakes along walkways with cloth strips at 4 feet intervals as evidence of wire and also "KEEP OFF" signs.

C. Defer Work when continuation of construction Work must occur over certain lawn areas.

3.10 MAINTENANCE PRIOR TO ACCEPTANCE

A. Maintain all sodded areas by properly mowing, watering, weeding, and similar care to keep Work in a clean and neat condition at all times. Advise Owner's Representative, in writing, when Work is in condition to meet acceptance.

3.11 CONDITIONS OF ACCEPTANCE

A. Fine Lawns shall be approved to begin one (1) year Maintenance and Guarantee Period based on the following requirements:

1. Bare spots, not greater than 1 square foot, shall be permitted up to a maximum of 3 percent of Fine Lawn Area.

B. Sod Areas shall be approved to begin one (1) year Maintenance and Guarantee Period based on the following requirements:

1. Sodded areas shall have been mowed at least twice since time of installation.
2. Sod shall have shown signs of knitting with topsoil layer and adjoining sod pads. Open joints between sod pads nor sod slippage on slopes shall not be accepted.
3. Sod shall be in a thriving and vigorous condition exhibiting a healthy green color. Bare spots or brown spots shall not be accepted.

C. During one(1) year Maintenance and Guarantee Period, Owner shall do no Maintenance Work, watering or cutting of lawns provided under this Contract.

D. Contractor may use existing underground irrigation systems if available.

E. When Work meets conditions specified above, Date of Acceptance shall be Date that Guarantee Period commences. Design Professional shall notify Contractor in writing of said Date.

3.12 MAINTENANCE AND GUARANTEE OF LAWN AREAS AND SODDED AREAS

A. Provide all Maintenance Work throughout Guarantee Period, which shall be one (1) year from Date of Acceptance.

B. Guarantee Work to be in vigorous and thriving condition by end of Guarantee Period, free of objectionable quantities of weeds and other undesirable growth. Maximum percentage allowed for scattered bare spots shall not exceed 3 percent of fine lawn area. Each bare spot shall not be larger than 1 square foot.

C. Maintenance Work shall include watering, remedial Work such as repair of eroded areas, and resodding if required. Provide general cleanup of stakes, strings, temporary signs, and sweeping of paving and sidewalks. Cut grass a minimum of 26 cuttings a year. Include other Work as maintenance as necessary, for example, lawn feeding, grub control and weeding, broadleaf weed control as deemed required by Contractor in support of Guarantee, or as may be brought to his/her attention during Guarantee Period.

D. Additional fertilization and limestone shall be required. Spread one (1) additional application of 10-6-4 fertilizer evenly over fine lawn area at rate of 25 pounds per 1,000 square feet and spread one (1) additional application of limestone at rate of 100 pounds per 1,000 square feet. Complete applications in fall season of year approaching termination of Maintenance and Guarantee Period.

E. Cutting of fine lawn areas shall occur when grass is dry and to maintain a height of about 2 inches. Cut grass a maximum of 1/3 of total grass blade height. Maintain a neatly-trimmed edge condition throughout at all times.

F. During one (1) year Maintenance and Guarantee Period, Owner shall do no Maintenance Work, watering or cutting of lawns provided under this Contract.

3.13 FINAL INSPECTION AND ACCEPTANCE

A. Toward end of Maintenance and Guarantee Period, give notice in writing to Owner's Representative stating desired Date for Final Inspection.

B. At time of Final Inspection, lawn Work shall be in condition required by Maintenance and Guarantee Work indicated.

C. If Work is accepted at time of Final Inspection, Guarantee shall be considered fulfilled and terminated. Should any Work need replacement at time of Final Inspection, continue Guarantee Period until such replacements are made and deemed acceptable.

D. Design Professional shall notify Contractor in writing of Date of Final Acceptance.

END OF SECTION

SECTION 32 92 10
TURF GRASS SEEDING

PART 1 GENERAL

1.1 SECTION SUMMARY

A. Provide seed, sod and related items. Seeding shall be where indicated and at a time allowed by environmental conditions, by adjacent construction operations, and as specified.

B. Review of conditions and materials affecting seed installations.

C. Maintenance of seeded or sodded areas.

1.2 RELATED SECTIONS

A. Applicable Sections: Division 1

B. Section 01 57 10 – Environmental Controls

C. Section 31 20 10 – Earthwork

D. Section 32 90 00 – Landscape Planting

1.3 SUBMITTALS

B. Notices and Scheduling

1. Submit a schedule itemizing lawn and meadow work to be performed. This schedule shall be in addition to Project Contract Schedule(s) required by General Conditions and shall be submitted within 45 calendar days after Contract Notice to Proceed.

a. Include in this schedule anticipated dates for commencement and sequencing of lawn and meadow seeding, including but not limited to seed bed fertilizer and water applications, seeding, sodding and commencement of maintenance period.

b. Schedule shall also include, and relate to, work specified in other sections, such as subgrade preparations; landscape soil placements and grading; utility installations paving and site wall installations; and other elements of site. Obtain related scheduling information from General Contractor.

2. Prior to seed and sod installation, submit confirmation of understanding that the following elements of work have been inspected and approved prior to start of any work of this Section:

a. Complete placement of planting soil mix including verification of acceptability of grades, quality of soil mixes, and quality of material placement.

b. Confirm, also, that no construction access will be required across lawn or meadow areas.

C. Product Data:

1. Submit manufacturers or supplier's literature or tear sheets giving name of product, manufacturers or supplier's name and evidence of compliance with Contract Documents.

2. Commercial fertilizer

3. Herbicides, pesticides and fungicides

4. Mulch(s)

D. Certificates:

1. Submit certified analysis for each treatment, amendment, and fertilizer material specified and as used. Include guaranteed analysis and weight for packaged material.

2. Prior to the use on site of any chemical weed control materials, submit a list of the weed control materials and quantities per acre intended for use in controlling the weed types expected on the site. Submittal shall include data demonstrating the compatibility of the weed control materials and methods of installation or application with the intended planting and seed or sod varieties.

E. Test Reports: Submit written reports of each grass and meadow seed mixture or sod compostion. Each report shall include the following as a minimum and such other information required specific to material tested:

1. Date issued;

2. Project Title and names of Contractor and supplier;

3. Testing laboratory name, address and telephone number, and name(s), as applicable, of each field and laboratory inspector;

4. Date, place, and time of sampling and test;

5. Location of material source;

6. Type of test;

7. Recommendations for soil additives, mix proportions, and methods of preparation, as applicable, for optimum lawn and meadow conditions;

8. Test for purity, proportion by weight, weed seed content and germination percentage of seed mixtures proposed for use.

9. No seed shall be delivered until the test reports are approved. Seed shall be tested within six months immediately proceeding date of sowing. Owner reserves the right to have seed tested independently.

F. Samples:

1. Mulch: Two-pound bag of each type, with manufacturer's recommendations on application rate for Hydro mulch.

G. Statement(s) of Qualifications: Submit to confirm qualifications as specified in Article 1.4, herein.

H. Maintenance Program: Submit a program for continued maintenance of lawn and meadow areas after Substantial Completion. Program shall include a report of conditions unique to site that has been identified during Contractor's maintenance of lawn and meadow work (Article 3.6, herein). Refer also to Article 1.4, herein.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Installation and maintenance foreman on the job shall be competent English-speaking supervisor(s), experienced in landscape installation and maintenance. Perform work with personnel totally familiar with lawn and meadow preparations and installations under the supervision of an experienced landscape foreman.

2. Exhibit and identify a record of at least three (3) lawn and meadow installations of similar scope or size to this Project.

B. Pre-lnstallation Review of Related Work: Within 45 calendar days after Contract Notice to Proceed for seeding work or such later date as approved by Owner's Representative, but prior to first Pre-lnstallation Conference, obtain data as necessary and review plant mix materials and soil amendments to be used for lawn and meadow areas of this Project. Become familiar with proposed plant mixes and on-site grading conditions. Reference Section 02920, Soil Preparation and Mixes, and design drawings.

1. Submit a report of acceptance of soil mixes as being appropriate for seed and sod installation and, if deemed necessary, recommendations for possible SOC adjustment of amendments.

2. Review conditions and coordinate findings of report at Pre-lnstallation Conference.

C. Pre-Installation Conference: Prior to commencement of any of the work of this section, Contractor shall arrange a conference at the site of this Project with the Owner's

Representative, Construction Manager, and Landscape Architect. At least five-(5) working days notice shall be given prior to the conference.

1. Conference attendance will include the Contractor, the foreman appointed to oversee the work of this Section, the foreman responsible for soil preparation and mixes and soil placement (Section 02920), other representatives of Owner, and other persons as deemed appropriate for coordination of work and quality control.

2. At the conference, review lawn and meadow installation and sequence schedules, specification criteria and installation, procedures, outstanding submittals and approvals, and such other subjects necessary for coordination of work.

3. Establish follow up meeting(s) as necessary including but not limited to a final pre-installation review of lawn and meadow area plant mix soil placement.

D. Inspection for Substantial Completion

1. Maintain all lawn and meadow areas until Substantial Completion. Maintenance will be in accordance with requirements specified in Article 3.6 of this Section.

2. The Landscape Architect will make an inspection for Substantial Completion of the work of this Section at the time of Substantial Completion of the entire Contract. The Contractor shall submit a full and complete written program for maintenance of the lawns and meadows for review by the Landscape Architect and Owner's Representative at the time of the request for substantial completion.

    a. Submit a written request for inspection at least 14 calendar days prior to the day on which the inspection is requested.

    b. Contractor shall prepare a list with status of items to be completed or corrected for review by the Landscape Architect, prior to inspection.

    c. At time of the Landscape Architect's inspection, all lawns and meadows shall show a uniform, thick, well-developed stand of plants. If the stand is unsatisfactory, as determined by the Landscape Architect, the Contractor's maintenance responsibility shall continue until an acceptable stand of plants is achieved.

    d. Upon completion of the inspection, the Landscape Architect will amend Contractor's list of items to be completed or corrected as determined necessary and will indicate the anticipated time period for their completion or correction.

3. Lawns and meadows will not be accepted until all items of lawn and meadow work have been completed or corrected. The Landscape Architect, after Contractor's completion of outstanding work, will recommend to the Owner, in writing, the Substantial Completion of the lawn and grasses work of this Section.

a. The Contractor's responsibility for maintenance, however, shall terminate only upon issuance of acceptance by Owner for Substantial Completion.

1.5 REFERENCES

A. SPN: "Standardized Plant Names," latest edition, by the American Joint Committee on Horticultural Nomenclature.

B. Association of Official Agricultural Chemists.

C. ASTM: American Society for Testing and Materials using test criteria as specified or required by other references.

D. AASHTO: American Association of State Highway and Transportation Officials.

1.6 REGULATORY REQUIREMENTS

A. Comply with all rules, regulations, laws and ordinances of local, state and federal authorities having jurisdiction. Provide labor, materials, equipment and services necessary to make Work comply with such requirements without additional cost to Owner.

B. Procure and pay for permits and licenses required for work of this section.

1.7 PROJECT/SITE CONDITIONS

A. Acquaintance With Existing Site Conditions:

1. Through study of all Contract Documents, and by careful examination of the site, become informed as to the nature and location of the work, the nature of surface and subsurface soil conditions, the character, quality and quantity of the materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the work, the general and local conditions, and all other matters which can in any way affect the work.

2. Investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to, ingress and egress of this work site. Conform to all governmental regulations in regard to the transportation of materials to, from, and at the job site, and secure in advance such permits as may be necessary.

B. Should the Contractor, in the course of work, find any discrepancies between Contract Drawings and physical conditions or any omissions or errors in Drawings, or in layout as furnished by the Owner, it will be Contractors duty to inform the Landscape Architect (Design Consultant) immediately in writing for clarification. Work done after such discovery, unless authorized by the Landscape Architect, shall be done at the Contractor's risk.

C. Sequencing and Scheduling:

1. Adjust, relate together, and otherwise coordinate work of this Section with Work of Project and all other Sections of Specification.

2. Seed installations shall not begin until all other constructions, including installation of all utilities and placement of planting soil mixes, are complete and possibility from damage caused by operations does not exist.

D. Environmental Requirements:

1. Perform soil work only during suitable weather conditions. Do not disc, rototill, or work soil when frozen, excessively wet, or in otherwise unsatisfactory condition.

2. Place grass seed or sod only at seasonal times within appropriate temperature range and wind conditions for plant development as approved by Landscape Architect:

a. Acceptable Seeding Seasons/Times:

1) Spring: April 1st - June 15th

2) Fall: September 1st - October 15th

b. Seeding or sodding at any time other than within the above seasons shall be allowed only when the Contractor submits a written request for permission to do so and permission is granted in writing by the Owner. Newly seeded or sodded areas, if installed out of season, must be continuously watered according to best recommended and Landscape Architect approved practice. Contractor shall be responsible for providing an acceptable stand of grass as specified.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in unopened bags or containers, each clearly bearing the name, guarantee, and trademark of the producer, material composition, manufacturers' certified analysis, and the weight of the material.

B. Bulk Materials

1. Deliver bulk materials with each individual shipment accompanied by an affidavit from the vendor (supplier), countersigned by the Contractor upon receipt, identifying the material type, composition, analysis, and weight and certifying that the material furnished complies with specification requirements of this Project.

2. Affidavits shall be furnished in duplicate with one copy submitted to Construction Manager at the end of day of shipment receipt at the Project site and the second copy retained with material or on file with Contractor.

C. Mulch, amendment materials, or soil stored on site temporarily in stockpiles prior to placement shall be protected from intrusion of contaminants, erosion and from mechanical or environmental damage.

PART 2 PRODUCTS

2.1 TEMPORARY TURF

A. Temporary turf seed mix shall be as specified on the Erosion Control Plans, Notes, and Details.

2.2 PERMANENT TURF

A. Permanent turf seed mix shall be the following:

Seed Type	Proportion by Weight	Minimum Purity	Minimum Germination
1. Turf-Type Tall Fescue	60%	95%	80%
2. Perennial Rye Grass	30%	95%	85%
3. Kentucky Blue Grass	10%	90%	80%

2.3 SOD

A. Nursery-grown and cultivated from certified seed containing seed mix as specified for Permanent Turf. Sod shall be from 11 to 36 months in age before lifting, uniform in density, natural green color, free of noxious weeds. Cut sod to a 3/4 inch depth. 1/8 inch tolerance plus or minus, with grass height at 1 1/2 inches to 2 inches, wetted before cutting. Obtain approval of sod and certify its grass types and percentages before cutting or delivery to Project Site.

2.4 TOPSOIL

A. Existing topsoil stripped from the project site, disturbed areas only, may be used for lawns, planting and transplanting work. Contractor shall verify if available project site topsoil is sufficient in quantity to perform the required work. If project site topsoil is insufficient the contractor shall provide topsoil from an approved off project site source(s) as required to complete work.

B. Topsoil to be imported to the project site shall be a sandy loam topsoil (as defined in USDA Soil Texture Classification) and be fertile, friable, well-drained, pH range of 6.0 to 6.5, free of subsoil, toxic substances harmful to plant growth, without clay lumps, stones, roots or debris. The imported topsoil shall have a mechanical analysis as follows:

1. Sand: 35 percent to 40 percent.
2. Clay: 15 percent to 20 percent.
3. Organic Matter: 2.5 percent.
4. Silt: Balance

2.5 FERTILIZER

A. Conforming to standards of Association of Official Analytical Chemists, delivered to Project Site in sealed and labeled bags, or in bulk with certification as to quality and analysis. Nitrogen source shall be at least 33 percent water insoluble. Fertilizer shall have the following formulations:

1. Basic Fertilizer: 10-10-10 or 10-6- 4 analysis.
2. Starter Fertilizer: 5-10-10 or 10-20-20 analysis.

B. Fertilizer shall be delivered to the site, mixed as specified, in the original unopened standard size bags showing weight, analysis and name of manufacturer. Containers shall bear the manufacturer's guaranteed statement of analysis or a manufacturer's certificate of compliance covering analysis shall be furnished to the Landscape Architect. Store fertilizer in a weatherproof place and in such a manner that it shall be kept dry and its effectiveness shall not be impaired.

2.6 LIMESTONE

A. Ground agricultural dolomitic limestone, 90 percent calcium carbonate equivalent, conforming to standards of Association of Official Analytical Chemists and applicable State and Federal Regulations. Material shall have a total of 100% passing the 10 mesh sieve, minimum of 90% passing the 20 mesh sieve, and a minimum of 60% passing the 100 mesh sieve.

2.7 SOIL-STABILIZING AGENT

A. For use in hydroseed mix only. Material shall be one (1) of the following:

1. "Verdyol Complex": Weyerhaeuser Company,
2. "Curasol": Wolbert Master Associates,
3. "Terra-Tack": Grass Growers, Inc,
4. "J-Tac": Reclamare Company,
5. Approved Equal.

2.8 MULCH MATERIALS

A. General Use: Straw, salt marsh hay, or a combination of both. Material shall be:

1. Reasonably weed free, not brittle or overly decomposed.
2. Cured to less than 20% moisture content by weight.
3. Contain no stems of tobacco, soybeans, or other coarse or woody material.

2.9 HYDROSEEDING MATERIALS

A. Fiber mulch shall be biodegradable, non-toxic green dyed-wood cellulose-fiber mulch; nontoxic; free of plant-growth or germination inhibitors; with maximum mixture content of 15 percent and a pH range of 4.5 to 6.5.

B. Nonasphaltic tactifier shall be a colloidal tactifier recommended by the fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors. Material shall be one (1) of the following:

1. "Verdyol Complex": Weyerhaeuser Company,
2. "Curasol": Wolbert Master Associates,
3. "Terra-Tack": Grass Growers, Inc,
4. "J-Tac": Reclamare Company,
5. Approved Equal.

2.10 EROSION CONTROL BLANKET/FABRIC NETTING

A. Contractor shall provide and install where indicated on civil drawings “Curlex” blankets: by American Excelsior Company; “Polyjute” Style465 CT: by Synthetic Industries or approved equal.

B. The area to be covered shall be properly prepared, fertilized, and seeded before blanket is applied. When blanket is unrolled, the netting shall be on top and the fibers in contact with the soil over the entire area. In ditches, the blanket shall be applied in the direction of the flow of water, butted snugly at ends and side and stapled. On slopes, the blankets shall be applied either horizontally or vertically to the slope. Ends and sides shall be butted snugly and stapled. Staple to manufacturer’s recommendations.

2.11 WATER

A. Potable, clean, fresh and free from harmful material. Water shall be furnished by Owner as necessary for lawn installation and maintenance. Include all hoses and other irrigation equipment required for correct use of water without waste.

2.12 ACCESSORY MATERIALS

A. Herbicides: For possible use if there is seed germination in lawn areas after plant soil mix placement and prior to seed installation. Herbicides shall be approved before use for type and rate of application by the Landscape Architect and by local and state agencies with jurisdiction.

1. Post-emergent shall be Roundup, as manufactured by Monsanto Agricultural Products Company, C3NJ, St. Louis, MO 63166, or an approved equal.

B. Sod Stables: 11 Gauge steel wire staples, one (1) inch wide and six (6) inches long for securing sod to slopes 4:1 (25%) or greater.

A. Lawn areas shall have fertilizer applied in two (2) applications with a thorough watering immediately following application. The first application shall be one (1) week before the seeding at the rate of 35 pounds per 1,000 square feet harrowed into the top two inches (2”) of seedbed. The second application shall be done at the rate of 25 pounds per 1,000 square feet, immediately following the second mowing.

B. Commercial fertilizer for temporary turf seed areas shall be a 10-10-10-grade fertilizer (600lbs/acre).

PART 3 EXECUTION

3.1 VERIFICATIONS

A. Prior to construction of lawn and meadow areas, ascertain the location of all electric cables, conduits, underdrainage systems and utility lines. Take proper precautions so as not to disturb or damage sub-surface elements. Contractor failing to take these precautions shall be responsible for making requisite repairs to damaged utilities at Contractors own expense.

B. Verify that required underground utilities are available, in proper location and ready for use. Coordinate with other trades.

C. Verify that all final grades blend with adjacent grades and that area(s) to be seeded is free from depressions and abrupt changes in slope and that all grades as placed have been approved by, and remain satisfactory to Landscape Architect.

D. Verify that all tree planting in lawn areas and all shrub beds adjacent to lawn areas have been installed, will remain as approved, and no further construction work will occur which will or may require access through lawns and meadows.

3.2 SUBSOIL PREPARATION

A. Inspect rough grade subsoil. Eliminate uneven areas and low spots. Remove, for example, debris, roots, branches and stones in excess of 2 inches in size. Remove subsoil which has been contaminated with petroleum, concrete spills, and toxic substances.

B. Bring subsoil to required levels, profiles and contours. Cut out areas to receive topsoil specified in this Section, and otherwise to subgrade elevations as specified in Section 02200 – Earthwork.

C. Cultivate subgrade to a depth of 6 inches where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.

D. Maintain during grading operations the specified compaction, restore previously compacted areas and test soil compaction according to Section 02200 - Earthwork.

3.3 TOPSOIL PLACEMENT AND LAWN BED PREPARATION

A. Inspect subsoil prior to placing topsoil to confirm subsoil conditions meet the requirements of this specification. If subsoil conditions do not meet the requirements repeat subsoil preparation work as specified under this Section.

B. Place topsoil in areas where seeding, sodding and planting are to be performed. Place to the following minimum depths, up to finished grade elevations: Six (6) Inches for seeded and sodded areas.

C. Incorporate the following materials uniformly throughout entire depth of topsoil:

1. Limestone: 100 pounds per 1,000 square feet or as determined by agricultural soil test reports.
2. Basic Fertilizer: 3 pounds per 1,000 square feet or as determined by agricultural soil test reports.

D. Use topsoil in relatively dry state. Place during dry weather. Do not spread wet or clumpy topsoil.

E. Fine grade topsoil to the required levels, profiles and contours. Eliminate rough and low areas to ensure positive drainage. Establish proper flowline gradients and profiles for swales and other storm management features. Drag smooth and hand rake topsoil to final grade elevations. Roll if necessary to stabilize in order to commence seeding. Remove all ruts, mounds, and ridges on surface of topsoil. Remove all stones greater than 1 inch, roots, weeds, or other debris visible on soil surface. Resulting holes shall be filled with specified topsoil, leaving a uniform planar surface. Grade uniformly so soil surface does not have low spots which may collect water. Finish grades shall be within ¼ inch +/- tolerance of finish grades indicated on the plans.

F. Manually spread topsoil around trees, plants, and other construction to prevent possible damage by grading equipment.

G. Blend topsoil smoothly into undisturbed areas. Do not place topsoil on existing vegetation in undisturbed areas. Maintain required depth of topsoil at limit of grading line.

H. Lightly compact and roll placed topsoil.

I. Clean all paved and building surfaces and remove soil to maintain quality of finished surface.

J. Allow for and verify that planting soils of lawn and meadow areas, completed in placement with deficiencies corrected as necessary, to settle for a minimum fourteen (14) days prior to beginning of lawn and meadow installation.

K. Coordinated sequencing of work shall allow immediate seed and sod installation after completion of verifications and preparations. \

3.4 ADDITIONAL SEED AND SOIL AMENDMENTS

A. Starter fertilizer: Add starter fertilizer at the following rates to surface of seed bed or include as an ingredient in hydroseed mix: 40 pounds per 1,000 square feet.

3.5 SEEDING

A. Seeding shall be done between the following dates:

1. Permanent Seeding:

a. Spring Seeding: April 1 to June 15.
b. Fall Seeding: August 15 to November 1.

2. Temporary (Non-Permanent) Seeding:

a. January 1 to December 31.

B. Prior to seeding contractor shall inspect surface soil bed conditions to assure they meet the requirements for receiveing seed. At minimum the soil bed surface shall be roughened to break-up large clods and surface crust, to scarify and fine rake to remove irregularities that will hold water.

C. Manual or mechanical sowing of seed may be by the following optional methods:

1. Mechanical Power-Drawn Seeder: Combination grass planter and land packer or pulverizer. Plant seed not deeper than [1/4 inch] {6 mm}. Keep seeding operation as close as possible to contours and not up and down slopes. After seeding, compact with land roller, such as a cultipacker. With proper equipment, sowing seed and cultipacking in one (1) operation is satisfactory.

2. Hopper Type Spreader: Manually-propelled or power-drawn hopper devices. Uniformly distribute seed by sowing half seed in one (1) direction and remainder at right angles to direction of first sowing. Cover seed an average depth of [1/4 inch] {6 mm} by means of chain harrow, cultipacker, or other approved method.

D. Hydroseeding: Mix specified seed, fertilizer and fiber mulch in water using clean, washed equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into a homogenous slurry suitable for hydraulic application. Hydraulic broadcasting of prepared material.

1. Hydroseed at the following rates per acre:

a. Water: As specified.
b. 1,500 pounds of wood cellulose, plus 15 percent for slopes 5 percent and steeper.
c. Fertilizer: As specified for starter fertilizer. Starter fertilizer may be added to surface of seed bed.
d. Soil stabilizer of type and at rate recommended in writing by manufacturer.
e. Seed Mix: As specified.
f. For a 3,000 gallon tank, multiply specified quantities by 0.75. Mix and agitate all materials, except wood cellulose, in 2,200 gallons of water; then add wood cellulose, fill tank with water and continue agitation. Seed promptly, under constant agitation of mix, beginning when complete mix is a uniform slurry. Limit coverage for 3,000 gallon tank to 0.75 acre.

g. Take precautions against overspray onto roads, curbs, sidewalks, building walls, and other surfaces except ground areas. Contractor shall promptly clean all areas of overspray to satisfaction of Owner's Representative and Landscape Architect.

3.6 SODDING

A. Provide sod as indicated on Drawings.

B. Place sod on topsoil bed prepared as indicated for seeded areas, including lime, basic fertilizer and starter fertilizer applied to bed surface. At time sod is placed, topsoil shall be in a damp, friable, loose condition, with no surface crust.

C. Retain sod on slopes equal to or steeper than four (4) horizontal to one (1) vertical and in drainage swales, using sod staples driven into sod until top is flush with sod.

D. In placing sod, keep rows parallel with contour lines. Keep work true to finished grade, and tamp or roll to establish firm contact with topsoil bed. Butt pads tightly and stagger ends with those in adjacent rows. If sod separates less than [1/2 inch] {13 mm}, backfill with topsoil flush with sod and overseed. If sod separates [1/2 inch] {13 mm} or greater, overlay with sod and spade cut to fit.

3.7 MULCHING

A. Except hydroseeded areas, seeded areas sloped four (4) horizontal to one (1) vertical or greater, and areas where lawn would be difficult to establish, shall be mulched at rate of 1.5 tons per acre.

B. Use wood fiber mulch or soil stabilizing agents, hydraulically applied in water at rate of 1,500 pounds of wood fiber per acre, plus l5 percent on slopes greater than four (4) to one (1).

C. For dry-mulched areas, spray with soil-stabilizing agent/tackifier material immediately after spreading straw or salt marsh hay or both, at rate of 200 gallons of asphalt per acre, in a method to bind mulch to soil and inhibit wind loss of mulch. Do not apply soil-stabilizing agent/tackifier material within when ambient temperature is below 55 degrees F. Clean off misplaced spray from building walks, paving, light standards and bases, and other surfaces to satisfaction of Owner's Representative or Landscape Architect.

3.8 WATERING

A. Keep newly sodded areas moistened until grass becomes well established and have shown signs of knitting with topsoil.

B. In event of insufficient rainfall, moisten areas every two (2) or three (3) days until sod becomes established. Thereafter, water in absence of rain every seven (7) to ten (10) days. When watering sod, make sure that water soaks through sod into topsoil bed below.

3.9 PROTECTIVE WORK

A. Provide materials and work necessary to protect Work from damage. Prevent damage to Owner's property and work specified in other Sections during these operations.

B. Protective work shall include wire line and stakes along walkways with cloth strips at 4 feet intervals as evidence of wire and also "KEEP OFF" signs.

C. Defer work when continuation of construction work must occur over certain lawn areas.

3.10 MAINTENANCE PRIOR TO ACCEPTANCE

A. Maintain all sodded areas by properly mowing, watering, weeding, and similar care to keep Work in a clean and neat condition at all times. Advise Owner's Representative, in writing, when work is in condition to meet acceptance.

3.11 CONDITIONS OF ACCEPTANCE

A. Fine Lawns shall be approved to begin one (1) year Maintenance and Guarantee Period based on the following requirements:

1. Bare spots, not greater than 1 square foot, shall be permitted up to a maximum of 3 percent of Fine Lawn Area.

B. Sod Areas shall be approved to begin one (1) year Maintenance and Guarantee Period based on the following requirements:

1. Sodded areas shall have been mowed at least twice since time of installation.
2. Sod shall have shown signs of knitting with topsoil layer and adjoining sod pads. Open joints between sod pads nor sod slippage on slopes shall not be accepted.
3. Sod shall be in a thriving and vigorous condition exhibiting a healthy green color. Bare spots or brown spots shall not be accepted.

C. During one(1) year Maintenance and Guarantee Period, Owner shall do no Maintenance work, watering or cutting of lawns provided under this Contract.

D. Contractor may use existing underground irrigation systems if available.

E. When work meets conditions specified above, Date of Acceptance shall be Date that Guarantee Period commences. Design Professional shall notify Contractor in writing of said Date.

3.12 MAINTENANCE AND GUARANTEE OF LAWN AREAS AND SODDED AREAS

A. Provide all maintenance work throughout Guarantee Period, which shall be one (1) year from Date of Acceptance.

B. Guarantee work to be in vigorous and thriving condition by end of Guarantee Period, free of objectionable quantities of weeds and other undesirable growth. Maximum percentage allowed for scattered bare spots shall not exceed 3 percent of fine lawn area. Each bare spot shall not be larger than 1 square foot.

C. Maintenance work shall include watering, remedial work such as repair of eroded areas, and resodding if required. Provide general cleanup of stakes, strings, temporary signs,

and sweeping of paving and sidewalks. Cut grass a minimum of 26 cuttings a year. Include other work as maintenance as necessary, for example, lawn feeding, grub control and weeding, broadleaf weed control as deemed required by Contractor in support of Guarantee, or as may be brought to his/her attention during Guarantee Period.

D. Additional fertilization and limestone shall be required. Spread one (1) additional application of 10-6-4 fertilizer evenly over fine lawn area at rate of 25 pounds per 1,000 square feet and spread one (1) additional application of limestone at rate of 100 pounds per 1,000 square feet. Complete applications in fall season of year approaching termination of Maintenance and Guarantee Period.

E. Cutting of fine lawn areas shall occur when grass is dry and to maintain a height of about 2 inches. Cut grass a maximum of 1/3 of total grass blade height. Maintain a neatly-trimmed edge condition throughout at all times.

F. During one (1) year Maintenance and Guarantee Period, Owner shall do no Maintenance work, watering or cutting of lawns provided under this Contract.

3.13 FINAL INSPECTION AND ACCEPTANCE

A. Toward end of Maintenance and Guarantee Period, give notice in writing to Owner's Representative stating desired Date for Final Inspection.
B. At time of Final Inspection, lawn work shall be in condition required by Maintenance and Guarantee Work indicated.
C. If work is accepted at time of Final Inspection, Guarantee shall be considered fulfilled and terminated. Should any work need replacement at time of Final Inspection, continue Guarantee Period until such replacements are made and deemed acceptable.
D. Design Professional shall notify Contractor in writing of Date of Final Acceptance.

END OF SECTION 32 92 10

SECTION 32 92 10
TURF GRASS SOD

PART 1 GENERAL

1.1 SUMMARY

A. Provide seed, sod and related items. Seeding shall be where indicated and at a time allowed by environmental conditions, by adjacent construction operations, and as specified.

B. Review of conditions and materials affecting seed installations.

C. Maintenance of seeded or sodded areas.

1.2 RELATED SECTIONS

A. Section 31 23 10 - Excavation, Backfill and Subgrade Preparation for Paving

B. Section 32 20 10 - Earthwork

C. Section 32 90 00 - Landscape Planting

1.3 SUBMITTALS

A. Notices and Scheduling

1.

B. Material Certificates: Submit materials certificate to the Owner's Civil Engineer which is signed by material producer and Contractor, certifying that materials comply with, or exceed, the requirements herein.

1.4 JOB CONDITIONS

A. Weather Limitations:

1. Apply prime and tack coats when ambient temperature is above 40°F, and when temperature has been above 35°F for 12 hours immediately prior to application. Do not apply when base is wet, contains excess moisture, or during rain.

2. Construct asphaltic paving when atmospheric temperature is above 40°F.

1.5 REFERENCES

A. MS-2-Mix design methods for asphaltic concrete and other hot mix types per The Asphalt Institute (AI)

B. MS-3-Asphalt Plant Manual per The Asphalt Institute (AI)

C. Hot Mix Asphalt Paving Handbook per US Army Corp of Engineers, UN-13 (CE MP-ET)

D. MS-19-Basic Asphalt Emulsion Manual per The Asphalt Institute (AI)

E. ASTM D946 - Penetration - Graded Asphalt Cement for use in Pavement Construction

F. AASHTO M-226/ASTM D3381 Asphalt Cement

G. AASHTO M-140/ASTM D997 or AASHTO M-208/ASTM D-2397 Tack Coat

H. AASHTO M-117/ASTM D242 Mineral Filler

I. AASHTO T-245/ASTM D1559 Marshall Mix Design

PART 2 PRODUCTS

2.1 MATERIALS

A. Provide asphalt-aggregate mixture as shown on drawings. Use locally available materials and gradations, which meet the Standard Specifications and exhibit satisfactory records of previous installations.

B. Asphalt Cement: Comply with AASHTO M-226/ASTM D 3381; Table 2 AC-10, AC-20, or AC-30, viscosity grade, depending on local mean annual air temperature. (See chart below):

Temperature Condition	Asphalt Grades
Cold, mean annual air temperature at 7 degrees C (45 degrees F) or lower	AC-10 85/100 pen.
Warm, mean annual air temperature between 7 degrees C (45 degrees F) and 24 degrees C (75 degrees F)	AC-20 60/70 pen.
Hot, mean annual air temperature at 24 degrees C (75 degrees F) or higher	AC-30

C. Prime Coat: A medium curing cut-back asphalt or an asphalt penetrating prime coat consisting of either MC-30 or SS-1h.

D. Tack Coat: Emulsified asphalt; AASHTO M-140/ASTM D 997 or AASHTO M 208/ASTM D 2397, SS-1h, CSS-1, or CSS-1h, diluted with one part water to one part emulsified asphalt.

E. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with AASHTO M-17/ASTM D 242, if recommended by applicable state highway standards.

F. Asphalt-Aggregate Mixture: Unless otherwise noted on the Drawings, the Design Mix shall have a minimum stability based on a 50-blow Marshall Mix Design Procedure complying

with ASTM D 1559 of 1000 lb with a flow between 8 and 16. The Design Mix shall be within sieve analysis and bitumen ranges below:
SIEVE ANALYSIS OF MIX

Square Sieve	Total Percent Passing	Percent Tolerance
3/4”	100	7%
1/2”	80 - 100%	5%
3/8”	65 - 93%	4%
#8	40 - 55%	4%
#50	12 - 27%	2%
#200	0 - 10%	0%

Percent bitumen by weight of total mix: 5.0 - 8.5.
Air voids: 3-6%
Percent aggregate voids filled with asphalt cement: 70 - 82%.
Allowable variance of percent bitumen by weight of total mix = 0.4

2.2 EQUIPMENT

Maintain equipment in satisfactory operating condition and correct breakdowns in a manner that will not delay or be detrimental to progress of paving operations.

PART 3 EXECUTION

3.1 PREPARATION

A. Remove loose material from compacted base material surface immediately before applying prime coat.

B. Proof roll prepared base material surface to check for areas requiring additional compaction and areas requiring removal and recompaction.

C. Do not begin paving work until deficient base material areas have been corrected and are ready to receive paving.

3.2 APPLICATIONS

A. Prime Coat:

1. Apply bituminous prime coat to all base material surfaces where asphaltic concrete paving will be constructed.

2. Apply bituminous prime coat in accordance with APWA Section 2204 and applicable Standard Specifications.

3. Apply at minimum rate of 0.25 gallon per square yard over compacted base material. Apply to penetrate and seal, but not flood surface.

4. Make necessary precautions to protect adjacent areas from overspray.

5. Cure and dry as long as necessary to attain penetration of compacted base and evaporation of volatile substances.

B. Tack Coat:

1. Apply to contact surfaces of previously constructed asphaltic concrete base courses or Portland cement concrete and surfaces abutting or projecting into asphaltic concrete or into asphaltic concrete pavement.

2. Apply tack coat to asphaltic concrete base course or sand asphalt base course. Apply emulsified asphalt tack coat between each lift or layer of full depth asphaltic concrete and sand asphalt bases and on surface of all such bases where asphaltic concrete paving will be constructed.

3. Apply emulsified asphalt tack coat in accordance with APWA Section 2204 and Pennsylvania highway specifications.

4. Apply at minimum rate of 0.05 gallon per square yard of surface.

5. Allow to dry until at proper condition to receive paving.

3.3 ASPHALTIC CONCRETE PLACEMENT

A. Place asphaltic concrete mixtures on completed compacted subgrade surface, spread, and strike off. Spread mixture at following minimum temperatures:

1. When ambient temperature is between 40°F and 50°F, mixture temp. = 285°F

2. When ambient temperature is between 50°F and 60°F, mixture temp. = 280°F

3. When ambient temperature is higher than 60°F, mixture temp. = 275°F

B. Whenever possible, all pavement shall be spread by a finishing machine; however, inaccessible or irregular areas may be placed by hand methods. The hot mixture shall be spread uniformly to the required depth with hot shovels and rakes. After spreading, the hot mixture shall be carefully smoothed to remove all segregated course aggregate and rake marks. Rakes and lutes used for hand spreading shall be of the type designed for use on asphalt mixtures. Loads shall not be dumped faster that than can be properly spread. Workers shall not stand on the loose mixture while spreading.

C. Paving Machine Placement: Apply successive lifts of asphaltic concrete in transverse directions with the surface course placed in the direction of surface-water flow. Place in typical strips not less than 10’-0” wide.

D. Joints: Make joints between old and new pavements, or between successive days and work in a manner that will provide a continuous bond between adjoining work. Construction joints shall have same texture, density, and smoothness as other sections of asphaltic concrete course. Clean contact surfaces of all joints and apply tack coat.

3.4 ROLLING AND COMPACTION

A. The mixture, after being spread, shall be thoroughly compacted by rolling as soon as it will bear the weight of the rollers without undue displacement. The number, weight, and types of rollers and sequences of rolling operations shall be such that the required density and surface are consistently attained while the mixture is in a workable condition.

B. The bituminous concrete pavement shall have a minimum thickness as specified on the contract drawings and should be compacted to a minimum of 96% of the maximum unit weight as determined by the Marshall Mix Design Procedures in accordance with ASTM D-1559.

C. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

D. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling with hot material.

E. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

F. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

G. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot asphaltic concrete. Compact by rolling to maximum surface density and smoothness.

H. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.5 FIELD QUALITY CONTROL

A. The Owner's Civil Engineer shall perform construction testing of in-place asphaltic concrete courses for compliance with requirements for thickness, compaction and surface smoothness. Asphaltic surface and base courses shall be randomly cored at a minimum rate of one core for
every 20,000 square feet of paving. However, no less than three cores in light duty areas and three cores in heavy-duty areas shall be obtained. Coring holes shall be immediately filled with full-depth asphalt or with concrete. Asphaltic Concrete pavement samples shall be tested for conformance with the mix design.

B. Grade Control: Establish and maintain required lines and elevations.

C. Temperature: The Owner's Civil Engineer shall monitor the asphaltic concrete mixture on the paver immediately prior to spreading asphalt mixture to certify that the minimum temperature requirements of this section are met. Temperature measurement shall be taken on the average of one test per 20 tons of material.

D. Thickness: In-place compacted thickness shall not be less than thickness specified on the drawings. Areas of deficient paving thickness shall receive a tack coat and a minimum 1"

overlay; or shall be removed and replaced to the proper thickness, at the discretion of the Owner; until specified thickness of the course is met or exceeded at no additional expense to the Owner.

E. Surface Smoothness: The Contractor shall perform testing on the finished surface of each asphalt concrete course for smoothness, using 10'-0" straightedge applied parallel with, and at right angles to centerline of paved area. These tests shall be performed under the observation of the Owner's Civil Engineer. Surfaces will not be acceptable if the following 10' straightedge tolerances for smoothness are exceeded.

Base Course Surface: 1/4"
Wearing Course Surface: 3/16"

F. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable paving as directed by Owner.

G. Compaction: The Owner's Civil Engineer shall perform in place density tests as part of the construction testing requirements using the Nuclear Method in accordance with ASTM D-2922 Method B direct transmission. Field density tests shall be performed at the rate of one test per 20,000 square feet of pavement.

H. Laboratory Confirmation of Field Compaction: Density tests for in place materials shall be performed by examination of field cores in accordance with one of the following standards:

1. Bulk specific gravity of paraffin-coated specimens: ASTM D-1188.

2. Bulk specific gravity using saturated surface-dry specimens: ASTM D-2726.

Rate of testing shall be one core per 20,000 square feet of pavement, with a minimum of 3 cores from heavy-duty areas and 3 cores from standard-duty areas. Cores shall be cut from areas representative of the project.

Areas of insufficient compaction shall be delineated, removed, and replaced in compliance with the specifications at no expense to the Owner.

END OF SECTION 32 13 10

SECTION 32 93 00
LANDSCAPE PLANTING

PART 1 GENERAL

1.1. DESCRIPTION OF WORK:

A. The planting of trees, shrubs, ground covers, perennials, and ornamental grasses, with planting soil, topsoil, soil amendments, fertilizer, mulch, planting accessories and maintenance.

B. The Contractor shall furnish all materials and perform all work in accordance with these specifications, drawings, and instructions provided by the Landscape Architect or Owner's representative hereafter also referred to as Landscape Architect. The work shall include everything shown on the drawings and required by the specifications and everything to which in the judgment of the Landscape Architect is incidental to what is shown on the drawings or required by the specifications.

1.2 RELATED SECTIONS

A. Applicable Sections: Division 01.

B. Section 31 20 10: Earthwork

C. Section 31 23 20: Trench Excavation and Backfill for Utilities

D. Section 32 92 00: Lawn and Grasses.

1.3 DEFINITIONS

A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Ground Ivy, Perennial Sorrel, and Brome Grass.

B. Plants: Living trees, plants, and ground cover specified in this Section.

1.4 REFERENCES

A Comply with the following references and standards:

1. American National Standards Institute (ANSI):

a. Z60.1 - American Standards for Nursery Stock

b. A300 – Standards for Tree Care Operations

2. United States Department of Agriculture (USDA)

a. Plant Hardiness Zone Map

3. United States Composting Council

a. Landscape Architecture Compost Use Specification

b. Test Methods for the Examination of Composting and Compost

1.5 REGULATORY REQUIREMENTS

A. Comply with Local, State or Federal Codes.

B. Comply with regulatory agencies for fertilizer and herbicide composition.

1.6 QUALITY ASSURANCE

A. All work completed and materials furnished and installed shall be of the best quality and shall be in strict accordance with the intention of the drawings, specifications and samples. The Contractor shall cooperate with the Landscape Architect so that no error or discrepancy in the drawings or specifications shall cause defective or inappropriate materials to be used or poor workmanship to be allowed and so that the work may proceed in the most efficient and effective manner. If there is a discrepancy between the graphic count of plants and the plant list count of plants on the Landscape Plan, the graphic count shall govern.

B. Before commencing work, all trees and shrubs which are to be saved must be protected from damage by the placement of fencing flagged for visibility or some other suitable protective procedure approved by the Owner's Construction Manager. No work may begin until this requirement is fulfilled.

C. In order to avoid damage to roots, bark or lower branches, no truck or other equipment shall be driven or parked within the drip line of any tree, unless the tree overspreads a paved way.

D. The contractor shall use any and all precautionary measures when performing work around trees, walks, pavements, utilities, and any other features either existing or previously installed under this Contract.

E. The Contractor shall adjust depth of earthwork and topsoiling when working immediately adjacent to any of the aforementioned features in order to prevent disturbing tree roots, undermining walks and pavements, and damage in general to any existing or newly incorporated item.

F. Where excavating, fill, or grading is required within the branch spread of trees that are to remain, the work shall be performed as follows:

1. TRENCHING: When trenching occurs around trees to remain, the tree roots shall not be cut but the trench shall be tunneled under or around the roots by careful hand digging and without injury to the roots.
2. CHANGING GRADES: Existing trees in areas where the new finished grade is to be altered more that 6" shall have regrading work done by hand to elevation as indicated. Roots as required shall be cut cleanly three inches (3") below finished grade.

G. The Landscape Architect reserves the right to inspect and reject plants at any time and at any place, and reserves the right to inspect plants at the growing nursery.

H. The Landscape Architect shall have the final approval for acceptance of the landscape planting work.

I. The nursery(s) where plants will be harvested shall specialize in growing and cultivating the plants specified in this Section with minimum six (6) years experience.

J. The landscape installer shall be a company specializing in installing and planting the plants specified in this Section with minimum six (6) years experience.

K. All plant materials shall be free of disease or hazardous insects.

L. The thickness of each shrub shall correspond to the trade classification "No.1". Single stemmed or thin plants shall not be accepted. The side branches must be generous, well twigged, and the plant as a whole well branched to the ground. The plants must be in healthy condition, free from dead wood, bruises or other root or branch injuries.

M. Where there is paving material that needs to be crossed by transporting plant material via machinery, the Contractor shall use any necessary form of reinforcement to ensure the paving does not crack, chip, break, or deform in any way.

1.7 SUBMITALS AND SAMPLES

A. It is the responsibility of the Contractor, before ordering or purchasing materials, to provide samples of those materials to the Landscape Architect for approval, if so requested.

B. The Contractor is to submit certification tags from trees, shrubs and miscellaneous materials verifying type, quality and purity.

C. Other submittals:

1. Planting Soil: ¼ Cubic foot.

2. Mulch: ¼ Cubic foot.

3. Organic Soil Amendment: Product data.

4. Fertilizer: Product data.

1.8 HARVESTING, DELIVERY, STORAGE, AND HANDLING OF MATERIALS

A. For balled and burlapped and bare root plant material dig plants in a manner to retain as many fibrous roots as possible. Spray trunks, twigs and foliage at the nursery with anti-desiccant in accordance with manufacturer's written recommendation.

B. Ball and burlap all plants, unless otherwise indicated, with firm natural ball of soil of sufficient breadth and depth to include roots. Minimum acceptable ball size shall be in accordance to sizes set forth in ANSI Z60.1 – American Standard For Nursery Stock for type and size indicated. Burlap and rope entire earth ball. Plants with mushy, badly cracked or frozen earth balls shall not be acceptable.

C. Container grown stock shall be grown in specified container long enough for root system to have developed sufficiently to hold soil together.

D. Prevent injury to plant material when digging, moving, transporting, and unloading.

E. Handle all balled and burlapped plants from root ball only.

F. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

G. During transport protect plants from wind by wrapping with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent injury to the plants.

H. Vehicles shall be adequately ventilated to prevent overheating of plants.

I. Protect plants until planted. Such protection shall encompass the entire period during which the plants are in transit, being handled, or are in temporary storage. Protection includes, but is not limited to:

1. Protecting plant stems and trunks from damage and/or injury.

2. During harvesting, transport, and planting processes the plant stem and trunks shall be wrapped with a pervious protective cover. The protective cover shall be removed once the plant is installed and complete. Plants with injured stems will not be accepted.

3. Protecting plant branches from damage and/or injury.

4. Protecting plants from injury due to wind burn.

5. Protecting plants from drying out, plants and root balls shall be kept moist and fresh.

J. Deliver plant materials immediately prior to placement. Keep plant ball moist. If plant materials are not scheduled to be installed within one (1) day of delivery they shall be healed in with composted leaves and the balls kept moist.

K. Unless otherwise authorized by the Landscape Architect, the Contractor shall notify the Landscape Architect at least 48 hours in advance of the anticipated delivery date of any plant materials. A legible copy of the invoice, showing kinds and sizes of materials included for each shipment shall be furnished to the Landscape Architect.

I. The Landscape Architect reserves the right to reject plant materials not meeting the above requirements.

L. Evidence of inadequate protection following digging, carelessness while in transit, or improper handling or storage shall be cause for rejection.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not install plants during freezing weather or when the ground is frozen.

B. Do not install plants during excessively wet conditions.

C. Do not install plants when wind velocity exceeds 30 mph.

D. Plants shall not be placed on any day in which temperatures are forecast to exceed 90 degrees unless the Landscape Architect approves otherwise.

1.10 SEQUENCING AND SCHEDULING

A. Coordinate and schedule work with other contractors and with the municipality.

B. Comply with planting periods as specified in this specification.

C. Notify the Landscape Architect and Owner’s Representative at least three (3) business days in advance of start of Work.

1.11 GUARANTEE

A. Provide a guarantee on work of this Section for twelve(12) months. Commence warranty on date when work is accepted by Owner.

B. Guarantee: Include coverage of plants from death or unhealthy conditions.

C. Replacements: Plants of same size and species as specified, planted in the next growing season, with a new guarantee commencing on date of replacement.

D. The condition of all new plant materials is the responsibility of the Contractor and shall be approved by the Landscape Architect.

E. Until final approval, any replacement of plant materials that may be necessary shall be at the expense of the Contractor.

F. In addition to other standard provisions, the Contractor's bid amount shall also provide for the following:

1. Maintenance necessary during Establishment Period, through final acceptance.

2. Replacement in kind, or with a substitute acceptable to the Landscape Architect, of all plant materials not in a healthy growing condition or that has died back to the crown or beyond normal pruning limits.

3. The Contractor shall also be responsible for any damage caused by his operations and shall dispose of all rubbish and excess soil as directed.

1.12 MAINTENANCE

A. Maintenance services shall be performed by installer.

B. Plant care and maintenance shall begin immediately after each plant is satisfactorily installed and shall continue throughout the life of the contract until final acceptance of the Owner.

C. Maintenance to include:

1. Cultivation and weeding plant beds and tree pits.

2. Application of herbicides for weed control in accordance with manufacturer's instructions. Remedy damage resulting from use of herbicides.

3. Application of pesticides in accordance with manufacturer's instructions.

4. Remedy damage from use of pesticides.

5. Watering or irrigating sufficient to saturate root system.

6. Trimming and pruning, including removal of clippings and dead or broken branches, and treatment of pruned areas or other wounds.

7. Disease control.

8. Maintaining guys, stakes, and strapping. Repair or replace accessories when required.

9. Replacing mulch that has been displaced by erosion or other means, repairing and reshaping water rings or saucers.

10. Performing any other work required to keep the plants in a healthy condition.

D. Contractor shall remove and replace all dead, defective and/or rejected plants as required before final acceptance.

PART 2 PRODUCTS

2.1 NURSERIES

A. Nursery shall be a member of American Association of Nurserymen and Pennsylvania Landscape and Nurserymen's Association (or other such State organization).

2.2 TREES, PLANTS, & GROUND COVERS

A. Trees, Plants, and Ground Covers: Species and size identifiable in plant schedule, grown in climatic conditions similar to those in locality of the Work. Plant shall in all cases conform with requirements of the American Standard for Nursery Stock latest versions of rules and grading adopted by the American Association of Nurserymen, Inc., but upgraded to meet the following additional requirements.

B. Unless specifically noted otherwise, all plants shall be of selected specimen quality, exceptionally heavy, symmetrical, tightly knit, so trained or favored in their development and appearance as to be superior in form, number of branches, compactness and symmetry. All plants shall have a normal habit or sound, healthy, vigorous plants with well-developed root system.

C. Plants shall be free of disease, insect pests, eggs or larvae.

D. Plants shall not be pruned before delivery.

E. Trees with abrasion of the bark, sunscalds, disfiguring knots or fresh cuts of limbs over one and one-fourth inches (1-1/4”) which have not completely calloused shall be rejected.

F. All plants shall be typical of their species or variety and shall have a normal habit of growth and be legibly tagged with the proper name. All plants shall have been grown under climatic conditions similar to those in the locality of the site of the project under construction or have been acclimated to such condition for at least two (2) years.

G. The root system of each shall be well provided with fibrous roots. All parts shall be sound, healthy, vigorous, and well-branched.

H. All plants designated ball and burlap (B&B) must be moved with the root systems as solid units with balls of earth firmly wrapped with burlap. The diameter and depth of the balls of earth must be sufficient to encompass the fibrous root feeding systems necessary for the healthy development of the plant. No plant shall be accepted when the ball of earth surrounding its roots has been badly cracked or broken preparatory to or during the process of planting. The balls shall remain intact during all operations. All plants that cannot be planted at once must be heeled-in by setting in the ground and covering the balls with soil or mulch and then watering. Hemp burlap and twine is preferable to treated. If treated burlap is used, all twine is to be cut from around trunk and all burlap is to be removed.

I. The trunk of each tree specified as ‘tree form’ shall be a single trunk growing from a single unmutilated crown of roots. No part of the trunk shall be conspicuously crooked as compared with normal trees of the same variety.

J. The thickness of each shrub shall correspond to the trade classification “No.1”. Single stemmed or thin plants shall not be accepted. The side branches must be generous, well twigged, and the plant as a whole well branched to the ground. The plants must be in healthy condition, free from dead wood, bruises or other root or branch injuries.

K. Plants shall be measured when branches are in their normal position.

L. Shrubs shall meet the requirements for spread, height or container size stated in the Plant List. The measurements are to be taken from the ground level to the average height of the shrub and not to the longest branch. Height and spread dimensions specified refer to the main body of the trees (measured from the crown of the roots to the tip of the top branch) shall be not less than the minimum size designated.

M. Caliper measurements shall be taken at a point on the trunk six inches (6”) above natural ground line for trees up to four inches (4”) in caliper, and at a point 12 inches (12”) above the natural ground line for trees exceeding four inches (4”) in caliper.

N. If a range of size is given, no plant shall be less than the minimum size, and not less than 50% of the plants shall be as large as the upper half of the range specified.

O. The measurements specified are the minimum size acceptable and, where pruning is required, are the measurements after pruning.

2.3 TOPSOIL

A. Existing topsoil stripped from the project site, disturbed areas only, may be used for lawns, planting and transplanting work. Contractor shall verify if available project site topsoil is sufficient in quantity to perform the required work. If project site topsoil is insufficient the contractor shall provide topsoil from an approved off project site source(s) as required to complete work.

B. Topsoil to be imported to the project site shall be a sandy loam topsoil (as defined in USDA Soil Texture Classification) and be fertile, friable, well-drained, pH range of 6.0 to 6.5, free of subsoil, toxic substances harmful to plant growth, without clay lumps, stones, roots or debris. The imported topsoil shall have a mechanical analysis as follows:

1. Sand: 35 percent to 40 percent.

2. Clay: 15 percent to 20 percent.

3. Organic Matter: 2.5 percent.

4. Silt: Balance.

2.4 ORGANIC SOIL AMENDMENT MATERIALS

A. Compost: A mixture of partially decomposed organic materials (chipped, shredded, or ground vegetation or waste or recycled wood products), leaf mold, mushroom soil/spent mushroom soil substrate (SMS), composted animal manure, or exceptional quality (Class A) composted bio-solids.

B. Compost shall be processed or completed to reduce weed seeds, pathogens, and deleterious material, and shall not contain paint, petroleum products, herbicides, fungicides, or other chemical residues that would be harmful to plant or animal life. Other deleterious material, plastic, glass, metal, or rocks shall not exceed 0.1 percent by weight or volume.

C. Compost produced from bio-solids (sewage/waste water sludge) shall be “Class A Grade” (exceptional quality) and meet US EPA’s 40 CFR Part 503 regulations.

D. Compost shall meet the following analysis:

1. Organic Matter Content: On dry weight basis, 40 to 75 percent.

2. Nitrogen Content: 1 to 2.5 percent.

3. Phosphorus Content: 1 to 2 percent.

4. Potassium Content: 0.5 to 1.5 percent.

5. Carbon – Nitrogen Ratio: 12 to 25:1

6. Moisture Content Range: 40 to 60 percent.

7. Moisture Absorbtion: 100 percent (Dry Weight Basis) Minimum.

8. pH Range: 6.0 to 8.0.

9. Bulk Density Range: 800 to 1,000 lbs. per cubic yard.

10. Soluble Salt Content: 5 dS (mmhos/cm) or less.

11. Trace Elements: Meet US EPA 40 CFR Part 503 requirements.

12. Particle Size: Must pass 1 inch sieve or smaller.

13. Stability Rating: Stable.

2.5 PLANTING SOIL MIXTURE

A. Tree Pits: Thoroughly mix planting soil mixture prior to installation in planting hole/tree pit.

B. Planting mix will consist of the following for trees and shrubs:

1. 3 Parts topsoil as specified.

2. 1 Part selected organic soil amendment.

D. Groundcover, Perennial, & Ornamental Grass Planting Holes/Beds: Install planting soil as described in Part 3.

1. 2 Parts topsoil as specified.

2. 1 Part selected organic soil amendment.

2.6 WATER

A. On-site water shall be furnished by the Owner. Hose and other watering equipment shall be furnished by the Contractor.

2.7 SOIL FERTILITY MATERIALS

A. Fertilizer (Trees & Shrubs): "Agriform", one (1) year duration controlled-released planting tablets manufactured by The Scotts Company, LLC, Marysville, OH, (800) 492-8255 or approved equal. Planting tablets shall be 20-10-5 formulation in 21 gram size. Apply fertilizer tablets in the following rates:

1. For trees: 2 tablets for each caliper inch.

2. For shrubs: 1 tablet for each 12 inches of plant height or spread.

B. Mycorrhizal Treatment for Trees & Shrubs: "Tree Saver"3-Ounce packet manufactured by Plant Health Care, Inc, 440 William Pitt Way, Pittsburgh, PA 15238; Phone: (412) 826-5488; Web: www.planthealthcare.com or approved equal. Install per manufacturer's instructions. Apply at the following rates:

1. For single stem trees: 1 Packet per inch of tree caliper, minimum of 1 packet.

2. For multi-stem stem trees: 1 Packet per each 12 inches of rootball diameter, minimum of 1 packet.

3. For shrubs: 1/3 Packet for each gallon of container size or for each 12 inches of plant height or spread.

C. Mycorrhizal Treatment (Perennials, Groundcovers, & Ornamental Grasses): "Flower Saver"manufactured by Plant Health Care, Inc, 440 William Pitt Way, Pittsburgh, PA 15238; Phone: (412) 826-5488; Web: www.planthealthcare.com or approved equal. Install per manufacturer's instructions. Apply at the following rates:

1. 6 Pounds per 100 square feet of planting bed.

2.8 HERBICIDE & PESTICIDE

A. Herbicide: As may be required with approval of Landscape Architect.

B. Pesticide: As may be required with approval of Landscape Architect.

2.9 MULCH MATERIALS

A. Wood Mulching Material: Double ground hardwood bark, brown in color, and free of growth or germination inhibiting ingredients. Contractor shall submit sample to the Landscape Architect for approval.

2.10 ANTI-DESICCANT SPRAY

A. Spray shall be an emulsion which will provide a protection fill over plant surfaces. It shall be permeable enough to permit transpiration such as "Wilt-

Pruf", manufactured by Nursery Product Specialties Company, Croton Falls, New York, or other approved equal. It shall be delivered in the manufacturer's containers and mixed according to the manufacturer's instructions.

2.11 GUYING & STAKING MATERIALS

A. Stakes: Cedar, 2-inch square with pointed end.

B. Synthetic tree guy strapping: ArborTie® strapping as manufactured by Deep Root Partners, L.P. – 530 Washington Street, San Francisco, CA 94111; Phone: (800) 458-7668; Web: www.deeproot.com or approved equal. Guy wire and rubber hose is not acceptable.

1. Material: Flat, woven polypropylene

2. Size: ¾ Inch wide

3. Color: White or Green

2.12 VERIFICATION

A. Provide certification of inspection by the Landscape Architect for confirming approval of plants supplied.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that Project Site is ready for planting prior to delivery of materials

B. Beginning of installation means acceptance of existing conditions.

3.2 PLANTING PERIODS

A. Planting shall be performed within the following periods:

1. From March 15 to June 15.

2. From September 1 to November 15.

B. Only with the approval of the Landscape Architect can planting occur for the period of after November 15 to March 15.

C. Planting between June 16 to August 31 is not permitted.

3.3 PREPARATION FOR PLANTING AREAS

A. Contractor shall locate plants by staking with stakes and flags as indicated on the Drawings for approval by the LANDSCAPE ARCHITECT.

B. For mass groundcover, perennial, or ornamental grass plantings excavate planting areas to depths as indicated and install planting soil in six inch maximum lifts. Once soil depth is achieved incorporate specified fertilizer/Mycorrhizal treatment into the soil mixture and roto-till entire planting bed to a depth of 12 inches. Planting mix shall be installed during dry weather and on dry unfrozen subgrade.

C. Grade planting to eliminate rough, low, or soft areas, and to ensure positive drainage.

3.4 PLANTING

A. Excavate circular plant pits with scarified vertical sides, except for plants specifically indicated to be planted in beds, to depths as indicated on the drawings. Provide planting pits at least twice the diameter of the root system or container. Depth of pit shall accommodate the entire root system. Scarify the bottom and sides of the pit to a depth of four inches. If groundwater is encountered upon excavation of planting holes, the Contractor shall promptly notify the Landscape Architect.

B. If plants are containerized, the containers shall be removed from the plants immediate prior to planting and in a manner that prevents damage to the root system. Containers may require vertical cuts down the full depth of the container to accommodate removal. All circling roots shall be loosened to ensure natural directional growth after planting.

C. Set plant material in the planting pit to proper grade and alignment. Set plant upright, plumb, and faced to give the best appearance or relationship to each other or adjacent structure. Set crown of plant material at the finish grade. No filling will be permitted around trunks or stems or above grafts on grafted trees.

D. Once plant material is set correctly in planting pit begin to backfill with specified planting mixture. Do not use frozen or muddy mixtures for backfilling. When planting hole depth is ½ full with planting soil, water soil in and lightly firm to remove voids and/or air pockets. After planting soil is watered and firmed for balled and burlapped plants remove burlap, rope/twine, and/or wire baskets from top 1/3 of rootball and tuck into planting hole. If burlap has been chemically treated (green color) or rope materials are plastic or not natural material remove from the planting pit.

F. Install fertilizer tablets and Mycorrhizal treatment packets as specified on firmed soil in planting pit. Tablets and packets shall be evenly distributed throughout the pit.

G. Continue backfilling planting hole to final grades as shown on the plans. Once backfilling is complete thoroughly water in planting soil and lightly firm to remove voids and/or air pockets.

H. Containerized shrubs shall follow same procedure as described above.

I. Containerized groundcover, perennials, and/or ornamental grasses shall be planted in a roto-tilled bed in holes same size as rootball. Once plant is placed lightly firm soil around rootball to ensure firmly placed in hole.

J. Space ground cover plants using triangular spacing in accordance with indicated dimensions. Adjust spacing as necessary to evenly fill planting bed with indicated quantity of plants. Plant to within eighteen inches (18") of the trunks of trees and shrubs within planting bed and to within twelve inches (12") of edge of bed.

3.5 MULCHING

A. Mulch tree and shrub planting pits and shrub beds with required mulch two inches (3") deep immediately after planting. Thoroughly water mulched areas. After watering, rake mulch to provide a uniform finished surface.

B. Mulch groundcover, perennial, and ornamental grass beds with required mulch two inches (3") deep immediately after planting. Thoroughly water mulched areas. After watering, rake mulch to provide a uniform finished surface.

3.6 STAKING/GUYING

A. Stake all deciduous and coniferous trees immediately after planting.

3.7 PRUNING

A. Prune all trees only to remove broken or damaged branches, or for aesthetic purposes as directed by the Landscape Architect. Branches will be pruned at the branch collar. Neither stubs nor flush cuts will be acceptable.

3.8 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, soil, debris, and equipment. Repair damage resulting from planting operations.

3.9 MAINTENANCE

A. Maintenance shall begin immediately after planting. Plants shall be watered, mulched, weeded, pruned, sprayed, fertilized, cultivated, and otherwise maintained and protected until provisional acceptance. Settled plants shall be reset to proper grade and position, planting saucer restored and dead material

removed. Stakes and wires shall be tightened and repaired. Defective work shall be corrected as soon as possible after it becomes apparent and weather and season permit.

B. If a substantial number of plants are sickly or dead at the time of inspection, acceptance shall not be granted and the Contractor's responsibility for maintenance of all plants shall be extended until replacements are made or existing plants are deemed acceptable by the Landscape Architect.

C. All replacements shall be plants of the same kind and size specified on the Plant List. They shall be furnished and planted as specified above. The cost shall be borne by the Contractor. Replacements resulting from removal, loss, or damage due to occupancy of the project in any part, vandalism, physical damage by animals, vehicles, etc., and losses due to curtailment of water by local authorities shall be approved and paid for by the Owner.

D. Plants shall be guaranteed for a period of eighteen (18) months after inspection and provisional acceptance. This period is also called the Establishment Period.

E. At the end of the Establishment Period, inspection shall be made again. Any plant required under this contract that is dead or unsatisfactory to the Landscape Architect or Owner shall be removed from the site. These shall be replaced during the normal planting season.

F. At the end of the Establishment Period, contractor shall return to the site and remove staking and strapping materials.

3.10 FINAL INSPECTION

A. Inspection to determine completion and acceptance of planted areas will be made by the Landscape Architect and/or Owner's Representative, upon Contractor's request. Provide notification at least ten (10) business days before requested inspection date. Inspection comments will be submitted to contractor in writing.

B. Planted areas will be accepted provided all requirements, including the maintenance period have been complied with and plant materials are alive and in a healthy, vigorous condition.

C. Upon acceptance the OWNER will assume plant maintenance and the plant material warrantee period begins.

D. An additional inspection will be made near the end of the warrantee period to determine if plant materials need to be replaced. Plants shall be in a healthy, vigorous growing state and free of disease and insects.

END OF SECTION 02900

SECTION 33 01 10
PROTECTION OF EXISTING UTILITIES

PART 1 GENERAL

1.1 SUMMARY

A. Identification and field mark out of all on-site utility lines to remain in operation during construction.

B. Submission of procedures to be used to ensure the safety of the utility.

C. Repair of any damage during construction operations.

1.2 RELATED SECTIONS

A. Section 02 41 00 - Site Demolition

B. Section 02110 - Site Clearing

C. Section 31 20 10 - Earthwork

D. Section 31 23 20 - Trench Excavation and Backfill for Utilities

E. Contract Drawings

1.3 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of capped utilities and utility lines encountered during construction.

1.4 REGULATORY REQUIREMENTS

A. Contractor shall notify all affected utility companies, agencies, authorities, owners, etc. at least 48 hours prior to the commencement of work and shall comply with their requirements.

B. Contractor shall contact the PA ONE-CALL service for an official utility mark out.

PART 2 PRODUCTS

NOT APPLICABLE

PART 3 EXECUTION

3.1 IDENTIFICATION

A. Locate all existing utilities which are to remain in service during construction as shown on the Construction Drawings.

3.2 PROTECTION

A. Flag, barricade or suitably protect existing utilities during construction operations and equipment movement.

B. Prevent interruption of existing utility service to occupied or used facilities, except when authorized in writing by authorities having jurisdiction.

3.3 LATERAL DISCONNECTION

A. Where a utility line is to be disconnected from portions to remain, the lateral pipes shall be cut and suitably plugged/capped in accordance with the Contract Drawings and applicable utility or agency requirements.

3.4 REPAIRS

A. Any damage to existing, operational utilities by the Contractor or his subcontractors during the on-going construction operation shall be immediately repaired to operational standards at the Contractor's expense. If the repairs are not immediately addressed by the Contractor, the utility owner and/or the Owner shall contract for the repair at the Contractor's expense.

END OF SECTION 33 01 10

SECTION 33 30 10
STORM SEWERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Work shall consist of all necessary excavation and backfill for, and installation of, the storm sewer system for roadway and lawn areas.

1.3 RELATED SECTIONS

A. Section 31 25 00 – Soil Erosion and Sediment Control

B. Section 31 20 10 – Earthwork

C. Section 31 23 20 - Trench Excavation and Backfill for Utilities

1.4 REFERENCES

A. Work and materials shall conform to the latest editions of the following standards:

1. City of Philadelphia – Plumbing Code – Latest Edition

2. ASTM A48 – Standard Specification for Gray Iron Castings.

3. ASTM A888 – Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

4. ASTM C76 – Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

5. ASTM C478 – Standard Specification for Precast Reinforced Concrete Manhole Sections and Catch Basins.

6. ASTM C564 – Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings

7. ASTM C1540 – Specification for Heavy Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings

B. Material shall be new and products of recognized, reputable manufacturers. All manufacturers shall have been in the business of providing pipe and gasket materials to the U.S. market for a period of 5 years minimum.

1.5 SUBMITTALS

A. The Contractor shall submit to Design Professional and the Philadelphia Water Department (PWD) written certification from all material manufacturers stating their products are compliant with the standards specified herein.

B. The Contractor shall submit

PART 2 PRODUCTS

2.1 MATERIALS

A. Pipe for stormwater collection system shall be Cast Iron Pipe and shall conform to ASTM A888. Fittings shall be watertight.

B. Precast manhole and catch basin structures shall conform to ASTM C478 requirements.

C. All drainage structures shall conform to the requirements detailed on the Contract Drawings.

D. Frames and grates for manholes and catch basins shall be gray iron castings conforming to the requirements of ASTM A48, Class 30B, free of cracks, casting faults or other composition defects. All castings shall be coated with not less than one coat of black asphaltum paint. Frame and grate types are noted on the drawings.

E. Filter fabric shall consist of non-woven filter fabric (Mirafi 140 N, Geotex 401, Amoco 4545, or approved equal).

PART 3 EXECUTION

3.1 INSTALLATION

A. Pipe

1. All materials furnished shall be delivered and distributed at the site by the Contractor. Pipe and other materials shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall such materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground.

2. The pipe shall be laid in the prepared excavations in accordance with the Manufacturer's recommendations. Care shall be taken to assure that the pipe is evenly supported on the foundation soils throughout its length.

3. The elevation of the pipe and structures shall not vary more than 1/2 inch from the elevation shown on the Contract Drawings. The Contractor shall utilize sufficient survey control such that it can be verified at all times that the construction is being accomplished at the proper location and grade.

4. Final observation of the work will include a visual review of drains by looking from end to end or structure to structure with the aid of reflected sunlight or an electric light. The pipe shall contain no deposits of sand, dirt, or other materials which will reduce the full cross-sectional area. Wall joints shall be tight. The Contractor shall furnish labor to assist in this inspection.

B. Manholes, Catch basins, and Other Structures

1. Structures shall be constructed as shown on the Contract Drawings. The elevations of the inverts and tops of the structures shall not vary more than 1/2 inch from plan elevations.

2. Excavation and backfill shall be in accordance with Section 02222 – Trench Excavation and Backfill for Utilities of these Specifications.

3. Frames and grates shall bear uniformly on the structure such that there is no movement or rocking.

4. If necessary to meet field conditions, Engineer may revise grate elevations prior to the installation of the grates. Any change within 8 inches shall be made by the Contractor at no additional charge.

B. Manholes, Catch basins, and Other Structures

1. Structures shall be constructed as shown on the Contract Drawings. The elevations of the inverts and tops of the structures shall not vary more than 1/2 inch from plan grades.

2. Excavation and backfill shall be in accordance with Section 02222 – Trench Excavation and Backfill for Utilities of these Specifications.

3. Frames and grates shall bear uniformly on the structure such that there is no movement or rocking.

4. If necessary to meet field conditions, Engineer may revise grate elevations prior to the installation of the grates. Any change within 8 inches shall be made by the Contractor at no additional charge.

END OF SECTION 02720

SECTION 33410
STORM DRAIN PIPE

PART 1 - GENERAL

1.01 SECTION DESCRIPTION

A. The Work Of This Section Includes:

1. Storm sewer pipelines

1.02 RELATED SECTIONS

A. Related Work Specified Elsewhere:

1. Section 31 25 00: Soil Erosion & Sedimentation Control
2. Section 32 90 00: Landscape Planting

1.03 QUALITY ASSURANCE

A. Reference Standards:

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

M36 Specification for Corrugated Steel Pipe, Metallic - Coated, for Sewers and Drains.

M294 Specification for Corrugated Polyethylene Pipe, 12-to 24-inch Diameter.

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

A760 Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains.

C14 Specification for Concrete Sewer, Storm Drain and Culvert Pipe.

C76 Specification for Reinforced Concrete Culvert Storm Drain, and Sewer Pipe.

C507 Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe.

3. Pennsylvania Department of Transportation:

Publication 408 Specifications

1.04 SUBMITTALS

A. Manufacturer's Literature:

1. Submit manufacturer's descriptive literature for the following items in accordance with Section 01300:

- Pipe
- Pipe fittings
- Joints

2. Submit manufacturer's instructions and recommendations for the following items in accordance with Section 01300

- Assembly of joints

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. During loading, transporting and unloading, exercise care to prevent damage to materials.

B. Do not drop pipe or fittings.

C. Other Requirements:

1. Section 01600 also addresses transportation and handling along with storage and protection of materials and equipment.

PART 2 - PRODUCTS

2.01 CORRUGATED GALVANIZED STEEL PIPE

A. Pipe, End Sections and Coupling Bands:

1. Section 601.2, Publication 408 Specifications.

2. AASHTO M36, Type I or ASTM A760, Type 1.

3. Metal sheet thickness and corrugation size as noted below unless otherwise indicated on Drawings.

Pipe Diameter	Wall Thickness	Corrugation Size
12 in.	0.064 in. (16 gauge)	2 2/3 in. x ½ in. helical
15 in.	0.064 in. (16 gauge)	2 2/3 in. x ½ in. helical
18 in.	0.079 in. (14 gauge)	2 2/3 in. x ½ in. helical

2.02 NON-REINFORCED CONCRETE PIPE

A. Pipe:

1. ASTM C14, Minimum Class 3 unless otherwise indicated on Drawings.

B. Joints:

1. Bell and spigot, or

2. Tongue and groove

2.03 REINFORCED CONCRETE PIPE

A. Pipe and Fittings:

1. ASTM C76, Minimum Class III unless otherwise indicated on Drawings.

B. Joints:

1. Bell and spigot, or

2. Tongue and groove

2.04 ELLIPTICAL REINFORCED CONCRETE PIPE

A. Pipe:

1. ASTM C507, Minimum Class HE-A or VE-II unless otherwise indicated on Drawings.

B. Joints:

1. Bell and spigot, or

2. Tongue and groove

2.05 SMOOTH LINED CORRUGATED POLYETHYLENE PIPE

A. Pipe

1. Section 601.2(a)3.d., Publication 408 Specifications

2. AASHTO M294, Type C (Corrugated) and Type S (Smooth-lined)

B. Joints

1. Hancor Titeline Watertight Joints or approved equal

PART 3 - EXECUTION

3.01 PREPARATION

A. Perform trench excavation to the line and grade shown on the Drawings and as specified in Section 02222.

B. Provide pipe bedding as specified in Section 02222 for each type of pipe used. Place aggregate in a manner to avoid segregation, and compact to the maximum practical density so that the pipe can be laid to the required tolerances.

3.02 LAYING PIPE IN TRENCHES

A. Give ample notice to the Resident Project Representative in advance of pipe laying operations.

B. Lower pipe into trench using handling equipment designed for the purpose to assure safety of personnel and to avoid damage to pipe. Do not drop pipe.

C. Lay pipe proceeding upgrade with the bell or groove pointing upstream.

D. Lay pipe to a true uniform line with the barrel of the pipe resting solidly in bedding material throughout its length. Excavate recesses in bedding material to accommodate joints, fittings, and appurtenances.

E. Lay each section of pipe to form a close concentric joint with the adjoining section and to avoid offsets in the flow line.

F. Clean and inspect each pipe and fitting before joining. Align pipe with previously laid sections.

G. Assemble joints in accordance with the pipe manufacturer's instructions. Pipe joints shall consist of a preformed rubber gasket or be mortared except for interlocking style pipe and pipe joined with bands.

1. For mortared joints, mortar the lower half of the joint before placing the succeeding pipe section to bring the inner surface of the abutting pipe flush. Before placing mortar, wet the pipe with as much water as it will readily absorb. Fill the outside of bell- and-spigot pipe joints with mortar, flush with the bell end. Fill tongue-and-groove pipe joints flush with the pipe's outside surface. On the inside of the pipe, fill the lower half of the joint flush with mortar, wipe clean, and finish smoothly. For pipes of 24-inch diameter and larger, fill the joints for the entire inside periphery in the same manner. Fill voids for lift holes with mortar after pipe is placed.

H. Check each pipe installed as to line and grade in place. Correct deviation from line and grade

immediately. A deviation from the designed grade as shown on the Drawings, or deflection of pipe joints, will be cause for rejection.

I. Place and compact sufficient backfill to hold each section of pipe firmly in place as the pipe is laid.

3.03 BACKFILLING TRENCHES

A. Backfill pipeline trenches only after examination of pipelaying by the Resident Project Representative.

1. If joints are mortared, backfilling may proceed immediately only if the operation will avoid joint damage, maintain pipe in proper alignment and grade, and provide satisfactory curing conditions for mortar.

B. Backfill and compact trenches as specified in Section 02222.

END OF SECTION 02722