

SECTION 02 21 13
PROJECT SURVEY & LAYOUT

PART 1 GENERAL

1.01 SCOPE OF SERVICES

- 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 benchmark, 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.

1.02 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 landscape architect, 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 landscape architect of any discrepancies between plans and field layout.

1.03 REFERENCE STANDARDS

A. In accordance with local rules and regulations.

1.04 QUALITY ASSURANCE

A. All construction layout work shall be performed under the direction of a Professional Land Surveyor, with prior similar experience.

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 02 21 13

SECTION 02 41 16
SITE AND STRUCTURE DEMOLITION

PART 1 GENERAL

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.

1.01 SCOPE OF WORK

- 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, site furnishings, 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 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. Backfill to grade with compacted suitable on-site soils.
 6. Removal from site and disposal of all excess and unusable material.
 7. Removal of trees and plant material as noted on the drawings.

1.02 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 00 – Earth Moving
- D. Section 31 23 10 - Excavation, Backfill & Subgrade Preparation for Pavement

E. Section 32 90 00 - Landscape Planting

1.03 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. All applicable sections of the International Building Code, latest edition.

1.04 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.

1.05 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. Permits shall be posted as required by the issuing authority/jurisdiction.

1.06 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.

1.07 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.

1.08 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.

1.09 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.

1.10 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 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

2.01 MATERIALS

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

PART 3 METHOD OF CONSTRUCTION

3.01 GENERAL

- A. The Contractor is responsible for the demolition of existing concrete slabs, walks and curb, 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 and properly compact all open excavations, including trenching for utility and foundation removal.

3.02 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.

3.03 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 PADEP and PWD.
- 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 PWD.

B. SEQUENCE OF CONSTRUCTION

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

2. A temporary crushed stone wheel cleaning pad shall be installed at the construction entrance/exits as shown on the Contract Drawings.
3. Compost filter sock 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 PWD upon commencement and completion of the project.

3.04 UTILITIES

A. GENERAL

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

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.

END OF SECTION 02 41 16

**SECTION 03 11 00
CONCRETE FORMWORK**

PART 1 GENERAL

1.01 CONCRETE FORMWORK

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

- A. Chamfer Strips: Wood, metal, PVC or rubber; 1 inch diameter, unless otherwise indicated on the drawings

PART 2 EXECUTION

2.01 PREPARATION OF FORM SURFACES

- A. Apply form-coating material in accordance with manufacturer's instructions.

2.02 INSTALLATION

- A. Provide chamfer on exposed external corners of concrete as shown on the drawings.
- B. Provisions for Work of Related Contracts: Provide openings in concrete formwork to accommodate Work of related contracts. Obtain information for size and location of openings, recesses and chases from contractor requiring such items.
- C. Shores and Supports:
 - 1. Concrete members subject to additional loads during construction shall be shored in such a manner as will protect the member from damage by the loads.
 - 2. Place shores supporting successive stories directly over those below or so design the shores to transmit the load directly to them.
 - 3. Do not remove shores until the member supported has acquired sufficient strength to safely support its weight and any weight imposed thereon.

2.03 REMOVAL OF FORMS

- A. ACI 301, Section 2.3.2 - Removal of Forms:
 - 1. Forms and shoring used to support the weight of concrete in beams, slabs and other structural members shall be removed in accordance with recommendations in paragraph 3.7.2.1 of Article 3.7 - Removal of Forms and Supports of "Recommended Practice for Concrete Formwork" (ACI 347-01).
 - 2. All formwork shall be removed after the concrete has sufficiently hardened, except in inaccessible spaces where approved.
 - 3. All formwork shall be removed after the concrete has sufficiently hardened, except in inaccessible spaces where approved.

2.04 RE-USE OF FORMS

- A. Split, frayed, delaminated, or otherwise damaged form facing material shall not be used.

END OF SECTION 03 11 00

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 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

1.02 SUBMITTALS

- A. Provide Submittals under the provision of Section 013330.
- 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.

1.03 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.
- C. Reference Standards: ACI/ASTM 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."
13. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural construction.
14. ANSI/ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
15. ASTM C33 - Concrete Aggregates.
16. ASTM C94 - Ready Mix Concrete.
17. ASTM C150 - Portland Cement
18. ASTM C260 - Air-Entraining Admixtures for Concrete.
19. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
20. ASTM C494 - Chemical Admixtures for Concrete.
21. FS TT-C-800 - Curing Compound Concrete for New and Existing Surfaces.
22. ANSI/ASTM A185 Welded Steel Wire Fabric for Concrete.
23. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.04 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.

1.05 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.

1.06 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

2.01 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 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.
- D. 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.

2.02 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.

2.03 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I.
 - 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.

2.04 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.

2.05 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.

2.06 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 cementitious 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.

2.07 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.

2.08 FABRICATING REINFORCEMENT

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

2.09 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

3.01 GENERAL

- A. Coordinate the installation of forms and reinforcing steel.

3.02 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-foot 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.

3.03 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.

3.04 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.

3.05 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.

3.06 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.

3.07 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. Broom Finish: Provide a rough-broom finish for inside and outside slabs, sidewalks, pavements, stairs, etc. After floating, apply one manual or mechanical troweling followed by a finishing operation with a stiff hairbrush (brooming) to produce a sandy surface similar to a "sidewalk" finish. Finishing shall be done after the concrete is hard enough to retain the scoring. Brooming shall be done transversely to the direction of main traffic.
- 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.

3.08 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.

3.09 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 03 30 00

**SECTION 11 68 13
PLAYGROUND EQUIPMENT**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes playground equipment as follows:
 - 1. Freestanding playground equipment.
 - 2. Composite playground equipment.

1.03 DEFINITIONS

- A. Definitions in ASTM F 1487 apply to Work of this Section.
- B. IPEMA: International Play Equipment Manufacturers Association.

1.04 PREINSTALLATION MEETINGS

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

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of playground equipment.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include fall heights and use zones for playground equipment, coordinated with the critical-height values of protective surfacing specified in Section 321816.13 "Playground Protective Surfacing."
- C. Samples for Initial Selection: For each type of exposed finish.
 - 1. Manufacturer's color charts.
 - 2. Include Samples of accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish on the following products:
 - 1. Include Samples of accessories to verify color and finish selection.
 - 2. Posts and Rails: Minimum 6 inches long.

3. Platforms: Minimum 6 inches square.
4. Molded Plastic: Minimum 3 inches square.

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, manufacturer, and testing agency.
- B. Product Certificates: For each type of playground equipment.
- C. Material Certificates: For the following items:
 1. Shop finishes.
- D. Field quality-control reports.
- E. Sample Warranty: For manufacturer's special warranties.

1.07 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For playground equipment and finishes to include in maintenance manuals.

1.08 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm whose playground equipment components have been certified by IPEMA's third-party product certification service.
- B. 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 Owner's Representative, should they be found after installation.
- C. The Contractor installing the play equipment and structures shall have a minimum of five (5) years of experience installing playground equipment AND must be certified installer for the specified play equipment. Contractor shall have 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.
- D. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.09 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of playground equipment that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures.

- b. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
- 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: Obtain playground equipment from single source from single manufacturer.
- B. Playground equipment and components shall have the IPEMA Certification Seal.
- C. Acceptable Manufacturers
 - 1. Kompan, Inc. 605 W Howard Ln, Suite 101, Austin, TX; 1-800-426-9788, www.kompan.us
 - 2. Approved Equivalent - subject to review and approval by the Owner's Representative.

2.02 PERFORMANCE REQUIREMENTS

- A. Safety Standard: Provide playground equipment according to ASTM F 1487.

2.03 FREESTANDING PLAYGROUND EQUIPMENT

- A. Freestanding Play Structures shall be as indicated on the drawings.

2.04 COMPOSITE PLAYGROUND EQUIPMENT

- A. Composite Play Structure: Integral play assembly that provides more than one play activity; manufactured as a system or assembled from manufacturer's standard modular-sized units.
 - 1. Equipment: Include play event components as indicated on the drawings.
 - 2. Arrangement: As indicated on Drawings.
 - 3. Age Appropriateness: Two through five years and five through 12 years.

2.05 FABRICATION

- A. Provide sizes, strengths, thicknesses, wall thickness, and weights of components as required to comply with requirements in ASTM F 1487. Factory drill components for field assembly. Unnecessary holes in components, not required for field assembly, are not permitted. Provide complete play structures, including supporting members and connections, means of access and egress, designated play surfaces, barriers, guardrails, handrails, handholds, and other components indicated or required for equipment indicated.

- B. Metal Frame: Fabricate main-frame upright support posts from metal pipe or tubing with cross-section profile and dimensions as required. Unless otherwise indicated, provide each pipe or tubing main-frame member with manufacturer's standard drainable bottom plate or support flange. Fabricate secondary frame members, bracing, and connections from either steel or aluminum.
- C. Wood Frame: Fabricate main-frame upright support posts from wood. Fabricate secondary frame members, bracing, and connections from wood, steel, or aluminum.
- D. Composite Frame: Fabricate main-frame upright support posts from metal and plastic. Fabricate secondary frame members, bracing, and connections from either steel or aluminum.
- E. Play Surfaces: Manufacturer's standard elevated drainable decks, platforms, landings, walkways, ramps, and similar transitional play surfaces, designed to withstand loads; fabricated from perforated or expanded metal into floor units with slip-resistant finish. Fabricate units in modular sizes and shapes to form assembled play surfaces indicated.
- F. Protective Barriers: Fabricate according to ASTM F 1487. Extend barriers to height above the protected elevated surface according to requirements for use by age group indicated. Fabricate from one or more of the following:
 - 1. Welded-metal pipe or tubing with vertical bars.
 - 2. Steel sheet with openings for vision and ventilation.
 - 3. Metal-pipe or -tubing frame with wire-mesh infill panels.
 - 4. Opaque plastic panels with openings.
- G. Guardrails: Provide guardrails configured to completely surround the protected area, except for access openings. Fabricate from metal pipe or tubing. Extend guardrails according to requirements for use by age group indicated.
- H. Handrails: Welded metal pipe or tubing, maximum OD 0.95 and 1.55 inches 0.125 inch.
 - 1. Provide handrails at heights to comply with requirements for use by age group indicated according to ASTM F 1487.
- I. Roofs and Canopies: Designed to discourage and minimize climbing by users.
 - 1. Fabricated from metal, metal-pipe or -tubing-framed welded wire, opaque plastic, or polyethylene.
- J. Signs: Manufacturer's standard sign panels, fabricated from opaque plastic with graphics molded in attached to freestanding, upright support posts.
 - 1. Text: Minimum informational content according to ASTM F 1487.
 - 2. Colors: as selected from manufacturer's full range.

2.06 MATERIALS

- A. Aluminum: Material, alloy, and temper recommended by manufacturer for type of use and finish indicated.
- B. Steel: Material types, alloys, and forms recommended by manufacturer for type of use and finish indicated.
- C. Stainless-Steel Sheet: Type 304; finished on exposed faces with No. 2B finish.
- D. Opaque Plastics: Color impregnated, UV stabilized, and mold resistant.
- E. Suspension Chain and Fittings: ASTM A 467/A 467M, Class CS, 4/0 or 5/0, welded-straight-link coil chain; PVC coated; with commercial-quality, hot-dip galvanized or zinc-plated steel connectors and swing or ring hangers.
- F. Iron Castings and Hangers: Malleable iron, ASTM A 47/A 47M, Grade 32510, hot-dip galvanized.
- G. Post Caps: Cast aluminum with color to match posts.
- H. Platform Clamps and Hangers: Cast aluminum or zinc-plated steel, not less than 0.105-inch.
- I. Hardware: Manufacturer's standard; commercial-quality; corrosion-resistant; hot-dip galvanized steel and iron, stainless steel, or aluminum; of a vandal-resistant design.
- J. Fasteners: Manufacturer's standard; corrosion-resistant; hot-dip galvanized or zinc-plated steel and iron, or stainless steel; permanently capped; and theft resistant.

2.07 CAST-IN-PLACE CONCRETE

- A. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete for normal-weight, air-entrained concrete with minimum 28-day compressive strength of 3000 psi, 3-inch slump, and 1-inch- maximum-size aggregate.
- B. Concrete Materials and Properties: Dry-packaged concrete mix complying with ASTM C 387/C 387M and mixed at site with potable water, according to manufacturer's written instructions, for normal-weight concrete with minimum 28-day compressive strength of 3000 psi , 3-inch slump, and 1-inch- maximum-size aggregate.

2.08 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils, medium gloss. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
- B. PVC Finish: UV-stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on PVC finish, with flame retardant added. Comply with coating manufacturer's written instructions for pretreatment and application.

2.09 IRON AND STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a

minimum dry film thickness of 2 mils. Comply with coating manufacturer's written instructions for pretreatment, applying, and baking.

- B. PVC Finish: UV-stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed on PVC finish, with flame retardant added. Comply with coating manufacturer's written instructions for pretreatment and application.

2.10 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for earthwork, subgrade elevations, surface and subgrade drainage, and other conditions affecting performance of the Work.
 - 1. Do not begin installation before final grading required for placing playground equipment and protective surfacing is completed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Comply with manufacturer's written installation instructions for each equipment type unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated.
 - 1. Maximum Equipment Height: Coordinate installed fall heights of equipment with finished elevations and critical-height values of protective surfacing. Set equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. Verify that playground equipment elevations comply with requirements for each type and component of equipment.
- B. Post and Footing Excavation: Excavate holes for posts and footings as indicated in firm, undisturbed or compacted subgrade soil.
- C. Post Set on Subgrade: Level bearing surfaces with drainage fill to required elevation.
- D. Post Set with Concrete Footing: Comply with Section 033000 "Cast-in-Place Concrete" for measuring, batching, mixing, transporting, forming, and placing concrete. ‘
 - 1. Set equipment posts in concrete footing. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at the correct angle, alignment, height, and spacing.

- a. Place concrete around posts and vibrate or tamp for consolidation. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
2. Embedded Items: Follow equipment manufacturer's written instructions and drawings to ensure correct installation of anchorages for equipment.
3. Finishing Footings: Smooth top and shape to shed water.

3.03 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative.
 1. Perform inspection and testing for each type of installed playground equipment according to ASTM F 1487.
- C. Playground equipment items will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Notify Owner 48 hours in advance of date(s) and time(s) of testing and inspection.

END OF SECTION 11 68 13

SECTION 12 93 00
SITE FURNISHINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Benches
 - 2. Trash Receptacles
 - 3. Bollards
 - 4. Tables

1.03 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.

1.04 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.

1.05 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

2.01 BENCHES

- A. 6' BACKED BENCHES - Model #160-60, as manufactured by DuMor, Inc, Mifflintown,

PA, Phone: (800) 598-4018, www.dumor.com, or approved equal. 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.

- B. 6' BACKLESS BENCHES - Model #139-60, as manufactured by DuMor, Inc, Mifflintown, PA, Phone: (800) 598-4018, www.dumor.com, or approved equal. 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.

2.02 TRASH RECEPTACLES

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

2.03 BOLLARDS

- A. 36" HIGH 4" SCHEDULE 40 STEEL BOLLARD – Model #400-36, as manufactured by DuMor, Inc, Mifflintown, PA, Phone: (800) 598-4018, www.dumor.com, or approved equal. Provide as shown on plans and details. Bollards shall be embedded in a concrete foundation using manufacturer's recommended anchors. Steel shall be polyester powder coated black.

2.04 TABLES

- A. 42" DIAMETER STEEL TABLE – Model #101-30 (3-Seat Table) and 101-40 (4-Seat Table), as manufactured by DuMor, Inc, Mifflintown, PA, Phone: (800) 598-4018, www.dumor.com, or approved equal. Provide as shown on plans and details. Tables shall be embedded in manufacturer's recommended concrete footing. Steel shall be polyester powder coated black.

2.05 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

3.01 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.

3.02 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 13 13
SELECTIVE LANDSCAPE PRESERVATION & PLANT REMOVAL

PART 1 GENERAL

1.01 STIPULATIONS

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

1.02 GENERAL REQUIREMENTS

- A. This Section includes the protection and stress reduction of existing trees and vegetation that interfere with, or are affected by, execution of the Work, whether temporary or permanent. Work is to be coordinated with the Project Plans.
- B. Coordinate Work with that of other trades affecting or affected by Work of this Section and cooperate to assure the steady progress of Work.

1.03 SECTION SUMMARY

Work Included: Provide labor and materials as indicated on drawings and specified to implement basic arboriculture activities for existing plants, as well as construction observation of activities within the Tree Protection Areas. Scope to include but not limited to:

- A. Temporary Site and Tree protection Fencing and Temporary Sign Installation
- B. Selective Crown and Root Pruning and Tree Removals
- C. Coordination of Temporary Tree and Plant Protection
- D. Diagnosis and Treatment Recommendations
- E. Temporary Limb Guying or Clearance Pruning for construction access
- F. Supplemental Watering
- G. Monitor Excavation & Construction within Tree Preservation Area.
- H. Disposal and Cleanup

1.04 RELATED SECTIONS

- A. 015719 – Environmental Controls
- B. 330110 – Protection of Existing Utilities
- C. 022113 – Project Survey and Layout
- D. 024113 – Site and Structure Demolition
- E. 129300 – Site Furnishing

- F. 312000 – Earth Moving
- G. 312500 – Soil Erosion and Sedimentation Control
- H. 312310 – Excavation, Backfill & Subgrade Preparation for Pavement
- I. 321216 – Asphalt Paving
- J. 321600 – Concrete Curb and Sidewalks
- K. 329000 – Landscape Planting
- L. 329210 – Turf Grass Seeding
- M. 329223 – Turf Grass Sodding

1.05 REFERENCE STANDARDS

- A. ASTM A 300 – Tree Care Operations
- B. National Arborist Association (N.A.A.) Standards
- C. American Society of Consulting Arborists
- D. American National Standard for Tree Care Operations
 - 1. ANSI Z133.1—1994
 - 2. ANSI A300—1995
- E. American Nurseryman Association Standards
- F. Pennsylvania Seed Act of 1965(Act No. 187) as amended
- G. Pennsylvania Agricultural Liming Materials Act of 1978 (P.L.15,No.9, as amended)
- H. Pennsylvania Soil Conditioner and Plant Growth Substance Law, Act of December 1, 1977, P.L. 258, No.86 (3P.S.68.2) as amended
- I. Regulations of the Pennsylvania Department of Agriculture Bureau of Plant Industry

1.06 QUALITY ASSURANCE

- A. Arboriculture: comply with all applicable standards of the National Arborist Association (NAA) for pruning, guying, fertilizing and installation of lightning protection systems. Arborist shall have current certification by the International Society of Arboriculture (ISA).
 - 1. All arboricultural work under this section shall be performed by personnel totally familiar with arboricultural work and under the supervision of an experienced foreman and ISA certified arborist.
 - 2. Pruning shall be performed by tree workers who, through a minimum of five years related training and on-the-job experience, are familiar with the techniques and hazards of this work.

- B. Analysis and testing of materials required under these specifications shall be in accordance with the current methods of the Association of Official Agricultural Chemists (AOCA) and ASTM.
- C. Equipment and Safety
 - 1. Equipment shall be modern and well maintained. Adhere to all applicable state and federal regulations. Contractor shall be responsible for damage to property resulting from equipment, including fluid leakage or damage resulting from equipment failure. Report incidents of this type immediately to Department of General Services' representative.
 - 2. Safety shall be a primary concern while working on the Site. Contractor shall have an established safety program and adhere to NAA, OSHA and ANSI standards applicable to the tree care industry, including electrical and utility requirements as well as personal equipment and safe work procedures.
- D. Pesticide Applications
 - 1. Certified Pesticide Applicator shall be responsible for supervision of all applications of fertilizer or pesticides on the site.
 - 2. Pesticides shall be applied in strict compliance with label instructions and all applicable federal, state and local requirements. Material Safety Data sheets shall be available for pesticides in the Contractor's possession while on the site.
- E. Arrange a pre-construction meeting between the Landscape Architect, General Contractor and Arboriculture Subcontractor. Such meeting shall seek to review the proposed arboriculture procedures, schedule, consideration of substitutions, and general review of specifications. Note that pruning, fertilization, vertical mulching and mulching activities should be performed prior to the start of construction activities, to improve the vigor of the existing trees to be preserved and to help mitigate the effects of construction stress.

1.07 DEFINITIONS

- A. Diameter shall be defined as diameter at breast height (dbh) which is the average tree diameter at 4.5 feet from the ground on the uphill side of the tree.
- B. Caliper shall be defined as the diameter of the trunk at 6" above the soil for trees up to 4" in caliper and as the diameter of the trunk at 12" above the soil for trees up to 12" caliper.
- C. Root zone shall be defined as 1 (one) foot of radius around trunk for every inch of trunk diameter (at 4.5 feet above the ground level on the uphill side of the tree).
- D. Root zone shall be defined as 1 (one) foot of radius around trunk for every inch of trunk diameter (at 4.5 feet above the ground level on the uphill side of the tree).

1.08 SUBMITTALS

- A. General: Make submittals in accordance with the general contract provisions and procedures of Divison 1, Submittals Specification. Render submittals and receive approval prior to delivery or installation.

1. Approval by the Landscape Architect of submitted product data, samples, test reports, and certificates, or material inspected at source of supply, does not constitute final acceptance.
- B. Product Data: Submit producers/manufacturers specifications, quality control, product data, and test reports for the following: Include instructions for handling, storage, installation and protection.
1. All Pesticides, Insecticides, Herbicides, and other chemicals
- C. Arboricultural Program: Submit detailed program of Arboriculture work and proposed schedule at the pre-construction meeting.
- D. Arborist Qualifications
1. Include evidence of experience, including project list.
 2. Verification of membership in the National Arborist Association (NAA).
- 1.09 COORDINATION
- A. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work, as necessary to assure the steady progress of all work of the Contract.
- 1.10 PERMITS AND CODES
- A. All work shall comply with applicable codes, ordinances, rules, regulations, and laws of all local, municipal, and state authorities having jurisdiction. All work necessary to make site preparation comply with such requirements shall be provided without additional cost to Department of General Services.
- 1.11 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 Department of General Services.
- B. Investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to and ingress and egress at the site. Conform to all governmental regulations regarding the transportation of materials and secure, in advance, any necessary permits.
- C. Procure and pay for permits and licenses required for Work.
- 1.12 DELIVERY, STORAGE AND HANDLING
- A. Packaged Materials: Deliver packaged materials in clearly marked containers showing net weight, guaranteed analysis and name of manufacturer. Specified requirements for packaged materials apply to bulk shipments. Protect materials from deterioration during delivery and during storage at site.

1.13 PROJECT CONDITIONS

A. Existing Conditions

1. Carefully examine the site before submitting a bid. Be informed as to the nature and location of the Work, general and local conditions including climate, adjacent properties and utilities, conformation of the ground, the nature of subsurface conditions, the character of equipment and facilities needed prior to and during execution of the Work. Be aware of and comply with restrictions regarding subsurface utilities and subterranean structures, including excavation and loading parameters.
2. Should the Contractor, in the course of Work, find any discrepancies between Drawings and physical conditions or any omissions or errors in Drawings, or in layout as furnished by the Landscape Architect, it will be his duty to inform the Landscape Architect immediately in writing for clarification. Work done after such discovery unless authorized by the Landscape Architect, shall be done at the Contractor's risk.

B. Environmental Conditions—Arboriculture

1. Pruning: Pruning is preferred, between October 1 and April 1st, prior to the leafing out of the trees. Pruning shall only occur when weather conditions are favorable; pruning shall not occur when branches are wet with snow or rain or when covered by ice.
2. Fertilization: Spring fertilization shall occur in early spring, before bud break. When leaves have fully expanded, fertilizing can continue until early July. Fall fertilization shall occur after October 1st or after the first hard freeze, whichever comes first, when all possibility of top growth in past and before the moisture in the soil freezes casing root activity. Avoid fertilizing between July and September 1.
3. Pest control: Avoid use of herbicides within planting bed. Avoid use of fertilizer/herbicide combinations within the dripline of trees in plant beds.

PART 2 PRODUCTS

2.01 SOIL AMENDMENT MATERIAL

- A. Sand: Natural, medium to coarse grained in texture, free from decomposed organic matter like roots, sticks, leaves, paper and of any other undesirable trash-like glass, plastic or metal fragments that could interfere with soil drainage and planting operations. Sand shall be salt-free.
- B. Ground Limestone: Natural dolomitic limestone containing a minimum of 88% of calcium and magnesium carbonates. Total of 100% passing the 10 mesh sieve; minimum of 90% passing the 20 mesh sieve; minimum of 60% passing the 100 mesh sieve.
- C. Water: Potable, clean, fresh and free from harmful materials. Water shall be furnished by the Contractor. All hoses and other irrigation equipment required for the Work shall be furnished by the Contractor.

2.02 FERTILIZERS

- A. General: As specified below, all fertilizer shall conform to applicable state fertilizer laws. It shall be uniform in composition, free-flowing, and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Any fertilizer which is unsuitable for use will be rejected.
- B. Fertilizer: To be determined based on testing.

2.03 MULCH

- A. Mulch shall be double shredded hardwood bark.

PART 3 EXECUTION

3.01 GENERAL

- A. Basic arboriculture shall include all activities as noted in drawings, and shall include other arboriculture activities as described herein. Note that pruning and mulching activities should be performed prior to the start of construction activities, to improve the vigor of the existing trees to be preserved and to help mitigate the effects of construction stress.
- B. The Arborist shall monitor excavations and construction within the Tree Preservation Area, including: being on site during all excavations within the Tree Preservation Area to ensure that hand or approved mechanical excavations does not damage existing root systems, and to perform compensatory pruning. The construction that would occur within the Tree Preservation Area would include but not be limited to removal of existing pavements, pavements, and utility trenching.

3.02 PRUNING

- A. Pruning – General: Pruning shall conform to ANSI A300 – 1995 standards as specified. Stripping of interior growth on trees is not acceptable. Interior growth may be selectively thinned when appropriate to type of prune. Thinning in general shall be accomplished from the tips of branches by removing diseased, crossing, and/or conflicting branch structure. Target pruning shall be the preferred method of branch removal. Equipment shall be sharp and well maintained. Proper equipment shall be used for all pruning procedures (i.e., handsaw, chainsaw, polesaw, or pole pruner). Employees pruning trees shall have adequate training as to the proper methods and procedures for tree pruning. Refer to ANSI A300 standards for other pruning requirements.
 - 1. On trees known or suspected of being diseased, tools are to be disinfected with methyl alcohol at 70% (denatured wood alcohol diluted appropriately with water) or Clorox solution after each cut and between trees where there is known to be a danger of transmitting the disease on tools.
 - 2. The presence of any structural weakness, disease conditions, decayed trunk or branches, split crotches or branches, should be reported in writing to the Professional and PPR, and corrective measures recommended.
- B. All Trees shall receive a crown cleaning to remove all dead, weak, and conflicting branches 1 (one) inch and larger at the point of attachment. Trees with root zone affected

by construction shall receive a slight reduction in the meristematic regions at the branch tips in the crown.

3.03 ROOT PRUNING

- A. Root pruning shall be performed in conjunction with Tree Preservation Fencing. Root pruning shall be performed as indicated on Drawings or as required, including: trenching for utilities, excavations for foundations, or wherever grades will be changed within the root zone of the tree to be preserved. Root pruning shall be to the depth of excavation or 24 inches, whichever is less. A trencher or vibratory plow shall be used to prune roots. Roots over 2" in diameter shall have a clean cut made on the surface of the root which is still attached to the tree. This cut shall be made with a hand saw or chain saw as soon as larger root is severed. Where fill is to be placed, root pruning shall be to the depth of top soil.
- B. The Arborist must verify exact layout with General Contractor, to ensure root pruning in appropriate location.
- C. When root pruning in conjunction with excavation and installation of utilities, the Arborist shall endeavor to work around and preserve the existing tree roots. Make all effort to preserve roots greater than 2" in diameter.

3.04 FERTILIZATION

- A. Trees shall receive a liquid fertilization within three months prior to construction activities. Fertilizer shall be applied at a rate of 1.5 pounds of nitrogen per 1,000 square feet of root zone treated. A root stimulant shall be added for trees with root loss or disturbance or otherwise affected by construction. Fertilizer shall be injected using a soil probe at a depth of six inches. Fertilizer shall be applied in three foot grid pattern evenly distributed throughout the root zone.

3.05 TREE WOUND CARE

- A. Tree wounds shall be treated according to standard practices, by a professional arborist. Wounds shall not be covered with dressings.

3.06 DISPOSAL AND CLEAN UP

- A. All refuse and debris from these operations shall be legally disposed of off-site. Material shall be removed or neatly stored at the end of each day's work. Dumping on the site shall not be permitted. Burning of material on the site shall not be permitted.
- B. All diseased, infected or infested vegetation that has been pruned/cut shall be removed immediately (at end of day pruning operations are performed) from the site.
- C. Maintain the site in an orderly condition during the progress of Work. Continuously and promptly remove excess and waste materials; keep lawn areas, walks and roads clear. Store materials and equipment where directed. Immediately remove rejected materials from the property. Promptly remove equipment, surplus material, and debris and trash resulting from operations under this Contract upon completion and prior to initial acceptance of Work. Lave the site in a neat, orderly condition, "broom clean".
- D. Maintain the site in an orderly condition during the progress of Work. Continuously and promptly remove excess and waste materials; keep lawn areas, walks and roads clear.

Store materials and equipment where directed. Immediately remove rejected materials from the property. Promptly remove equipment, surplus material, and debris and trash resulting from operations under this Contract upon completion and prior to initial acceptance of Work. Leave the site in a neat, orderly condition, "broom clean".

END OF SECTION 31 13 13

**SECTION 31 20 00
EARTH MOVING**

PART 1 GENERAL

1.01 SCOPE OF WORK

- 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.

1.02 RELATED SECTIONS AND DOCUMENTS

- A. Section 33 01 10– Protection of Existing Utilities
- B. Section 31 25 00 – Soil Erosion and Sedimentation Controls

1.03 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/ft³ (600 kN-m/m³)),” 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/ft³ (2,700kN-m/m³)),” 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.

1.04 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.

1.05 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.
- D. 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.

1.06 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

2.01 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 32 92 10 – Turf Grass Seeding.

2.02 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

3.01 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.

3.02 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.

3.03 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.

3.04 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.

3.05 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

3.06 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 00

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

PART 1 GENERAL

1.01 SCOPE OF WORK

- 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 02200 - Earthwork.

1.02 RELATED SECTIONS AND DOCUMENTS

- 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 13 20 – Concrete Paving
- E. Construction Drawings.

1.03 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/ft³ (600 kN-m/m³)),” 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/ft³ (2,700kN-m/m³)),” 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.

1.04 QUALITY ASSURANCE

A. An Owner's Geotechnical Engineer may perform construction testing on filling operations and subgrade preparation as specified in Section 31 20 00 and described herein. Refer to Item 1.04 of Section 31 20 00 for 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.

1.05 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 00 – Earth Moving.

PART 2 PRODUCTS

2.01 MATERIALS

A. The fill material must meet the requirements of Section 31 20 00 – Earth Moving and be approved by the Geotechnical Engineer.

2.02 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

3.01 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.

3.02 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 00 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

3.03 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 stockpile or dispose of this material off-site as noted on drawings 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 2.02 of this Section prior to placement of pavement subbase. Refer to Section 31 20 00 – Earth Moving, 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 00 of these Specifications, or as directed by the Engineer.

3.04 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 00.

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 00.

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.

3.05 QUALITY CONTROL

A. Compaction tests shall be performed as specified in Section 31 20 00 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 31 23 10

GIFFORD MINI PITCH

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EXCAVATION, BACKFILL & SUBGRADE PREPARATION FOR PAVEMENT

SECTION 31 25 00
SOIL EROSION AND SEDIMENTATION CONTROLS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Temporary and permanent soil erosion control systems.
- B. Slope Protection Systems.

1.02 RELATED SECTIONS

- A. Section 31 20 00 – Earth Moving
- B. Section 32 90 00 – Landscape Planting
- C. Section 32 92 10 – Lawn and Grasses
- D. Construction Drawings

1.03 REFERENCE STANDARDS

- A. The PADEP, Erosion Sediment and Pollution Control, April 2000.
- B. Philadelphia Water Department (PWD), Stormwater Management Guidance Manual, Version 2.0

1.04 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.

1.05 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

2.01 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

3.01 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.

3.02 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 32 92 10) 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 02020

SECTION 32 01 16.71
MILLING OF ASPHALT PAVEMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Milling of asphalt paving.

1.02 DESCRIPTION OF WORK

- A. This work is the milling of an existing bituminous pavement surface, with specified equipment, to a depth of two (2") inches, or depth of existing wearing course, whichever is greater.

PART 2 PRODUCTS

NOT APPLICABLE

PART 3 EXECUTION

3.01 EQUIPMENT

- A. Use a milling machine designed and built for this type of work. Provide a machine with an effective automatic grade and slope control system and having the capacity to mill concrete patches.

3.02 MILLING OPERATION

- A. Mill so the finished surface is free from gouges, grooves, and ridges and is in accordance with the specified surface tolerance requirements, or as directed.
- B. To facilitate traffic control, pick up and move milled material, as specified, immediately after the milling operations.
- C. Use care to remove the existing bituminous material around all utility facilities within the work areas.
- D. Repair or replace, to the satisfaction of the utility owner, utility facilities which are damaged by the milling operation.
- E. Control the rate of milling to avoid tearing of the mat, resulting in chunky an non-uniformly milled material.
- F. Separate oversize and chunky milled material as directed.
- G. Keep the milled pavement surface free of all loose materials and dust.

3.03 SURFACE TOLERANCE

- A. Test the finished surface with a ten (10) foot straightedge whenever Engineer suspects an area is deficient or irregular.
- B. Use the straightedge at transverse joints and paving notches.
- C. Hold the straightedge in successive positions parallel to the road centerline, in contact with the surface, and check the whole area from one side to the other, as necessary.
- D. Advance along the pavement in stages of not more than one-half the length of the straightedge.
- E. Correct irregularities of more than 3/16 inch.
- F. For irregularities which develop before completion of rolling, correct by loosening surface mixture and removing or adding material, as required.
- G. If irregularities or defects that cannot be corrected remain after final compaction, the affected area will be considered defective.

3.04 DISPOSITION OF MILLED MATERIAL

- A. Satisfactorily dispose of the milled material.

END OF SECTION 32 01 16.71

**SECTION 32 12 16
ASPHALT PAVING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Warm-mix asphalt paving.
 - 2. Warm-mix asphalt patching.

1.3 DEFINITION

- A. Warm-Mix Asphalt Paving Terminology: Refer to PennDOT Publication 408, Section 413.2 for definitions of terms.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
 - 1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
- B. Material Certificates: For each paving material, from manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Warm Mix Asphalt: Asphalt paving-mix manufacturer registered with and approved by PennDOT.
- B. Comply with materials, workmanship, and other applicable requirements of Publication 408, Section 400 for flexible pavement work.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
 - 1. Prime Coat: Minimum surface temperature of 40 deg F and rising.

2. Tack Coat: Minimum surface temperature of 60 deg F.
3. Slurry Coat: Comply with weather limitations in ASTM D3910.
4. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

PART 2 - PRODUCTS

2.1 ASPHALT MATERIALS

A. Asphalt Binder:

1. Warm Mix Asphalt PG 64S-22. As approved by PennDOT.

2.2 GEOTEXTILE – Non-woven, Type II. Approved by PennDOT.

2.3 MIXES

A. Warm-Mix Asphalt: Dense, warm-laid, warm-mix asphalt plant mixes manufactured by a PennDOT approved plant and complying with the mix designations indicated on the drawings and the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protection: Provide protective materials, procedures, and worker training to prevent asphalt materials from spilling, coating, or building up on curbs, driveway aprons, manholes, and other surfaces adjacent to the Work.
- B. Asphalt surface preparation shall be in accordance with Section 469.3 (c) PENNDOT Specifications.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.3 WARM-MIX ASPHALT PLACING

- A. Machine place Warm-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 - 1. Place warm-mix asphalt base course in number of lifts and thicknesses indicated.
 - 2. Place warm-mix asphalt surface course in single lifts not to exceed 4 inches in finished thickness.
 - 3. Spread mix at minimum temperature as defined in PennDOT Publication 408, Section 411.2, Table A “Job-Mix Formula.”.
 - 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
 - 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 12 feet wide or half a pavement section’s full width when 30 feet or less wide, unless infill edge strips of a lesser width are required.
 - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with warm-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.
- D. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of warm-mix asphalt course.
 - 1. Clean contact surfaces and apply tack coat to joints.
- E. Begin compaction as soon as placed warm-mix paving will bear roller weight without excessive displacement. Compact warm-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
 - 1. Complete compaction before mix temperature cools to 185 deg F.
- F. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

- G. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while warm-mix asphalt is still hot enough to achieve specified density. Continue rolling until warm-mix asphalt course has been uniformly compacted to the following density:
 - 1. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent nor greater than 100 percent.
 - 2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- H. Finish Rolling: Finish roll paved surfaces to remove roller marks while warm-mix asphalt is still warm.
- I. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment.
- J. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, warm-mix asphalt. Compact by rolling to specified density and surface smoothness.
- K. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- L. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.4 INSTALLATION OF PAVING GEOTEXTILE

- A. Place paving geotextile promptly in accordance with manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds.
- B. Protect paving geotextile from traffic and other damage, and place warm-mix asphalt overlay the same day.

3.5 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of warm-mix asphalt course.
 - 1. Clean contact surfaces and apply tack coat to joints.
 - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
 - 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
 - 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method in accordance with AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

5. Compact joints as soon as warm-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.6 COMPACTION

- A. General: Begin compaction as soon as placed warm-mix paving will bear roller weight without excessive displacement. Compact warm-mix paving with hot hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
 1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while warm-mix asphalt is still hot enough to achieve specified density. Continue rolling until warm-mix asphalt course has been uniformly compacted to the following density:
 1. Average Density, Marshall Test Method: 96 percent of reference laboratory density in accordance with ASTM D6927, but not less than 94 percent or greater than 100 percent.
 2. Average Density, Rice Test Method: 92 percent of reference maximum theoretical density in accordance with ASTM D2041/D2041M, but not less than 90 percent or greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while warm-mix asphalt is still warm.
- E. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, warm-mix asphalt. Compact by rolling to specified density and surface smoothness.
- F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

3.7 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 1. Surface Course: Plus 1/4 inch no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a smooth surface.

3.8 FIELD QUALITY CONTROL

- A. Owner Representative to be notified prior to paving.
- B. Thickness: In-place compacted thickness of Warm-mix asphalt courses will be determined according to ASTM D3549.
- C. Surface Smoothness: Finished surface of each asphalt course will be tested for compliance with smoothness tolerances.

3.9 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

END OF SECTION 32 12 16

SECTION 32 13 73
CONCRETE PAVING JOINT SEALANTS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Provide labor, materials, equipment and services, and perform operations required for installation of sealants/site and related work as indicated on the drawings or specified herein.
- B. Work Included: The work of this Section shall include, but not be limited to, the following:
 - 1. Exterior weather joints between similar and dissimilar materials.
 - 2. Exterior horizontal traffic joints.
- C. The words ‘caulking’ and ‘sealant’ shall be considered synonymous on the Contract Documents. It shall be understood that both words define materials for sealing joints or seams watertight.

1.02 QUALITY ASSURANCE

- A. Materials shall conform to the latest edition of reference specifications listed below, specified herein and to applicable codes and requirements of local authorities having jurisdiction. Work and installation shall conform to ASTM C962.
- B. Qualifications: Installer of sealants shall have a minimum of five (5) years of successful experience in the application of the type of materials specified in this section and only skilled workmen shall be used for the work.

1.03 SUBMITTALS

- A. Product Data: Copies of manufacturer’s latest published literature for all materials specified herein shall be submitted before materials are delivered to the site.
- B. Schedule of Sealant Usage: Submit a detailed schedule of all locations of sealant usage. List each sealant material, joint filler(s), color(s) and related data for each location of use.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered to the site, in original unopened containers, clearly indicating manufacturer’s name, brand name, and other identifying information.
- B. Materials shall be stored in a dry location, off the ground and in such a manner as to prevent freezing, damage and the intrusion of foreign matter.
- C. Materials which have become damaged or otherwise unfit for use during delivery, or storage, shall be replaced at the expense of the Contractor.

1.05 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturers.
 - 2. When joint substrates are wet due to rain, frost, condensation, or other causes.
- B. Joint Width Conditions: Do not proceed with installation of joint sealers where joint widths are less or more than allowed by the joint sealant manufacturer for the application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with their adhesion are removed from joint substrates.
- D. Joint Design: Joint widths indicated within the Contract Documents are detailed at their “Designed Width”, which is when the joint would be at the average air temperature of 70 degrees F. Installation shall take into account the ambient temperature range at the time of respective installation and operation.
 - 1. Joint materials shall perform over an ambient air temperature range of 120 degrees F. and a surface temperature range of 180 degrees F.

1.06 WARRANTY

- A. The Contractor shall execute and deliver to the Owner before final payment is made, a written warranty in a satisfactory form, stating that labor and materials furnished, and work performed by the Contractor are in accordance with the Contract Documents and authorized alterations and additions thereto; and that, should any defects develop during the warranty period, the Contractor shall upon written notice from the Architect or Owner, replace or satisfactorily repair such defects, including adjustments to adjacent work, as required; at the convenience of, and without expense to the Owner. Contractor shall warranty work for Five (5) years from date of final acceptance.

PART 2 PRODUCTS

2.01 SEALANT MATERIALS

- A. General: Provide a complete system of cleaners, primers, fillers, tapes, backer rods and tapes and sealants in accordance with the manufacturer’s requirements and the standards specified herein.
 - 1. Color of Sealants: For concealed joints provide manufacturer’s standard color which has the best overall performance qualities for the application shown. For exposed joints the Architect will select colors from the manufacturer’s standard colors or special colors as specified elsewhere.
- B. Elastomeric Compounds
 - 1. Multi-Component Polyurethane (Sealant Type 1): ASTM C920, class and use as

best suited for the intended purpose. Products meeting these requirements are:

- a. “Dymeric” by Tremco.
 - b. “Dynatrol II by Pecora Corp.
 - c. “Sonolastic NP II” by Sonneborn Building Products.
2. Self-Leveling Traffic Bearing (Sealant Type 2): ASTM C920, self-leveling, two-part polyurethane compound, with a Shore A cured hardness of 35 plus or minus 5, Sealant shall have a joint movement capability of plus/minus 50 percent.
- a. “Sonolastic 2C SL” by Sonneborn Building Products
 - b. “Sikaflex 12SL” by Sika Corp.
 - c. “Urexpan NR-20 1’ by Pecora Corp.

2.02 JOINT FILLER MATERIALS

- A. Compressible Rod (Filler Type 1): Types as shown, or as required for proper performance of the sealant in the specific joint, which is compatible with sealant, as recommended by sealant manufacturer. One of the following:
1. Closed Cell Polyethylene Foam Rod: One of the following:
 - a. “Tremco Joint Backing” (Tremco).
 - b. “Green-Rod Polyethylene Backer Rod” (Nomaco, Inc.).
 - c. “HBR Backer Rod” (Hercules, Inc.).
 - d. “Sonofoam Back Rod” (Sonneborn Building Products).
 2. Open Cell Polyurethane Rod: “Denver Foam” as distributed by Pecora Chemical Corp. or Woodmont Products Inc.
- B. Preformed Sponge Rubber or Cork (Filler Type 2): ASTM D1752, Type I, II or III; type best suited for joint condition.
- C. Closed Cell Neoprene (Filler Type 3): ASTM D1056, Type S, Class SCE.
- D. Closed Cell Polyethylene (Filler Type 5): Not less than 3 psi for 25% compression resistance, highly resistant to petroleum oils and solvents, one of the following:
1. “Expand-O-Foam” (Williams Products, Inc.).
 2. “Filler Foam Gasket FF4” (Progress Unlimited Inc.)
 3. “Tremco Joint Backing” (Tremco)
- E. Select shape and size of joint filler in consultation with the manufacturer for proper performance in the specific condition of use in each case.

2.03 MISCELLANEOUS MATERIALS

- A. Joint Cleaner: Provide non-staining cleaner recommended by the manufacturer of the sealant for the specific joint surface and condition.
- B. Joint Primer and Sealer: Provide non-staining compounds recommended by the manufacturer of the sealant for the specific joint surface and condition. Primers and cleaners shall not damage applied metal finishes
- C. Bond Breaker Tape: Pressure sensitive polyethylene tape.
- D. Vent Tubes: Vent tubes (weep holes) shall be heat-bendable acrylic tubes with stainless steel mesh screens.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine conditions at the job site where work of this section is to be performed to insure proper arrangement and fit of the work. Start of work implies acceptance of job site conditions.

3.02 PREPARATION

- A. Comply with the sealant manufacturers requirements for all preparations.
 - 1. Comply with conditions specified herein before in Paragraph "Project Conditions".
- B. Clean out joints to receive sealant, backup material or preformed joint filler to comply with recommendations of approved manufacturer and as specified herein.
 - 1. Thoroughly clean joints, removing foreign matter such as dust, oil, grease, water, surface dirt and frost. Sealant must be applied to the base surface. Previously applied paint, film sealers, or coatings shall be entirely removed unless tested and approved by the sealant manufacturer for adhesion.
 - 2. Porous materials such as concrete and masonry shall be cleaned where necessary by grinding, water blast-cleaning, mechanical abrading, or combination of these methods as required to provide a clean, sound base surface for sealant adhesion.
 - a. Clean masonry surfaces with water and air; do not use any acid or other material which might stain surfaces.
 - b. Remove laitance and form release agents from concrete.
 - c. Remove loose particles present or resulting from grinding, abrading or blast-cleaning by blowing out joints with compressed air, oil free, or vacuuming joints prior to application of primer or sealant.
 - 3. Clean and remove protective coatings on metallic surfaces as recommended by sealant manufacturer. Clean joint areas protected with masking tape or strippable

films as above after removal of tape film.

3.03 INSTALLATION

- A. Comply with the sealant manufacturers requirements for all preparations.
 - 1. Comply with conditions specified herein before in Paragraph “Project Conditions”
 - 2. Do not begin sealant operations if the work does not in comply with Contract Documents and the sealant manufacturer’s recommendations.
- B. Joint Fillers: Install joint fillers beneath all sealants.
 - 1. Perform work in strict accordance with manufacturer’s instructions.
 - 2. Employ mechanics skilled in this trade and proficient in the installation of specified sealant materials.
 - 3. Install joint filler materials when temperature is between 25 degrees F and 95 degrees F.
 - 4. For facade and traffic bearing conditions, foam sealant shall be at compression of 25 percent of uncompressed dimension. Depth of joint seal shall be in accordance with manufacturer’s requirements. Prior to installation, size of joint and sizing of seal shall be reviewed having regard to ambient temperature and expected thermal movement.
- C. Sealants
 - 1. Prime joint substrates where recommended by joint sealer manufacturer based upon the completion of a preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer’s recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces or exposed surfaces.
 - 2. Use masking tape or other materials to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove as soon as possible after tooling sealant without disturbing joint seal.
 - 3. In joints where depth of joint exceeds required depth of sealant, install joint backing (after primer is dry) in joints to provide backing and proper joint shape for sealant. Proper shape for sealant is a very slight concave curvature. Use special blunt T-shaped tool or roller to install joint backing to the proper and uniform depth required for the sealant. Joint backing shall be installed with approximately 30 percent compression. Do not stretch, twist, braid, puncture, or tear joint backing: Butt joint backing at intersections.
 - 4. Install bond breaker smoothly over surfaces that would bond to sealant and at back of joints where joint backing is not required, so that sealant adheres only to the sides of the joint and not back surfaces or backing.
 - 5. It is recommended that sealant be installed when the average daily air temperature

is 70 degrees F (plus/minus 5 degrees F), when joint should be at its Designed Width. When average daily temperature is lower or higher than this range Contractor shall perform work in strict accordance with sealant manufacturer's recommendations.

6. Apply sealant in accordance with the manufacturer's application manual and manufacturer's instructions, using hand guns or pressure equipment, on clean, dry, properly prepared substrates. Sealant application shall be such to ensure complete contact and adhesion to sides of joints. Temperature of sealant, as well as of substrates, at time of sealant application, shall be as recommended by sealant manufacturers. Refer to Paragraph "Job Conditions". Force sealant into joint in front of the tip of the "caulking gun" (not pulled over it) and force sealant against sides to make uniform contact with sides of joint and to prevent entrapped air or pulling of sealant off of sides. Fill sealant space solid with sealant.
7. Tool exposed joints to form smooth and uniform beds, with slightly concave surface. Finished joints shall be straight, uniform, smooth and neatly finished. Remove masking tape immediately after tooling of sealant and before sealant face starts to "skin" over. Neatly remove any excess sealant from adjacent surfaces of joint, leaving the work in a neat, clean condition.

3.04 LOCATIONS OF USE

- A. Sealants: Provide sealants in accordance with the following locations of use:
 1. Provide Sealant (Type 1) for all exterior weather seals and movement joints.
 2. Provide Sealant (Type 2) for all exterior paving joints.
- B. Joint Filler Materials: Provide joint fillers or tapes at all locations of sealant use as follows:
 1. Provide backer rods (Filler Type 1) at all joints to be sealed.
 2. Provide backer rods and joint fillers behind all horizontal joints and horizontal lengths of joints.
 3. Provide bond breaker tape at all joints indicated on the Drawings to have no backer rod and at joints as required by the sealant manufacturer.

3.05 FIELD QUALITY CONTROL

- A. Work under this section shall be subject to detailed inspection. Any sealants found out of plumb or cracking or backer rod or joint fillers found out of plumb or displaced by caulking operations or any work otherwise defective, or work not in accordance with specifications and details, shall be taken out and replaced to the complete satisfaction of the Architect, at no additional cost to the Owner.

3.06 CLEANING AND PROTECTION

- A. Upon completion of the work, unused materials, containers, equipment, masking tape or protective measures, etc., shall be removed from the site. Floors, walls and other adjacent surfaces, that are stained or damaged by work of this section, shall be repaired and adjacent surfaces shall be left in a clean and undamaged condition.

- B. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

END OF SECTION 32 13 73

SECTION 32 16 00
CONCRETE CURBING AND SIDEWALKS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Section includes concrete paving work for the project.

1.02 RELATED SECTIONS AND DOCUMENTS

- A. Applicable Sections: Division 1
- B. Section 02 41 16 – Site and Structure Demolition
- C. Section 31 20 00 – Earth Moving
- D. Section 31 23 10 – Excavation, Backfill & Subgrade Preparation for Pavement
- E. Section 03 30 00 – Cast-In-Place Concrete
- F. Section 32 13 73 – Concrete Paving Joint Sealants

1.03 REFERENCE STANDARDS

- A. Standard for Concrete Work: As indicated in Division 3.
- B. Municipal Specifications: Standard Specifications for Paving and Repaving, Department of Streets, City of Philadelphia.
- C. Pennsylvania Department of Transportation (PennDOT) – Publication 408 – Standard Specifications for Roads and Bridges, latest edition.

1.04 PERFORMANCE REQUIREMENTS

- A. The contractor shall maintain access for pedestrian traffic as required for other access to the existing buildings and facilities remaining in use and for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

1.05 SUBMITTALS

- A. Submit per the requirements of Division 1.
- B. The contractor shall submit the required submittals to Owner or Design Professional at least two weeks prior to the start of construction for approval.
- C. Comply with Cast-In-Place Concrete: Division 3

1.06 QUALITY ASSURANCE

- A. Owner will retain an independent testing agency to perform the required tests. The contractor shall provide any necessary assistance to the testing agency and provide the testing agency with the intended construction schedule at least one week prior to the start of construction.
- B. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.
- 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.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. The forms shall be of a depth equal to the depth of curbing or sidewalk, and so designed as to permit secure fastening together at the tops. Coat forms with non-staining type coating that will not discolor or deface surface of concrete.
- B. Concrete Materials: Comply with requirements of the PennDOT Standard Specifications or as referenced in the Contract Documents for concrete materials, admixtures, bonding materials, curing materials, and others as required. Concrete shall have a minimum 28-day compressive strength of 4,500 psi.
- C. Joint Fillers: Resilient premolded bituminous impregnated fiberboard units complying with ASTM D 1751 FS HH-F-341, Type II, Class A; or AASHTO M 153, Type I.
- D. Welded wire fabric as indicated on Contract Drawings.

2.02 MIX DESIGN AND TESTING

- A. Concrete mix design and testing shall comply with requirements of the PennDOT Standard Specifications or as referenced in the Contract Documents.
- B. Design mix to produce normal weight concrete consisting of Portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce the following properties:
 - 1. Compressive Strength: 4,500 psi, minimum at 28 days, unless otherwise indicated on the Drawings.
 - 2. Slump Range: 4" maximum.
 - 3. Air Entrainment: 4% to 7%.

2.03 SUBMITTALS

- A. Unless otherwise specified, Design/Builder shall submit any required submittals at least two weeks prior to the start of construction for review and approval.

PART 3 EXECUTION

3.01 PREPARATION

- A. Proof-roll prepared base material surface to check for unstable areas. The paving work shall begin after any unsuitable areas have been corrected and are ready to receive paving. Compaction testing for the base material shall be completed prior to the placement of the paving.
- B. Surface Preparation: Remove loose material from compacted base material surface to produce a firm, smooth surface immediately before placing concrete.

3.02 INSTALLATION

A. Form Construction

1. Set forms to required grades and lines, rigidly braced and secured.
2. Install sufficient quantity of forms to allow continuance of Work and so that forms remain in place a minimum of 24 hours after concrete placement.
3. Check completed formwork for grade and alignment to following tolerances:
 - a. Top of forms not more than 1/8" in 10'-0".
 - b. Vertical face on longitudinal axis, not more than 1/4" in 10'-0".
4. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.
5. Install 6"x6" welded wire fabric unless otherwise indicated on the Drawings. Support wire on metal wire chairs to ensure that wire stays mid-depth of sidewalk section during concrete pour.

B. Concrete Placement

1. Do not place concrete until base material and forms have been checked for line and grade. Moisten base material if required to provide uniform dampened condition at time concrete is placed. Concrete shall not be placed around manholes or other structures until they are at the required finish elevation and alignment.
2. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of dowels, and joint devices.

3. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than ½ hours, place construction joint. Automatic machine may be used for curb and gutter placement at Design/Builder's option. Machine placement must produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.
4. Concrete placement shall be conducted between 40 degrees and 90 degrees Fahrenheit. Concrete placement in sever weather conditions must be pre-approved by Engineer and shall be conducted in accordance with related ACI recommended procedures.

C. Joint Construction

1. Contraction Joints: Concrete curb, concrete gutter or concrete curb and gutter, shall be constructed in uniform sections of the length. The joints between sections shall be formed either by steel templates 1/8 inch in thickness, of a length equal to the width of the gutter and/or curb, and with a depth which will penetrate at least 2 inches below the surface of the curb and/or gutter; or with ¾-inch thick preformed expansion joint filler cut to the exact cross section of the curb and/or gutter; or by sawing to a depth of at least 2 inches while the concrete is between 4 to 24 hours old. If steel templates are used, they shall be left in place until the concrete has set sufficiently to hold its shape, but shall be removed while the forms are still in place.
 2. Longitudinal Construction Joints: Concrete curb, concrete gutter or combination concrete curb and gutter, where specified on the Contract Drawings, shall be tied to concrete pavement with ½ inch round deformed reinforcement bars of the length and spacing shown on the Contract Drawings. Joint spacing as specified on the Contract Drawings.
 3. Transverse Expansion Joints: Transverse expansion joint in curb, curb and gutter, gutter or sidewalk shall have the filler cut to the exact cross section of the curb, curb and gutter, gutter or sidewalk. The joints shall be similar to the type of expansion joint used in the adjacent pavement. Joint spacing as specified on the plans.
- D. Joint Fillers: Extend joint fillers full-width and depth of joint, and not less than 2" or more than 1" below finished surface where joint sealer is indicated. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.
- E. Joint Sealants: All joints shall be sealed with approved exterior pavement joint sealants and shall be installed per manufacturer's recommendations (see Section 32 13 73).

3.03 CONCRETE FINISHING

- A. After striking off and consolidating concrete, smooth surface by screening and floating. Adjust floating to compact surface and produce uniform texture. After floating, test surface for trueness with 10'-0" straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide continuous smooth finish.
- B. Work edges of sidewalks, gutters, back top edge of integral curb, and formed joints with an edging tool, and round to ½" radius. Eliminate tool marks on concrete surface. After

completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:

1. Inclined Slab Surfaces: Provide coarse, nonslip finish by scoring surface with stiff-bristled broom perpendicular to line of traffic.
 2. Curbs, gutters, and sidewalks: Broom finish by drawing fine-hair broom across surface perpendicular to line of traffic. Repeat operation as necessary to produce a fine line texture.
 3. Do not create "picture frame" appearance on concrete by use of trowel around perimeter. Such appearance shall result in rejection by Owner & Design Professional.
- C. 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.
- D. Protect and cure finished concrete paving using acceptable moist-curing methods, more particularly described in the "water-curing" section of ACI 308-81.

3.04 BACKFILL

- A. After the concrete has set sufficiently, the spaces in front and back of the curb and gutter or sidewalk shall be refilled to the required elevation with suitable material in accordance with Sections 329000, 329210, 329223, and the contract drawings, which shall be compacted until firm and solid and neatly graded.

3.05 CLEANING AND ADJUSTING

- A. Sweep and wash curb and sidewalks so that they are free of stains, discolorations, dirt, and other foreign material just prior to final inspection.
- B. Protect concrete from damage until acceptance of Work.

END OF SECTION 32 16 00

SECTION 32 18 16.13
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, Backfill & Subgrade Preparation for Paving
- B. Section 32 12 16 – Asphalt Paving
- C. Section 32 13 73 – Concrete Paving Joint Sealants

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)
- F. Pennsylvania Department of Transportation (PennDOT)
1. Publication 408 – Standard Specifications

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 Fahrenheit 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 Wabasse 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: ¾ inch minimum.
- D. Color Mixtures:
 - 1. As specified on the plans.

2.04 POLYURETHANE PRIMER AND BINDER

- A. Primer and Binder shall be a single component Polyurethane pre-polymer formulated using a polymeric foam of Diphenylmethane Diisocyanate (MDI).
- B. No Toluene Diphenyl Isocyanate (TDI) shall be used.
- C. No filler materials shall be used in urethane such as plasticizers and the catalyzing agent shall contain no heavy metals.
- D. 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 Wabasse 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.
- E. Weight of polyurethane shall be no less than 8.5 pounds/gallon and no more than 9.5 pounds/gallon.
- F. 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.
- 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 coat 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.
- I. 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 18 16.13

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:

Material Supplier:

Address:

Address:

Contact Phone Number:

Contact Phone Number:

Ext _____

Ext _____

Sign _____ Date _____

Sign _____ Date _____

Print _____

Print _____

Authorization / Accepted (Sign) _____ Date _____

(Owner Representative) (Print Name) _____

**SECTION 32 18 23.53
ACRYLIC SURFACING**

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Asphalt pavement colorcoating. The Contractor shall furnish all labor, materials and equipment required for the complete leveling/patching and surfacing of all areas indicated on the plans to the satisfaction of the Owner or Owner's Representative.

1.2 SUBMITTALS

- A. Submit under provisions of Division 1 - Submittals.
- B. Product Data: Provide manufacturer's data on colorcoating.
- C. Instructions: Provide manufacturer's application instructions.

1.3 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this section with minimum two years experience.

1.4 TEST MATERIALS

- A. The Owner reserves the right to sample materials both as delivered to the job site in unopened drums and after dilution and mixing prior to application. Such testing shall be by an independent laboratory of the Owner's choice to assure that the materials meet the standards set by this specification.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply colorcoating when ambient air temperature does not meet manufacturers recommendations.
- B. Surfacing system shall be asbestos free.

1.6 SUBSTITUTIONS

- A. Under provisions of Division 1 Specification Sections.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: California Products Corporation, Plexipave.
- B. Approved equivalent.

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ACRYLIC SURFACING

2.2 MATERIALS

- A. Acrylic Patching System: Shall be court patch binder conforming to manufacturer's specifications.
- B. Crack Filler: Shall be a fortified acrylic type filler for use in fine cracks (less than 3/16" wide) conforming to manufacturer's specifications.
- C. Acrylic Resurfacer: Shall be a 100% acrylic emulsion binder conforming to manufacturer's specifications. Color: Black.
- D. Finish Coating: Shall be a reinforced acrylic finish coating conforming to manufacturer's specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that existing paving surface is ready to receive work.
- B. Beginning of colorcoating application means acceptance of existing conditions.

3.2 PREPARATION

A. Surface Preparation

- 1. The asphalt paving surface shall be thoroughly cleaned, removing all loose dirt, oil, grease, leaves, and drippings and scrub with a detergent and water. Remove all traces of detergent.

B. Holes and Cracks

- 1. Where asphalt paving surface cracks occur, they shall be milled to remove all asphalt humps, cleared of all debris, dirt, and vegetation, sprayed with an approved soil sterilant, and filled with court patch binder as recommended by colorcoating manufacturer. Hairline fissures will not be considered as surface cracks.
- 2. Where open joints or cracks occur (more than 3/8 inch wide and less than 1 inch wide), they shall be milled to remove all debris, dirt, and vegetation. Spray with an approved soil sterilant, backfill with crushed stone, and seal with bituminous paving.
- 3. Where open joints or cracks occur (1 inch wide or greater), they shall be milled to remove all debris, dirt, and vegetation. Spray with an approved soil sterilant, backfill with No. 8 coarse aggregate, and seal with 1 1/2" of bituminous paving.

C. Depressions

1. The court shall be flooded and allowed to drain a minimum of 20 minutes and a maximum of 1 hour. Any area that holds water enough water to cover a five cent piece shall be filled with court patch binder patching mix, as recommended by the surface colorcoating manufacturer.

D. Curing

1. New asphalt pavement surface shall be allowed to cure a minimum of 14 days prior to application of colorcoating.

3.3 APPLICATION

A. General

1. All areas to be colorcoated shall be clean, free from sand, clay, grease, dust, salt, or other foreign matters. The Contractor shall obtain the Owner's approval, prior to applying any surface treatment. The storage of materials, mixing, and surface preparation shall be in accordance with the manufacturer's instructions.
2. The Contractor shall arrange for a representative of the surfacing material manufacturer to be present at the start of the work, to check installation conditions, and to instruct the applicators as to proper methods and procedures, and also as may be necessary during the course of the work, to insure a satisfactorily completed installation.
3. The application shall be done by thoroughly experienced and skillful workmen, in strict accordance with the manufacturer's instructions.

B. Filler Coat

1. Filler coat (acrylic resurfacer) shall be applied to the clean underlying surface in one application to obtain a total quantity of not less than 15-20 yards per gallon based on the material prior to any dilution. Apply filler coat as recommended by the surface colorcoating manufacturer.
2. Allow filler coat to dry thoroughly. Scrape off all ridges and rough spots prior to any subsequent application of acrylic resurfacer or color surface system.

C. Finish Coating

1. The Contractor shall apply two (2) coats of Fortified Plexipave reinforced acrylic finish coating.
2. Each finish coat shall be applied at a rate of 0.4 - 0.5 gallons per square yard. Allow each coat to dry thoroughly prior to any subsequent applications of color surface system.
3. Apply the second coat at a 90 degree angel to the previous coat.
4. The finished surface shall have a uniform appearance and be free of ridges and tool marks.

3.4 PROTECTION

- A. Cure time: Do not permit traffic over pavement per the time indicated by the manufacturer recommendations.

END OF SECTION 32 18 23.53

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ACRYLIC SURFACING

SECTION 32 31 13 CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fence framework, fabric, and accessories.
2. Excavation for post bases.
3. Concrete foundation for posts and center drop for gates.
4. Manual gates and related hardware.

1.2 REFERENCES

A. ASTM International:

1. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
3. ASTM A491 - Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.
4. ASTM B429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
5. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
6. ASTM F567 - Standard Practice for Installation of Chain-Link Fence.
7. ASTM F668 - Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric.
8. ASTM F900 - Standard Specification for Industrial and Commercial Swing Gates.
9. ASTM F934 - Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.
10. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
11. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.

B. Chain Link Fence Manufacturers Institute:

1. CLFMI - Product Manual.

1.3 SUBMITTALS

A. Division 1 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

C. Product Data: Submit data on fabric, posts, accessories, fittings and hardware.

- D. Submit manufacturer's certification attesting the fencing materials meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Division 1 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Procedures for submittals.

1.5 QUALITY ASSURANCE

- A. Supply material in accordance with CLFMI - Product Manual.
- B. Perform installation in accordance with ASTM F567.
- C. Fences and gates shall be complete units produced by a single manufacturer, including necessary accessories, fittings and fasteners.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum five years experience.
- B. Installer: Company specializing in performing work of this section with minimum five years documented experience approved by manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Division 1 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Deliver fence fabric and accessories in packed cartons or firmly tied rolls.
- C. Identify each package with manufacturer's name.
- D. Store fence fabric and accessories in secure and dry place.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers:
 - 1. Northeast Fence and Iron Works – 8451 Hegerman Street, Philadelphia, Pennsylvania 19136, Phone: (215) 335-1681, Web: <http://www.northeastfence.net/>
 - 2. Stephens Pipe and Steel, LLC – 300 Streibeigh Lane, Montoursville, Pennsylvania 17754, Phone: (888) 275-1638, Web: <http://www.spsfence.com>

3. Master Halco – 3010 Lyndon B Johnson Freeway, Suite 800, Dallas, Texas 75234, Phone: (800) 883-8384, Web: www.masterhalco.com
4. Equal approved Philadelphia Parks and Recreation

2.2 MATERIALS

- A. Framing (Steel): ASTM F1083 Schedule 40 galvanized steel pipe, welded construction, minimum yield strength of 25 ksi; coating conforming to ASTM F1043 Type A on pipe exterior and interior.
- B. Fabric Wire (Steel): ASTM A392 Class 1 zinc coated, or ASTM A491 aluminum coated
 1. If alternative 1 is selected fabric shall be ASTM F668 PVC coated steel wire.
 - a. Color: Black
- C. Concrete: ASTM C94; Normal Portland Cement, 3,500 psi strength at 28 days, 3 inch slump; 1 inch nominal sized coarse aggregate (maximum); and 2 percent to 4 percent entrained air.

2.3 COMPONENTS

- A. Gate Posts: 4-inch diameter.
- B. Top and Brace Rail: 1.66 inch outside diameter, plain end, sleeve coupled.
- C. Bottom Rail: 1.66 inch outside diameter pipe, use standard offset couplings.
- D. Gate Frame:
 1. 1.9 inch outside diameter
 2. Provide horizontal and vertical members to ensure proper gate operation and for attachment of fabric, hardware and accessories; space so that frame members are not more than 8 feet apart.
- E. Fabric: 2 inch diamond mesh interwoven wire, 9 gage thick, top salvage knuckle end closed, bottom selvage knuckle end closed.
- F. Tension Wire: 6 gage thick steel, galvanized coil spring tension wire.
 1. 9 gage hog rings and tie wire.
- G. Tension Band: Steel, space not over 15 inches on center top secure stretcher bars to end corner, pull and gate posts.
- H. Tension Strap: Once piece lengths equal to full-height fabric with minimum cross section of 3/16 inch x 3/4 inch. Provide one stretcher bar for each gate and end post and two for each corner and pull post.
- I. Tie Wire: Aluminum alloy steel wire.

J. Truss Rods: 0.313 inch rod, turnbuckles.

2.4 ACCESSORIES

A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; galvanized steel.

C. Gate Hardware: Fork latch with gravity drop Center gate stop and drop rod; two 180 degree gate hinges for each leaf and hardware for padlock.

2.5 GATES

A. General:

1. Gate Types, Opening Widths and Directions of Operation: As indicated on Drawings.
2. Factory assemble gates.
3. Design gates for operation by one person.

B. Swing Gates:

1. Fabricate gates to permit 180 degree swing.
2. Gates Construction: ASTM F900 with welded corners. Use of corner fittings is not permitted.

2.6 FINISHES

A. Components and Fabric:

1. Base Bid: Galvanized
2. Alternate 1: Vinyl coating ASTM F668, black color in accordance with ASTM F934
3. Alternate 3: Vinyl coating ASTM F668, black color in accordance with ASTM F934

PART 3 EXECUTION

3.1 INSTALLATION

A. Install framework, fabric, accessories, and gates in accordance with ASTM F567.

B. Set intermediate, terminal, gate, and posts plumb, in concrete footings with top of footing 1 inch above finish grade. Slope top of concrete for water runoff.

C. Line Post Footing Depth Below Finish Grade: ASTM F567; except a minimum of 3feet.

D. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567; except minimum of 3 feet.

E. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.

- F. Install top rail through line post tops and splice with 6 inch long rail sleeves.
- G. Install center and bottom brace rail on corner gate leaves.
- H. Place fabric on outside of posts and rails.
- I. Do not stretch fabric until concrete foundation has cured 28 days.
- J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.
- K. Position bottom of fabric 2 inches above finished grade.
- L. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.
- M. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- N. Install bottom tension wire strap stretched taut between terminal posts.
- O. Support gates from gate posts. Do not attach hinged side of gate from building wall.
- P. Install gate with fabric to match fence. Install three hinges on each gate leaf, latch, catches, drop bolt.
- Q. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.
- R. Connect to existing fence at new terminal post.
- S. Install posts with 6 inches maximum clear opening from end posts to buildings, fences and other structures.
- T. Excavate holes for posts to diameter and spacing indicated on Drawings without disturbing underlying materials.
- U. Center and align posts. Place concrete around posts and vibrate or tamp for consolidation. Verify vertical and top alignment of posts and make necessary corrections.
- V. Extend concrete footings 1 inches above grade, and trowel, forming crown to shed water.
- W. Allow footings to cure minimum 7 days before installing fabric and other materials attached to posts.

3.2 ERECTION TOLERANCES

- A. Division 1 - Quality Requirements: Tolerances.
- B. Maximum Variation from Plumb: 1/4 inch.

C. Maximum Offset from Indicated Position: 1 in.

END OF SECTION 32 31 13

GIFFORD MINI PITCH
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CHAIN LINK FENCES AND GATES

SECTION 32 90 00
LANDSCAPE PLANTING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: The furnishing and planting of trees, shrubs, ground covers, perennials, and ornamental grasses, with planting soil, topsoil, soil amendments, fertilizer, mulch, planting accessories and maintenance.

1.02 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 00: Earth Moving
 - 3. Section 31 23 10: Excavation, Backfill & Subgrade Preparation for Pavement
 - 4. Section 32 92 10: Turf Grass Seeding

1.03 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, shrubs, perennials and ground cover specified in this Section.
- C. Design Professional: Landscape Architect responsible for the design of the project.

1.04 REFERENCES

- A. Comply with the following Reference Codes and Standards in accordance with Division 1:
 - 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

1.05 REGULATORY REQUIREMENTS

- A. Comply with Local, State, and Federal Codes.
- B. Comply with regulatory agencies for fertilizer and herbicide composition.

1.06 QUALITY ASSURANCE

- A. Nursery: Company specializing in growing and cultivating the plants specified in this Section with minimum six (6) years experience.
- B. Installer: Company specializing in installing and planting the plants specified in this Section with minimum six (6) years experience.
- C. Plant Materials: Free of disease or hazardous insects.

1.07 OPERATION AND MAINTENANCE DATA

- A. Submit instructions for continuing maintenance under provisions of Section 01700.
- B. Include cutting and trimming methods; types, application frequency and recommended coverage of fertilizer, mulching frequency, etc.

1.08 HARVESTING, DELIVERY, STORAGE, AND HANDLING

- A. Landscape Architect shall accompany Contractor on selection trip(s) to nursery. Landscape Architect shall select plants for proper visual formation. Contractor shall inspect selected plants for disease and other requirements of Contract Documents. Prior to this trip, Contractor shall have preselected Nursery(s) to ascertain that sufficient plants in size and specie required are available for proper selection. The Landscape Architect shall tag all trees and at least five (5) shrubs of each specie as a representative Sample. Trees delivered without tags, and shrubs that do not equal quality of tagged Samples, shall be rejected.
- B. 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.
- C. 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.
- D. Container grown stock shall be grown in specified container long enough for root system to have developed sufficiently to hold soil together.
- E. Prevent injury to plant material when digging, moving, transporting, and unloading.
- F. Handle all balled and burlapped plants from root ball only.
- G. Deliver fertilizer and soil fertility materials in waterproof bags showing weight, chemical analysis, and name of manufacturer.
- H. During transport protect plants from wind by wrapping with plastic or tarpaulins. For transportation spray trees with anti-desiccant at the recommendation of the nurseryman.

- I. Vehicles shall be adequately ventilated to prevent overheating of plants.
- J. Protect plants until planted. 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.
- K. Deliver plant materials immediately prior to placement. Keep plant ball moist.
- L. Notify Design Professional at least three (3) working days in advance of start of Work.
- M. The Design Professional reserves the right to reject plant materials not meeting the above requirements.

1.09 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 Design Professional 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 Landscape Architect at least three (3) business days in advance of start of Work.

1.11 WARRANTY

- A. Provide a warranty on work of this Section for eighteen (18) months. Commence warranty on date when work is accepted by OWNER.
 - 1. Warranty includes coverage of plants from death or unhealthy conditions.
 - 2. Replacement plants must be plants of the same size and species as specified, planted in the next growing season, with a new warranty commencing on the date of replacement.

1.12 MAINTENANCE SERVICE

- A. Maintenance Services: Performed by installer.
- B. Maintain plant life immediately after placement until work is accepted by 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. 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, wire, hoses, turnbuckles, and/or strapping. Adjust turnbuckles to keep guy wires tight. Repair or replace accessories when required.

PART 2 PRODUCTS

2.01 NURSERIES

- A. Nursery shall be a member of American Association of Nurserymen and Pennsylvania Landscape and Nurserymen's Association (or other such State organization).
- B. Plant nursery shall be within same plant hardiness zone and having similar climate conditions as Project Site. Zone shall be as defined on U.S. Department of Agriculture Plant Hardiness Zone Map.

2.02 TREES, SHRUBS, PERENNIALS & GROUND COVERS

- A. Trees, Shrubs, Perennials and Ground Covers: Species and size identifiable in plant schedule, grown in climatic conditions similar to those in locality of the work.
- B. Plant Substitutions: If a plant is found not to be suitable or available, Contractor shall notify Landscape Architect before bidding. Design Professional shall then select a reasonable alternate or inform all Contractors of availability of specified plant.

2.03 TOPSOIL

- A. Provide topsoil in compliance with Section 32 92 10 – Turf Grass Seeding.

2.04 EXISTING/IN-SITU SOIL

- A. Existing/in-situ soil is soils found in tree planting hole if located outside of man-made planters.

2.05 ORGANIC SOIL AMENDMENT MATERIALS

- A. Compost: A mixture of partially decomposed organic materials (chipped, shredded, or ground vegetation or waste or recycled wood products), mushroom soil/spent mushroom soil substrate (SMS), composted animal manure, well composted leaf mold, 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.

2.06 COURSE SAND

- A. Provide clean washed sand complying with the following mechanical analysis:

SIEVE SIZE	PERCENT PASSING
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GIFFORD MINI PITCH
32 90 00-5
LANDSCAPE PLANTING

4	100
10	95-100
18	90-100
35	50-100
60	0-50
140	0-20
270	0-5

2.07 PLANTING SOIL MIXTURE

A. Tree Planting Hole/Pit (Outside of Man-Made Planters): Thoroughly mix planting soil mixture prior to installation in planting hole/tree pit. Planting mix will consist of the following:

1. 3 Parts existing/in-situ soil from planting hole.
2. 1 Part selected organic soil amendment.

B. Shrub Planting Holes/Beds: Thoroughly mix planting soil mixture prior to installation in planting hole/tree pit. Planting mix will consist of the following:

1. 3 Parts topsoil as specified.
2. 1 Part selected organic soil amendment.

C. Groundcover, Perennial, & Ornamental Grass Planting Holes/Beds (Outside of Man-Made Planters): Install planting soil as described in Part 3.

1. 2 Parts topsoil as specified.
2. 1 Part selected organic soil amendment.

2.08 WATER

A. Water shall be clean, fresh, potable, and free of substances or matter which could inhibit vigorous growth of plants.

2.09 SOIL FERTILITY MATERIALS

A. 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 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.

B. 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.

2.10 HERBICIDE & PESTICIDE

- A. Herbicide: As may be required with approval of Landscape Architect.
- B. Pesticide: As may be required with approval of Landscape Architect.

2.11 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.'

2.12 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.

1. Material: Flat, woven polypropylene
2. Size: ¾ Inch wide
3. Color: White

2.13 ANTI-DESICCANT

- A. "Wilt-Pruf", manufactured by Nursery Specialty Products of New York, or approved equal.

2.13 VERIFICATION

- A. Provide certification of inspection by the Landscape Architect for confirming approval of plants supplied.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that Project Site is ready for planting prior to delivery of materials
- B. Beginning of installation means acceptance of existing conditions.

3.02 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.

3.03 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 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.

3.05 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.
- E. Install Mycorrhizal treatment packets as specified on firmed soil in planting pit. Tablets and packets shall be evenly distributed throughout the pit.
- F. 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.

- G. Containerized shrubs shall follow same procedure as described above.
- H. 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.
- I. 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.

3.06 MULCHING

- A. Mulch tree and shrub planting pits and shrub beds with required mulch two inches (2") 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 (2") deep immediately after planting. Thoroughly water mulched areas. After watering, rake mulch to provide a uniform finished surface.

3.07 STAKING/GUYING

- A. Stake all deciduous and coniferous trees immediately after planting.

3.08 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.

3.09 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.

3.10 MAINTENANCE

- A. Begin specified maintenance until work is accepted by owner.

3.11 FINAL INSPECTION

- A. Inspection to determine completion and acceptance of planted areas will be made by the Landscape Architect, 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 32 90 00

**SECTION 32 92 10
TURF GRASS SEEDING**

PART 1 GENERAL

1.01 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.

1.02 RELATED SECTIONS

- A. Applicable Sections: Division 1
- B. Section 01 57 19 – Environmental Controls
- C. Section 31 20 00 – Earth Moving
- D. Section 32 90 00 – Landscape Planting

1.03 SUBMITTALS

- A. 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.
- B. 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)
- C. 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.
- D. 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 preceding date of sowing. Owner reserves the right to have seed tested independently.

- E. Samples:
 - 1. Mulch: Two-pound bag of each type, with manufacture's recommendations on application rate for Hydro mulch.
- F. Statement(s) of Qualifications: Submit to confirm qualifications as specified in Article 1.4, herein.
- G. 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.

1.04 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 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 (reference design drawings), 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 Owner or 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 Owner or Landscape Architect, prior to inspection.
 - c. At time of the Owner or 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 Owner or 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 Owner or 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.

1.05 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.

1.06 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.

1.07 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 Contractor's duty to inform the Landscape Architect (Design Consultant) immediately in writing for clarification. Work done after such discovery, unless authorized by the Owner or 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.

1.08 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

2.01 TEMPORARY TURF

- A. Temporary turf seed mix shall be as specified on the Erosion Control Plans, Notes, and Details.

2.02 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%

2.03 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.

2.04 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

2.05 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.

2.06 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.

2.07 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.

2.08 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.

2.09 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.
- C. 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.
- D. Commercial fertilizer for temporary turf seed areas shall be a 10-10-10-grade fertilizer (600lbs/acre).

PART 3 EXECUTION

3.01 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 Owner & 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.

3.02 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 31 20 00 – Earth Moving.
- 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.

3.03 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. \

3.04 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.

3.05 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.

3.06 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.

3.07 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 15 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.

3.08 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.

3.09 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

GIFFORD MINI PITCH
32 92 10-15
TURF GRASS SEEDING

SECTION 32 92 23
TURF GRASS SODDING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes:

- 1. Sodding.

1.03 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.
- E. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Certification of each seed mixture for turfgrass sod, identifying source, including name and telephone number of supplier.
- C. Qualification Data: For qualified landscape Installer.
- D. Product Certificates: For soil amendments and fertilizers, from manufacturer.
- E. Material Test Reports: For existing surface soil and imported topsoil.
- F. Planting Schedule: Indicating anticipated planting dates for each type of planting.
- G. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of lawns during a calendar year. Submit before expiration of required initial maintenance periods.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn establishment.
 - 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.
- B. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
 - 1. Report suitability of topsoil for lawn growth. State-recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Sod: Harvest, deliver, store, and handle sod according to requirements in TPI's "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in its "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.

1.07 PROJECT/SITE CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.
 - 1. Spring Planting: April 15th through June 15th.
 - 2. Fall Planting: August 1st through November 1st.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.08 MAINTENANCE SERVICE

- A. Initial Lawn Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the periods established below.

PART 2 PRODUCTS

2.01 TURFGRASS SOD

- A. Turfgrass Sod:
 - 1. Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with TPI's "Specifications for Turfgrass Sod Materials" in its "Guideline Specifications to Turfgrass Sodding."
 - 2. Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.
 - 3. Sod will be farm grown and a minimum of two (2) years old.
- B. Sod Turfgrass Species: Consisting of three named improved varieties of Dwarf Turf-type Tall Fescues and include minor amounts of Kentucky Bluegrass and Turf-type Perennial Ryegrass species.

2.02 PLANTING ACCESSORIES

- A. Selective Herbicides: EPA registered and approved, of type recommended by manufacturer for application.

2.03 FERTILIZER

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: (8-32-16); 1 lb/1000 sq. ft. of actual phosphorous by weight or as recommended by soil analysis.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine areas to receive sod for compliance with requirements and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1. Protect grade stakes set by others until directed to remove them.
- B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Remove existing grass, vegetation, and turf. Do not mix into surface soil.

1. Loosen surface soil to a depth of at least 4 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture.
 - a. Apply fertilizer directly to surface soil before loosening.
 2. Remove stones larger than 1 inch in any dimension and sticks, roots, trash, and other extraneous matter.
 3. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.
- D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
- E. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- F. Before planting, restore areas if eroded or otherwise disturbed after finish grading.

3.03 PREPARE AREA AS SPECIFIED IN "LAWN PREPARATION" ARTIC SODDING

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
 1. Lay sod across angle of slopes exceeding 1:3.
 2. Top of sod mat to be level with adjacent pavements. Any sod creating a ponding situation shall be removed, regarded, and sod re-laid until ponding condition has been eliminated.
- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.04 LAWN RENOVATION

- A. Renovate existing lawn damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
 1. Reestablish lawn where settlement or washouts occur or where minor regrading is required.
 2. Provide new topsoil as required

- B. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury in soil.
- C. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.
- D. Maintain all lawn within the Construction fence until Substantial Completion.
- E. Remove weeds before sodding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- F. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- G. Till stripped, bare, and compacted areas thoroughly to a soil depth of 4 inches.
- H. Apply soil amendments and initial fertilizers required for establishing new lawns and mix thoroughly into top 4 inches of existing soil. Provide new planting soil to fill low spots and meet finish grades.
- I. Apply sod as required for new lawns.
- J. Water newly planted areas and keep moist until new lawn is established.

3.05 LAWN MAINTENANCE

- A. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn. Provide materials and installation the same as those used in the original installation.
- B. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 1 1/2 inches.
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of sod. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 - 2. Water lawn with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.
- C. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
 - 1. Mow grass to a height of 2-1/2 to 3 inches.
- D. Lawn Post-fertilization: Apply fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to lawn area.

3.06 SATISFACTORY LAWNS

- A. Lawn installations shall meet the following criteria as determined by landscape architect:
 1. Satisfactory Sodded Lawn: At the time of Substantial Completion site observation, a healthy, well-rooted, even-colored, viable lawn has been established, free of weeds, open joints, bare areas, and surface irregularities.
- B. Use specified materials to reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.07 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris, created by lawn work, from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after lawn is established.
- C. Remove non-degradable erosion-control measures after grass establishment period.

END OF SECTION 32 92 23

**SECTION 33 01 10
PROTECTION OF EXISTING UTILITIES**

PART 1 GENERAL

1.01 SCOPE OF WORK

- 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.

1.02 RELATED SECTIONS AND DOCUMENTS

- A. Section 02 41 16 - Site and Structure Demolition
- B. Section 31 20 00 – Earth Moving
- C. Section 31 23 10 – Excavation, Backfill & Subgrade Preparation for Pavement
- D. Contract Drawings

1.03 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of capped utilities and utility lines encountered during construction.

1.04 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

3.01 IDENTIFICATION

- A. Locate all existing utilities which are to remain in service during construction as shown on the Construction Drawings.

3.02 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.

3.03 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.

3.04 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