SECTION 02227 - AGGREGATE MATERIALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes

1. Aggregate Materials

B. Related Sections

1. Division 2 Section "Earthwork".
2. Division 2 Section "Erosion and Sedimentation Control"

1.3 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM) latest edition.

1. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10 lb (4.54 Kg) Rammer and 18-inches (457 mm) Drop.
3. ASTM D1883 - California Bearing Ratio (CBR) of Laboratory Compacted Soils
4. ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
5. ASTM D2487 - Classification of Soils for Engineering Purposes.
6. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
7. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.
8. ASTM D4318 - Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

B. American Association of State Highway and Transportation Officials (AASHTO) latest edition.

1. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-pound (4.54 Kg) Rammer and an 18-inch (457 mm) Drop.
2. AASHTO M147 - Materials for Aggregate and Soil-Aggregate.

1.4 QUALITY CONTROL

A. Tests and analysis of aggregate material will be performed in accordance with standard ASTM and AASHTO procedures listed herein, and in accordance with Division 1.

1.5 SUBMITTALS

A. Submit in air tight containers a sample of each aggregate or mixture that is to be incorporated into the project to the testing laboratory designated by the Owner. The amount of sample will depend upon the test(s) being performed, coordinate with the testing laboratory.

B. Submit the name of each material supplier and specific type and source of each material. Any change in source throughout the job requires approval of the Owner and Architect.

C. Submit materials certificate to on-site independent testing laboratory that is signed by material producer and Contractor, certifying that materials comply with, or exceed, the requirements herein.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All construction and materials shall meet or exceed the requirements of this section and any state highway department specification section referred to or noted on the drawings that pertain to paving base course design, materials, preparation, and/or execution. All materials shall be as indicated on Drawings and shall comply with applicable state highway specification regarding source, quality, gradation, liquid limit, plasticity index, and mix proportioning.

B. Backfill material for all excavations to include demolished utility lines and basement foundations shall be PADOT 2A. Other materials may be considered for use upon the Contractor's submission (after the bid opening) of a "Request for Substitution" form along with a suitable credit to the Owner.

C. Porous fill under all interior slabs shall be AASHTO #57 crushed aggregate.

D. Porous fill under all exterior slabs shall be AASHTO #8 crushed aggregate.

E. In all cases slag shall not be used for drainage fill.

PART 3 - EXECUTION

3.1 STOCKPILING

A. Stockpile on-site at locations indicated by the Owner in such a manner that there will be no standing water or mixing with other materials.

3.2 BORROW SITES

A. Upon completion of borrow operations, clean up borrow areas as indicated on the plans in a neat and reasonable manner to the satisfaction of the property owner, the Owner and the Architect.

3.3 TRANSPORTATION

A. Off-site materials shall be transported to the project using well-maintained and operating vehicles. Once on the job site, all transporting vehicles shall stay on designated haul roads and shall at no time endanger any of the improvements by rutting, overloading or pumping the haul road.

END OF SECTION 02227

SECTION 02230 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Protecting existing plants and grass to remain.
2. Removing existing plants and grass.
3. Coordination with site demolition work.
4. Removing above and below-grade site improvements.
5. Disconnecting, capping or sealing, and removing site utilities.
6. Temporary erosion and sedimentation control measures.
7. Removing existing stumps and roots.
8. Removal and relocation of existing signage.

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.
2. Division 2 Section "Lawns and Grasses" for finish grading including preparing and placing planting soil mixes and testing of topsoil material.

1.3 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than two inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.

B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

B. Record drawings, according to Division 1 Section "Project Record Documents," identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

B. Contact PADEP or the County Conservation District prior to the commencement of clearing activities.

1.7 PROJECT CONDITIONS

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

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

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

D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing. Contact PA One Call System at 1-800-242-1776, 3 to 10 days prior to any excavation.

E. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 2 Section "Earthwork."

1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

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

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE PROTECTION

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

1. Do not store construction materials, debris, or excavated material within fenced area.
2. Do not permit vehicles, equipment, or foot traffic within fenced area.
3. Maintain fenced area free of weeds and trash.

B. Do not excavate within tree protection zones, unless otherwise indicated.

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

1. Cover exposed roots with burlap and water regularly.
2. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
3. Coat cut faces of roots more than 1-1/2-inches in diameter with emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
4. Backfill with soil as soon as possible.

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

1. Employ an arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
2. Replace trees that cannot be repaired and restored to full-growth status, as determined by Architect.

3.4 UTILITIES

Contractor will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.
2. Owner will arrange to shut off indicated utilities when requested by Contractor.

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

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

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

E. Removal of underground utilities is included in Division 2 Sections covering site utilities.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
3. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18-inches below exposed subgrade.
4. Use only hand methods for grubbing within tree protection zone.
5. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of eight inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Limit height of topsoil stockpiles to 12 feet, unless prior approval of a higher stockpile is received from the Engineer.
2. Do not stockpile topsoil within tree protection zones.
3. Dispose of excess topsoil as specified for waste material disposal.
4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 SITE IMPROVEMENTS

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

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

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

3.8 DISPOSAL

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

1. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION 02230

SECTION 02231 - TREE PROTECTION AND TRIMMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the protection and trimming of existing trees that interfere with, or are affected by, execution of the Work, whether temporary or permanent construction.

B. Related Sections include the following:

1. Division 2 Section "Site Clearing" for removal limits of trees, shrubs, and other plantings affected by new construction.
2. Division 2 Section "Earthwork" for building and utility trench excavation, backfilling, compacting and grading requirements, and soil materials.
3. Division 2 Section "Exterior Plants" for tree and shrub planting, tree support systems, and soil materials.

1.3 DEFINITIONS

A. Tree Protection Zone: Area surrounding individual trees or groups of trees to remain during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.4 SUBMITTALS

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

B. Tree Pruning Schedule: Written schedule from arborist detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

C. Qualification Data: For tree service firm and arborist.

D. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

E. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

1.5 QUALITY ASSURANCE

A. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of tree protection and trimming.

B. Arborist Qualifications: An arborist certified by ISA or licensed in the jurisdiction where Project is located.

C. Tree Pruning Standard: Comply with ANSI A300 (Part 1), "Tree, Shrub, and Other Woody Plant Maintenance--Standard Practices (Pruning)".

PART 2 - PRODUCTS

2.1 MATERIALS

A. Drainage Fill: Selected crushed stone, or crushed or uncrushed gravel, washed, ASTM D 448, Size 24, with 90 to 100 percent passing a 2 1/2-inch sieve and not more than 10 percent passing a 3/4-inch sieve.

B. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 1-inch in diameter; and free of weeds, roots, and toxic and other non-soil materials.

1. Obtain topsoil only from well-drained sites where topsoil is 4 inches deep or more; do not obtain from bogs or marshes.

C. Filter Fabric: Manufacturer's standard, nonwoven, pervious, geotextile fabric of polypropylene, nylon, or polyester fibers. Color: Safety yellow or orange.

D. Organic Mulch: Shredded hardwood, free of deleterious materials.

PART 3 - EXECUTION

3.1 PREPARATION

A. Temporary Fencing: Install temporary fencing around tree protection zones to protect remaining trees and vegetation from construction damage. Maintain temporary fence and remove when construction is complete.

1. Install safety orange, high density polyethylene fence according to manufacturer's written instructions.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

C. Mulch areas inside tree protection zones and other areas indicated.

1. Apply 3-inch average thickness of organic mulch. Do not place mulch within 2 inches of tree trunks.

D. Do not store construction materials, debris, or excavated material inside tree protection zones. Do not permit vehicles or foot traffic within tree protection zones; prevent soil compaction over root systems.

E. Maintain tree protection zones free of weeds and trash.

F. Do not allow fires within tree protection zones.

3.2 EXCAVATION

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

1. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.3 REGRADING

A. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade beyond tree protection zones. Maintain existing grades within tree protection zones.

B. Minor Fill: Where existing grade is 6 inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

3.4 TREE PRUNING

A. Prune trees to remain that are affected by temporary and permanent construction.

B. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.

C. Pruning Standards: Prune trees according to ANSI A300 (Part 1).

D. Cut branches with sharp pruning instruments; do not break or chop.

3.5 TREE REPAIR AND REPLACEMENT

A. Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots according to arborist's written instructions.

B. Remove and replace trees indicated to remain that die or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.

1. Provide new trees of 6-inch caliper size and of a species selected by Architect when damaged trees more than 6-inches in caliper size, measured 12 inches above grade, are required to be replaced. Plant and maintain new trees as specified in Division 2 Section "Exterior Plants."

C. Aerate surface soil, compacted during construction, 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill 2-inch diameter holes a minimum of 12 inches deep at 24 inches o.c. Backfill holes with an equal mix of augered soil and sand.

3.6 DISPOSAL OF WASTE MATERIALS

A. Burning is not permitted.

B. Disposal: Remove excess excavated material and displaced trees from Owner's property.

END OF SECTION 02231

SECTION 02260 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes temporary excavation support and protection systems.

B. Related Sections include the following:

1. Division 1 Section "Temporary Controls" for temporary support facilities.
2. Division 1 Section "Temporary Utilities" for temporary utility connections.
3. Division 2 Section "Earthwork" for excavating and backfilling and for existing utilities.

1.3 PERFORMANCE REQUIREMENTS

A. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.

1. Provide professional engineering services needed to assume engineering responsibility, including preparation of Shop Drawings and a comprehensive engineering analysis by a qualified professional engineer.
2. Prevent surface water from entering excavations by grading, dikes, or other means.
3. Install excavation support and protection systems without damaging existing buildings, pavements, and other improvements adjacent to excavation.

1.4 SUBMITTALS

A. Shop Drawings for Information: Prepared by or under the supervision of a qualified professional engineer for excavation support and protection systems.

1. Include Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.

B. Qualification Data: For Installer and professional engineer.

C. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by the absence of, the installation of, or the performance of excavation support and protection systems.

1.5 PROJECT CONDITIONS

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

B. Survey adjacent structures and improvements, employing a qualified professional engineer or land surveyor; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.

C. Steel Sheet Piling: ASTM A328/A328M, ASTM A572/A572M, or ASTM A690/A690M; with continuous interlocks.

D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of four inches

E. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.

F. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces is not impeded.

D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.

E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.2 SOLDIER BEAMS AND LAGGING

A. Install steel soldier beams before starting excavation. Space soldier beams at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2-inches from a horizontal line and not more than 1:120 out of vertical alignment.

B. Install wood lagging within flanges of soldier beams as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at centers indicated and secure to soldier beams.

3.3 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock to form a continuous barrier. Limit vertical offset of adjacent sheet piling to 60 inches. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment. Cut tops of sheet piling to uniform elevation at top of excavation.

3.4 TIEBACKS

A. Tiebacks: Drill for, install, grout, and tension tiebacks into position. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.

1. Test loading shall be observed by a qualified professional engineer responsible for design of excavation support and protection system.
2. Maintain tiebacks in place until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.5 BRACING

A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work, unless otherwise approved by Architect.
2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.6 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction and abandon remainder.
2. Repair or replace, as approved by Architect, adjacent work damaged or displaced by removing excavation support and protection systems.

B. Leave excavation support and protection systems permanently in place.

END OF SECTION 02260

SECTION 02270 – EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section includes the following:

1. Temporary erosion three dimensional tubular stormwater runoff devices.
2. Temporary seeding and mulching of all earthwork areas.
3. Temporary construction entrances, where indicated or desired by the Contractor.

B. Related sections include the following:

1. Division 2 Section "Site Clearing".
2. Division 2 Section "Earthwork".
3. Division 2 Section "Landscape Grading".

1.3 REFERENCE STANDARDS

A. Commonwealth of Pennsylvania Department of Transportation (PADOT):

1. PADOT Publication 408, 2007 edition.

a. PADOT Section 703 - Aggregates.
b. PADOT Section 735 - Geotextiles.
c. PADOT Section 804 - Seeding and Soil Supplements
d. PADOT Section 805 - Mulching
e. PADOT Section 806 - Watercourse and Slope Erosion Protection
f. PADOT Section 850 - Rock Lining
g. PADOT Section 860 - Sediment Trap
h. PADOT Section 864 - Diversion Ditch
i. PADOT Section 865 - Silt Barrier Fence
j. PADOT Bulletin 15 - Approved Construction Materials

B. Commonwealth of Pennsylvania, Department of Environmental Protection, Bureau of Soil and Water Conservation

1. Erosion and Sediment Pollution Control Program Manual, March 2012 edition.

C. The Pennsylvania State University, College of Agriculture

1. "The Agronomy Guide", 1990 (PSU).

PART 2 - PRODUCTS

2.1 TUBULAR SEDIMENT RUNOFF DEVICE

A. Filtrexx SiltSoxx as manufactured by Filtrexx International, LLC (440-926-2607).

2.2 POSTS FOR SEDIMENT RUNOFF DEVICE

A. Of sufficient length for 18-inch embedment in the ground; minimum 2-inches square for wood, or 1.25 x 1.00 inch steel T-sections, PADOT Section 865.

2.3 SEED MIXTURES

A. Temporary seed mixture for all earthwork areas:

1. Species

a. Annual rye grass @ 50 lbs. per acre.

1) 100 percent by weight
2) 98 percent by purity
3) 90 percent germination

b. Seed shall be clean, dry, new crop.

2.4 CONSTRUCTION ENTRANCE

A. PADOT Section 703, AASHTO No. 1 coarse aggregate, 8-inch depth, minimum 50 feet in length, and of sufficient width to accommodate all vehicular traffic in and out of construction area.

2.5 STRAW/HAY BALE

A. Any commercial straw or hay bales approved by the local County Conservation District.

2.6 STAKES FOR STRAW/HAY BALE

A. Stakes to be two inch by two inch by three foot long hardwood stakes for securing straw/hay bales.

2.7 MULCHES

A. Straw shall be unrotted, small grain free of all kinds of weeds and prohibited noxious weeds such as: thistles, johnsongrass, and quackgrass.

2.8 WOOD CELLULOSE MULCH

A. Wood cellulose shall be green-dyed and air-dried wood cellulous fibers, containing no growth or germination inhibiting substances, in packages not exceeding 100 pounds gross, net weight shown on package and meeting the following:

1. Moisture content: 14 percent $\pm$ 3%
2. Organic matter (oven dried basis): 98.6 percent $\pm$ 0.2%
3. Ash content: 1.4 percent $\pm$ 0.2%
4. Water holding capacity: 1,000% minimum

2.9 SHREDDED BARK MULCH

A. Shredded bark shall be suitable fibrous ground, shredded or chunks, aged hardwood or pinewood bark, free from viable, noxious weed seeds and insect life, not decomposed and between 1/4-inch and 2-inch in dimension.

2.10 MULCH BINDERS

A. Non-asphaltic emulsion shall be natural vegetable gum blended with jelling and hardening agents, (Terra Tack AR) as manufactured by Grass Growers Company or equal.

B. Other mulch binders as approved by the local County Conservation District and the PADEP Bureau of Soil and Water Conservation.

2.12 MULCH NETTINGS

A. Jute or excelsior blanket, paper, plastic and cotton mulch mattings of a kind and type approved by the local County Conservation District and the PADEP Bureau of Soil and Water Conservation. Do not use metal staples in areas to be mowed.

1. Staples shall be as recommended by netting manufacturer and local County Conservation District and PADEP Bureau of Soil and Water Conservation.
2. Other mulch nettings as approved by the Architect and the local County Conservation District and PADEP Bureau of Soil and Water Conservation.

2.13 FERTILIZER

A. Any 1-2-2 ratio fertilizer containing minimum 5 percent nitrogen, 10 percent available phosphoric acid and 10 percent soluble potash conforming to PADOT Standard Specifications.

2.14 LIMESTONE

A. Pulverized limestone shall be composed of not less than 85 percent calcium and magnesium carbonates equivalent to not less than 40 percent calcium and magnesium oxides conforming to PADOT Standard Specifications.

2.15 WATER

A. Suitable clean water may be used without testing.

PART 3 - EXECUTION

3.1 SEDIMENT RUNNOFF DEVICE

A. Construct temporary sediment runoff device as indicated and in accordance with manufacturer's written instructions.

B. Temporary Erosion Checks: Anchor each bale with minimum of two hardwood stakes.

3.2 CONSTRUCTION ENTRANCE

A. Place filter fabric over the entire area receiving stone. Lap filter fabric a minimum of 24 inches at joints. Embed end of filter fabric in soil as indicated.Place aggregate at location(s) shown so that all traffic leaving the site will pass over the aggregate.

C. All surface water flowing or diverting toward construction entrances shall be diverted away from road. A mountable berm with 5:1 slopes will be permitted.

D. Wheels shall be cleaned to remove sediment prior to entrance onto public rights-of-way. When washing is required, it shall be done on an area stabilized with stone and which drains into an approved sediment trapping device. All sediment shall be prevented from entering storm drains, ditches or water courses.

3.3 TEMPORARY EROSION SEEDING

A. Within 20 days following grading activities, seed all earthwork areas with temporary seed mixture to prevent erosion; maintain until "final grading and seeding" is performed.

B. Site Preparation

1. Install needed surface water control measures. Perform all cultural operations at right angles to the slope. Apply uniformly two tons of ground limestone per acre (92 pounds per 1,000 square feet) or according to agricultural soil test results.
2. Apply uniformly a 10-20-10 analysis fertilizer, according to soil test, at the rate of 400 pounds per acre (9.2 pounds per 1,000 square feet). Work in lime and fertilizer to a depth of 4 inches using any suitable equipment.
3. Apply temporary grass seed at a rate of one to two pounds per 1,000 sq. ft. Cover annual rye grass with about 1/2-inch of soil.
4. Additional seeding will be required until substantial catch of grass can be acquired and maintained.

3.4 MULCHING

A. Place mulch, of the kind indicated, within 48 hours after seeding. Unless otherwise indicated, place only straw or wood cellulose over topsoil areas. Use hay, straw or wood cellulose in other areas, as indicated or specified.

B. Place hay or straw uniformly, in a continuous blanket, at a minimum rate of 1,200 pounds per 1,000 square yards, or as otherwise indicated. If directed, increase the rate of application, depending upon the material used, season, soil conditions, or method of application. An acceptable mechanical blower may be used to apply mulch. Machines which cut mulch into short pieces will not be permitted. Anchor with acceptable materials at the following rates.

1. Wood Cellulose, 160 pounds per 1,000 square yards.
2. Non-asphaltic Emulsion, 25 pounds per 1,000 square yards.
3. Chemical Mulch Binders, at manufacturers recommended rates.

C. Hydraulically apply wood cellulose fiber. It may be incorporated as an integral part of the slurry after the seed and soil supplements have been thoroughly mixed. Apply uniformly at the rate of 320 pounds per 1,000 square yards, unless otherwise indicated.

3.5 STRAW BALE DIKE

A. Bales shall be placed at the toe of a slope or on the contour and in a row with ends tightly abutting the adjacent bales.

B. Each bale shall be embedded in the soil a minimum of four inches and placed so the bindings are horizontal.

C. Bales shall be securely anchored in place by either two stakes or re-bars driven through the bale. The first stake in each bale shall be driven toward the previously laid bale at an angle to force the bales together. Stakes shall be driven flush with the bale.

D. Bales shall be removed when they have served their usefulness so as not to block or impede storm flow or drainage.

3.6 MAINTENANCE

A. General

1. The Contractor shall monitor performance of sediment control measures. The Contractor shall inspect at 30 day intervals or following a rainfall, whichever is sooner. The Contractor shall remove all silt accumulation in the sediment control structures.
2. Lawn and critical slope areas shall be monitored at weekly intervals. Any bare or eroded areas will be re-established as required. Should isolated areas repeatedly resist stabilization, Contractor shall contact local County Conservation District for assistance. Stabilized Construction Entrance

1. The entrance shall be maintained by the Contractor in a condition which will prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic top dressing with additional stone as conditions demand and repair and/or clean out of any measures used to trap sediment. All sediment spilled, dropped, washed or tracked onto public rights-of-way must be removed immediately.
2. Periodic inspection and needed maintenance shall be provided by the Contractor after each rain.

C. Mulching

1. Properly maintain mulched areas until the entire project has been completed. Promptly re-apply mulch materials which become dislodged or lost due to wind, rain, fire or other causes, at initial or modified rates, as directed.

3.7 EROSION AND SEDIMENT POLLUTION CONTROL

A. Construction operations shall be carried out in such a manner so that erosion, air and water pollution will be minimized. State and local laws concerning pollution abatement shall be followed.

B. An Erosion and Sedimentation Control Report has been completed by the Engineer and reviewed and approved by the local County Conservation District. This report contains a detailed staging of construction activities that the Contractor must follow throughout the period of its construction contract. Should the Contractor need to revise this staging of construction due to site conditions, it must notify, in writing, the County Conservation District, the Engineer of its requested revisions prior to proceeding with the construction activities. The Contractor will be responsible for all engineering costs associated with revisions to the approved Erosion and Sedimentation Control Plan.

END OF SECTION 02270

SECTION 02300 – EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns and grasses and exterior plants.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for slabs-on-grade.
4. Subbase course for concrete walks and pavements.
5. Subbase course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling for utility trenches.
8. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.
9. Quality control testing requirements.

B. Related Sections include the following:

1. Division 2 Section "Site Clearing" for temporary erosion and sedimentation control measures, site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
2. Division 2 Section "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
3. Division 2 Section "Lawns and Grasses" for finish grading, including preparing and placing topsoil and planting soil for lawns.
4. Division 2 Section "Site Concrete" for site concrete work.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

D. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

F. Fill: Soil materials used to raise existing grades.

G. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,090 lbf and stick-crowd force of not less than 18,650 lbf; measured according to SAE J-1179.
2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp flywheel power and developing a minimum of 48,510-lbf breakout force with a general-purpose bare bucket; measured according to SAE J-732.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Each type of plastic warning tape.
2. Geotextile.

B. Samples: 12-by-12-inch Sample of subdrainage and separation geotextile.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D 1557 for each on-site and borrow soil material proposed for fill and backfill.

D. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

1.5 QUALITY CONTROL

A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548. Retained and paid for by the Contractor.

B. Pre-excavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1. Coordinate construction activities with PADEP and the Conservation District.

1.6 PROJECT CONDITIONS

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

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.
3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups: ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

2. Unsatisfactory soils also include slag as a drainage course material.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1 1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1 1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

F. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

G. Drainage Course: Narrowly graded mixture of washed, crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1 1/2-inch sieve and zero to five percent passing a No. 8 sieve. Slag is not permitted.

H. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to five percent passing a No. 4 sieve.

I. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.

J. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 157 lbf; ASTM D 4632.
3. Sewn Seam Strength: 142 lbf; ASTM D 4632.
4. Tear Strength: 56 lbf; ASTM D 4533.
5. Puncture Strength: 56 lbf; ASTM D 4833.
6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.

7. Permittivity: 0.2 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 247 lbf; ASTM D 4632.
3. Sewn Seam Strength: 222 lbf; ASTM D 4632.
4. Tear Strength: 90 lbf; ASTM D 4533.
5. Puncture Strength: 90 lbf; ASTM D 4833.
6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of six inches wide and four mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 2 Section "Site Clearing."

C. Protect and maintain erosion and sedimentation controls, which are specified in Division 2 Section "Site Clearing," during earthwork operations.

D. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations, within a tolerance of plus or minus 1-inch, regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:

    a. Twenty-four inches outside of concrete forms other than at footings.
    b. Twelve inches outside of concrete forms at footings.
    c. Six inches outside of minimum required dimensions of concrete cast against grade.
    d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
    e. Six inches beneath bottom of concrete slabs on grade.
    f. Six inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus one inch. Do not disturb bottom of excavations intended as bearing surfaces.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.
1.

3.7 SUBGRADE INSPECTION

A. Notify Testing Agency when excavations have reached required subgrade.

B. If Testing Agency determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.8 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of any remaining trees.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.11 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than one vertical to four horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use satisfactory soil or engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.12 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within two percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by two percent and is too wet to compact to specified dry unit weight.

3.13 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than eight inches in loose depth for material compacted by heavy compaction equipment, and not more than four inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top six inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
3. Under lawn, planted areas, or unpaved areas, scarify and recompact each layer of backfill or fill soil material at 95 percent to one foot below final subgrade elevation. Compact the remainder of the fill material at 90 percent to the final subgrade elevation.
4. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.

3.14 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn, Planted, or Unpaved Areas: Plus or minus one inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.15 SUBSURFACE DRAINAGE

A. Subdrainage Pipe: Specified in Division 2 Section "Subdrainage."

B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a six inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers six inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least six inches.

1. Compact each filter material layer with a minimum of two passes of a plate-type vibratory compactor.

C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers six inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least six inches.

1. Compact each filter material layer with a minimum of two passes of a plate-type vibratory compactor.
2. Place and compact impervious fill over drainage backfill in six-inch thick compacted layers to final subgrade.

3.16 SUBBASE COURSES

A. Place subbase course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course under pavements and walks as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place base course material over subbase course under hot-mix asphalt pavement.
3. Shape subbase course to required crown elevations and cross-slope grades.
4. Place subbase course 6 inches or less in compacted thickness in a single layer.
5. Place subbase course that exceeds six inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
6. Compact subbase course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

C. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.17 DRAINAGE COURSE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place drainage course six inches or less in compacted thickness in a single layer.
3. Place drainage course that exceeds six inches in compacted thickness in layers of equal thickness, with no compacted layer more than six inches thick or less than three inches thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 90 percent of maximum dry unit weight according to ASTM D 1557.

3.18 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage and pay for a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 1000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet or less of wall length, but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet or less of trench length, but no fewer than two tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.19 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 02300

SECTION 02505 - PAVING SUBBASE COURSE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes the following:

1. Granular Base
2. Testing requirements

B. Related Sections
1. Division 2 Section "Earthwork".
2. Division 2 Section "Aggregate Materials".
3. Division 2 Section "Site Concrete",

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM) latest edition.

1. D1556 - Test Method for Density of Soil in-place by the Sand-Cone Method.
2. D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10 lb (4.54 Kg) Rammer and 18-inch (457 mm) Drop.
3. D2167 - Test Method for Density and Unit Weight of Soil in-place by the Rubber Balloon Method.
4. D2922 - Test Methods for Density of Soil and Soil-Aggregate in-place by Nuclear Methods (Shallow Depth), Method B (Direct Transmission).
5. D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Subbase material for this project shall be PADOT 2A crushed, coarse limestone aggregate meeting the written requirements of PADOT standard specifications.

B. Submit materials certificate to Architect from on-site independent testing laboratory which is signed by testing laboratory and Contractor, certifying that materials comply with, or exceed, the requirements herein.

C. Submit materials certificate to Architect from supplier which is signed by responsible official of supplier certifying that off-site imported materials comply with, or exceed, the requirements herein.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Contractor shall verify that the subgrade has been inspected, tested and the gradients and elevations are correct, with proper moisture content and properly prepared.

3.2 CONSTRUCTION

A. Perform subbase course construction in a manner that will drain surface properly at all times and at the same time prevent runoff from adjacent areas from draining onto base course construction.

B. Compact base material to not less than 95 percent of maximum dry density, as determined by ASTM D 1557, plus or minus two percent of optimum moisture content.

C. Granular Base: Construct to thickness indicated on Drawings. Apply in lifts or layers not exceeding 8-inches, measured loose.

3.3 FIELD QUALITY CONTROL

A. An Independent Testing Laboratory, selected and paid for by the Contractor in accordance with Division 1 shall be retained to perform construction testing of in-place base courses for compliance with requirements for thickness, compaction, density and tolerance. Paving base course tolerances shall be verified (by rod and level readings on not more than fifty-foot centers) to be not more than 0.05 foot above design elevation that will allow for paving thicknesses as shown on the Drawings. Contractor shall provide instruments and a suitable benchmark.

B. The following tests shall be performed on each type of material used as subbase course material:

1. Moisture and Density Relationship: ASTM D 1557.
2. Mechanical Analysis: AASHTO T-88.
3. Plasticity Index: ASTM D-4318.
4. Subbase material thickness: Perform one test for each 2,000 square feet of in-place base material area.
5. Subbase material compaction: Perform one test in each lift for each 2,000 square feet of in-place base material area.
6. Test each source of base material for compliance with applicable state highway specifications.

C. Field density tests for in-place materials shall be performed according to one of the following standards as part of construction testing requirements:

1. Sand-Cone Method: ASTM D 1556.
2. Balloon Method: ASTM D 2167.
3. Nuclear Method: ASTM D 2922, Method B (Direct Transmission).

D. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results. The Owner, Architect, and Contractor shall be provided with copies of reports within 96 hours of time test was performed. The Owner, Architect, and Contractor shall be notified immediately by Independent Testing Laboratory in the event that any test performed fails to meet the Specifications. The Owner reserves right to employ Independent Testing Laboratory and to direct any testing that is deemed by it to be necessary. Contractor shall provide free access to site for testing activities.

END OF SECTION 02505

SECTION 02515 - SITE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Preparation of subgrade to receive aggregate subbase course.
2. Place and compact aggregate subbase course materials.
3. Concrete pavement, sidewalks, curbs, and other site related items indicated with reinforcement.
4. Surface finishing and application of curing materials.

B. Related Sections include the following:

1. Division 2 Section "Earthwork"
2. Division 2 Section "Paving Subbase Course"

1.3 REFERENCE STANDARDS

A. American National Standards Institute (ANSI)/American Society for Testing and Materials (ASTM):

1. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
2. ANSI/ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
3. ANSI/ASTM C31 - Making and Curing Concrete Test Specimens in the Field.
4. ANSI/ASTM C33 - Concrete Aggregates.
5. ANSI/ASTM C94 - Ready-Mixed Concrete.
6. ANSI/ASTM C143 - Slump of Portland Cement Concrete.
7. ANSI/ASTM C150 - Portland Cement.
8. ANSI/ASTM C231 - Air Content of Freshly Mixed Concrete by the Pressure Method.
9. ANSI/ASTM C260 - Air-Entraining Admixtures for Concrete. ANSI/ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
10. ANSI/ASTM D994 - Preformed Expansion Filler for Concrete.

B. American Concrete Institute (ACI):

1. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

2. ACI 305 - Recommended Practice for Hot Weather Concreting.
3. ACI 306 - Recommended Practice for Curing Concrete.
4. ACI 347 - Recommended Practice for Concrete Formwork.

C. Pennsylvania Department of Transportation, Standard Specifications, 2007 edition.

1.4 INSPECTION AND TESTING

A. Inspection and testing of concrete shall be performed by an independent testing laboratory supplied and paid for by the Contractor.

B. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.

C. Three concrete cylinder samples shall be taken in accordance with ANSI/ASTM C31 for every 100 or less cubic yards of concrete placed and at a minimum at least once daily.

D. One slump (ANSI/ASTM C143) and air content (ANSI/ASTM C231) test shall be taken for each 10 cubic yards of concrete placed, and whenever test cylinders are made.

E. All tests shall be performed in the presence of the Engineer or his representative.

F. Concrete cylinder compressive strength testing shall be performed in accordance with the following schedule: Two cylinders broken at 28 days and one extra cylinder broken at the direction of Engineer if the design compressive strength requirements are not met at 28 days.

1.5 SUBMITTALS

A. Mix Design: Submit proposed mix design and obtain approval by Engineer prior to commencement of concrete work.

B. Ready-mix delivery tickets, ANSI/ASTM C94.

C. Jointing Plan: Unless indicated, submit a jointing plan for review, prior to paving, clearly indicating types, spacing, and locations of joints.

D. Accurately record the actual locations of embedded utilities and components which are concealed from view.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Allowable Concrete Temperatures:

1. Cold Weather: Conform to maximum and minimum requirements of ANSI/ASTM C94 and ACI 306.

a. Maintain protection against freezing for minimum 72 hours.

2. Hot Weather: Maximum concrete temperature of 90 degrees F. Conform to requirements of ANSI/ASTM C94 and ACI 305.

a. Prevent rapid drying during hot weather.

B. Do not place concrete during rain, sleet, or snow unless protection to conform to ACI requirements is provided.

PART 2 - PRODUCTS

2.1 AGGREGATE BASE COURSE

A. Angular crushed natural stone or gravel; free from shale, clay and friable materials and debris; graded in accordance with PADOT Standard Specifications, Publication 408 for 2A aggregate:

Sieve Size	% Passing
2-inch	100
3/4-inch	52-100
3/8-inch	36-70
No. 4	24-50
No. 8	16-38
No. 16	10-30
No. 200	0-10

2.2 CONCRETE MATERIALS

A. Concrete Ready-Mixed: Shall conform to requirements of ANSI/ASTM C94.

B. Portland Cement: ANSI/ASTM C150, Type I, II, III, or V.

C. Coarse Aggregate: Conforming to requirements of PADOT.

1. Maximum aggregate size shall not be more than 1/4 the slab thickness or 3/4 - 1 inch, whichever is less.

D. Fine Aggregate: Washed, hard sand complying with PADOT Specifications.

E. Water: Potable, clean, and free from injurious amount of oil, alkali, organic matter, or other deleterious material, in accordance with ACI Specifications.

F. Air Entrainment Admixture: Conform to ACI Specifications.

2.3 REINFORCEMENT

A. Reinforcing Steel: 60 ksi yield strength; deformed billet steel bars, conforming to PADOT Specifications.

B. Welded Steel Wire Fabric: Plain type, conforming to PADOT Specifications; in flat sheets or rolls; plain finish; size as indicated.

C. Tie Wire: Minimum 16 gauge annealed type, or patented system acceptable to Engineer.

2.4 FORMWORK AND ACCESSORIES

A. Formwork: Matches, tight fitting and adequately stiffened to support weight of concrete without deflection detrimental to tolerance and appearance of concrete.

B. Joint Filler

1. 1/4-inch thick preformed asphalt or rubber for use in the construction of sidewalk slabs.
2. In roadway pavement comply with the requirements of PADOT Publication 408, Section 705.

C. Curing Compound: PADOT approved; dissipating type after curing cycle is complete (chemically breaks down after approximately two weeks and remaining film can be removed by brooming after an additional three to four weeks for linseed oil protection treatment).

1. Compounds containing wax, resin, or chlorinated rubber not compatible with the linseed oil protection treatment, specified and applied under Section 09874, are not acceptable.

2.5 CONCRETE MIX

A. Mix concrete in accordance with requirement of ANSI/ASTM C94, only in quantities for immediate use.

B. Paving/Slabs, and/or Other Site Related Items:

1. Paving: Cement Concrete mixed and proportioned to produce a minimum compressive strength of 4,000 psi after 28 days with a maximum slump of three inches and four to six percent air entrainment.
2. Other Site Related Items: Cement Concrete mixed and proportioned to produce a minimum compressive strength of 3,500 psi after 28 days with a maximum slump of three inches and four to six percent air entrainment.

C. Admixtures:

1. The use of admixtures is prohibited without the prior approval of the Engineer.

2. Upon written approval by the Engineer, use accelerating admixtures in cold weather.

   a. Use of admixtures shall not relax cold weather placement requirements.
   b. Do not use calcium chloride.

3. Upon written approval by Engineer use set-retarding admixtures during hot weather.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADE

A. Ensure rough grading has brought subgrade to required elevations, lines, grade, and cross sections indicated.

B. All soft and yielding material and portions of the subgrade that will not compact readily when rolled or tamped shall be removed and replaced with suitable material.

C. Bring subgrade to a firm and unyielding condition by compacting it to uniform density.

D. Compact at or slightly above standard optimum moisture.

E. Concrete shall not be placed on a soft, spongy, frozen, otherwise unsuitable subgrade.

3.2 PLACEMENT OF AGGREGATE BASE COURSE

A. Place and compact aggregate base course over prepared subgrade to lines, grade, and cross sections shown.

B. All aggregate material shall be compacted with mechanical tampers to compacted depths indicated, in layers not over four inches.

3.3 FORMING

A. Form vertical surfaces to full depth and securely position to required lines and levels.

B. Ensure form ties are not placed so as to pass through concrete.

C. Arrange and assemble formwork to permit easy dismantling and stripping, and to prevent damage to concrete during formwork removal.

3.4 PLACING REINFORCING

A. Reinforce concrete pavement, curbs, and other site related items as indicated, adequately supported and secured against displacement.

B. Do not extend reinforcing through expansion and contraction joints, except where specifically shown or specified.

C. Install steel bars and welded wire fabric in longest practical lengths.

D. Lap and splice bars minimum 30 times diameter; lap wire fabric one full mesh minimum; tie splices with wire.

E. Offset end laps in adjacent widths of wire fabric to prevent continuous laps.

F. Keep reinforcement in its proper position during concrete replacement and operations.

G. Provide dowelled joints through expansion and contraction joints in pavement and curbs where indicated, with one end of dowels fitted with capping sleeve to allow free movement.

3.5 ISOLATION, CONTROL AND CONSTRUCTION JOINTS

A. Isolation Joints (expansion joints): Provide where concrete abuts permanent objects within paved area.

1. Form isolation joint by use of premolded expansion joint material, full depth of concrete.

B. Control Joints (contraction joints): Provide control joints for sectioning concrete into areas to eliminate shrinkage and thermal cracking.

1. Form weakened-plane control joints to a depth equal to a minimum of three- the concrete thickness, or as shown on the plans, as follows:

a. Tooled Joints: Form joints in fresh concrete, by hand grooving top portion using appropriate cutting tool and finishing edges with a jointer tool, while still plastic.

b. Sawed Joints: Form joints by using power saw equipped with shatterproof diamond-rimmed blades. Put joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by the cutting action.

C. Construction Joints: Provide at end of all pours when concreting operations are stopped for a period of more than two hour, except where such pours terminate at expansion joints.

1. Form construction joints by use of wood formed or metal preformed keys.

D. Provide joints with filler of required profiles, set perpendicular to longitudinal axis of pavement and curbs.

E. Recess 1/4-inch below finished concrete surface.

3.6 PLACING CONCRETE

A. Notify the Engineer, a minimum of 24 hours, prior to commencement of concreting operations.

B. Before placing concrete, ensure that:

1. Freestanding water, snow, ice, or other foreign materials are removed.
2. Subgrade is moist at time of concreting.
3. All forms have been thoroughly cleaned, secured in position, and coated with a form-release agent.

C. Ready mixed concrete hauled in truck mixers or truck agitators shall be deposited in place within 90 minutes from the time water is added to the mix.

D. Place concrete, strike off, consolidate, and finish surfaces to plan grade, smooth and uniform, free of open texturing and exposed aggregate.

E. Avoid working mortar to surface.

F. Concrete pavement shall be pitched to area drains or perimeter areas for positive drainage.

G. Provide control joints in pattern indicated, continuous across the slab, unless interrupted by full-depth premolded filler.

H. All joints shall be completed before uncontrolled shrinkage cracking occurs.

I. Round all edges, including edges of scored and expansion and contraction joints, with 3/8-inch radius edging tool.

3.7 CONCRETE FINISHING

A. After concrete has been struck off and consolidated, a bullfloat may be used to remove any high or low spots.

1. Bullfloat use shall be confined to a minimum.

B. Provide exposed surface with a final skid-resistant finish accomplished by broom or burlap drag, alternate direction of finish on adjacent blocks, unless indicated or noted otherwise.

C. Ensure finished surfaces do not vary from true lines, levels or grade by more than 1/8-inch in 10 feet when measured with straightedge.

D. Apply curing compound on finished surfaces immediately after placement, in accordance with manufacturer's printed instructions and recommended procedures.

3.8 PROTECTION

A. Concrete pavement shall be closed to pedestrian and/or vehicular traffic for not less than seven days after concrete is placed.

B. In all cases approval must be obtained from the Engineer prior to opening of pavement to traffic.

END OF SECTION 02515

SECTION 02720 - TACTILE WARNING SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Cast-In-Place Detectable Warning Tiles for installation in new exterior concrete paving.

B. Related Sections include the following:

   1. Division 32 Section "Concrete Paving" for concrete sidewalks and curbs.

1.3 SUBMITTALS

A. Furnish submittals in accordance with Division 01 requirements.

B. Product Data: Submit manufacturer's literature describing products, installation procedures and routine maintenance.

C. Shop drawings are required for products specified showing fabrication details, composite structural system, tile surface profile, sound on cane contact amplification feature, plans of tile placement including joints, and material to be used as well as outlining installation materials and procedure.

D. Samples for Verification Purposes: Submit two minimum 6" x 6" tile samples.

E. Material Test Reports: Submit complete test reports from qualified accredited independent testing laboratories to qualify that materials proposed for use are in compliance with requirements and meet or exceed the properties indicated on the specifications. All tests shall be conducted on a Detectable Warning Tile system as certified by a qualified independent testing laboratory and be current within a 24 month period.

F. Maintenance Instructions: Submit copies of manufacturer's specified installation and maintenance practices for Detectable Warning Tile and accessories as required.

1.4 QUALITY ASSURANCE

A. Provide Detectable Warning Tiles and accessories as produced by a single manufacturer with a minimum of three years experience in the manufacturing of specified materials.

B. Installer's Qualifications: Engage an experienced Installer certified in writing by Detectable Warning Tile manufacturer as qualified for installation, who has successfully completed installations similar in material, design, and extent to that indicated for Project.

C. Americans with Disabilities Act Accessibility Guidelines (ADAAG): Provide materials that comply with detectable warnings on walking surfaces section of ADAAG (Title III Regulations, 28 CFR Part 36 ADA STANDARDS FOR ACCESSIBLE DESIGN, Appendix A, Section 4.29.2 DETECTABLE WARNINGS ON WALKING SURFACES).

D. California Code of Regulations (CCR): Provide only approved DSAAC detectable warning products as provided in the California Code of Regulations (CCR) Title 24, Part 2, Section 205 definition of "Detectable Warning", Section 1117A.4 and 1127B.5 for "Curb Ramps", and Section 1133B.8.5 for "Detectable Warnings at Hazardous Vehicular Areas".

1.5 DELIVERY, STORAGE, AND HANDLING

A. Be suitably packaged or crated to prevent damage in shipment or handling. Protect finished surfaces by sturdy plastic wrappings to protect tile from concrete residue during installation and identify tile type by part number.

B. Deliver to location at building site for proper storage prior to installation. Comply with manufacturer's recommendations for storage and handling procedures

1.6 ENVIRONMENTAL CONDITIONS

A. Maintain minimum temperature of 40°F in spaces to receive Detectable/Tactile Warning Surface Tiles for at least 24 hours prior to installation, during installation, and for not less than 24 hours after installation.

B. The use of water for work, cleaning or dust control, etc. shall be contained and controlled and shall not be allowed to come into contact with the general public. Provide barricades or screens to protect the general public.

1.7 WARRANTY

A. Furnish manufacturer's standard written warranty against defective work, breakage, deformation, fading and loosening of tiles.

B. Length of Warranty: Five years from date of substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design: The design for the cast-in-place detectable warning surfaces system is based on Horner Cast-In-Place System, as manufactured by Advantage Tactile Systems, 241 Main Street, Suite 100, Buffalo, NY 14203, 1-800-679-4022. Subject to compliance with requirements, provide the named product or a comparable product by the following, or an approved equal.

1. MetaDome LLC.

2.2 MATERIALS

A. General: Stainless steel, with tiles having the following characteristics:

1. Have an integral non-slip surface stamped into the stainless steel plate on the top of the domes and in the field surface between the domes.
2. Have an ultra violet stabilized coating.
3. Incorporate an in-line pattern of truncated domes measuring nominal 0.2" height, 0.9" base diameter, and 0.45" top diameter, spaced center-to-center 2.4" as measured on a diagonal and 1.7" as measured side by side.
4. For wheelchair and high heel shoe safety the field area shall consist of an integral non-slip surface within the stainless steel plate that measures 0.03" above the adjacent surface.
5. Sizes: 24" width by lengths as required, nominal.

B. Performance Requirements:

1. Slip Resistance - Wet and Dry Static Coefficients of Friction: Not to be less than 0.80 on top of domes and field area when tested by ASTM C 1028.
2. Chemical Stain Resistance: Withstand saturated calcium chloride, red enamel spray paint, red lipstick, red wax crayon, black liquid ink, chewing gum, mustard, ketchup, urine, coffee, diesel fuel, asphalt, tobacco juice, hydraulic oil and motor oil without discoloration or staining when tested by ASTM D 543.
3. Abrasive Wear: Average wear depth shall not exceed 0.010 after 1,000 abrasion cycles when measured on the top surface of the dome representing the average of three measurement locations per sample when tested by BYK – Gardener Tester ASTM D 2486 with reciprocating linear motion of 37± cycles per minute over a 10" travel. The abrasive medium, a 40 grit Norton Metallite sand paper, to be fixed and leveled to a holder. The combined mass of sled, weight and wood block shall be 3.2 lb.
4. Abrasive Wear: Average wear index shall be a minimum of 480 after 1,000 abrasion cycles with ASTM C 501 parameters when measured on top surface of dome representing the average of four sample measurements when tested by Taber Tester ASTM C 501 with H22 coarse Calibrade Wheels with each testing coupon weighed to the nearest 0.01 gram.

5. Gardner Impact to Geometry: Have a mean failure energy expressed as a function of specimen thickness of not less than 550 in. lbf/in. when tested by ASTM D 5420. A failure is noted when a crack is visible in coating or a 3mm depression on domes for coated tile.
6. Accelerated Weathering: Exhibit a result of – ΔE <2.6, as well as no deterioration, fading, or chalking of surface of federal yellow color tile (federal No. 33538) when tested by ASTM G 155 for 3,000 hours.
7. Accelerated Aging and Freeze Thaw Test: Show no evidence of cracking, delamination, warpage, checking, blistering, color change, loosening of tiles or other detrimental defects when tested to ASTM D 1037.
8. Salt and Spray Performance: Show no deterioration or other defects after 1,000 hours of exposure when tested to ASTM B 117.
9. Tensile Bond Strength of Concrete Repair and Overlay Materials by Direct Pull-off Method: Be not less than 160 psi when tested by ASTM C 153.
10. Crazing Resistance: No failure up to 450 degrees Fahrenheit by thermal shock with breaches in coating when tested by ASTM C 554.
11. AASHTO HB-17 single wheel HS20-44 loading "Standard Specifications for Highways and Bridges". Exhibit no visible damage when Cast-In-Place Tile is mounted on a concrete platform and then subjected to specified maximum load of 10,400 lbs., corresponding to an 8,000 lb individual wheel load and a 30% impact factor.

C. Color: Yellow (Federal Color No. 33538).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of surfacing system materials.

B. Report any discrepancies or unacceptable conditions that have been corrected. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Verify that shop drawings indicate that tile field level (base of truncated dome) is flush to adjacent surfaces to permit proper water drainage and eliminate tripping hazards between adjacent finishes.

3.2 PREPARATION

A. Coordinate installation of detectable/tactile warning surface materials with installation of new concrete sidewalks and curbs provided under a Division 32 Section.

B. Properly locate warning surface materials according to approved shop drawings and in compliance with ADAAG guidelines.

C. During installation procedures, ensure adequate guidelines are in place and that they are in accordance with applicable industry and government standards.

D. Prior to placement review manufacturer's and contract drawings and refer any discrepancies to Construction Manager.

E. Verify physical characteristics of concrete to be consistent with contract specifications, while maintaining a slump range of 4 - 7 to permit solid placement of the Cast In Place Detectable/Tactile Warning Surface Tile system. Do not provide an overly wet mix that will cause the tile to float. If tiles lift slightly, place suitable weights such as 2 concrete blocks or 25 lb. sandbags on each tile.

F. The concrete pouring and finishing operations require typical mason's tools, however, a 4' long level with electronic slope readout, 25 lb. weights, and a large non-marring rubber mallet are specific to tile installation. If a vibrating mechanism is required, use one similar to that manufactured by Vibco. Fix vibrating unit to a soft base such as wood, at least 1 foot square.

3.3 INSTALLATION

A. Install materials according to manufacturer's installation instructions.

B. Leave factory-installed plastic sheeting in place during entire installation process to prevent splashing of concrete onto finished surface of tile.

C. When preparing to set tile, remove no concrete in area designated to accept tile. It is imperative that installation techniques eliminate any air voids under tile. Holes in tile perimeter allow air to escape during installation process. Concrete will flow through large holes in each embedment flange on underside of tile to lock tile solidly into cured concrete.

D. Pour and finish concrete true and smooth to required dimensions and slope prior to tile placement. Immediately after finishing concrete, use electronic level to check that required slope is achieved. Place tile true and square to curb edge in accordance with shop drawings. Tamp or vibrate tiles into fresh concrete to ensure that field level of tile is flush to adjacent concrete surface. Do not accomplish embedment process by stepping on tile as this may cause uneven setting which can result in air voids under tile surface.

E. Set tiles deeper such that top of domes are level to adjacent concrete on top and sides of ramp and that base of domes allow water drainage. This installation will reduce the possibility of damage due to snow clearing operations.

F. Immediately after placement, check tile elevation to adjacent concrete. Set elevation and slope consistent with shop drawings to permit water drainage to curb as design dictates. Ensure that field surface of the tile is flush with surrounding concrete and back of curb so that no ponding is possible on tile at back side of curb.

G. While concrete is workable, use a 3/8" radius edging tool to create a finished edge of concrete. Then use a steel trowel to finish concrete around tile's perimeter, flush to field level of tile.

H. During and after tile installation and concrete curing stage, prevent anyone from walking, leaning, or placing external forces on tile that may rock tile causing a void between underside of tile and concrete.

I. Following tile placement, review installation tolerances to shop drawings and adjust tile before concrete sets. Place two suitable weights of 25 pounds on each tile as necessary to ensure solid contact of underside of tile to concrete.

J. Following concrete curing stage, remove protective plastic wrap from tile surface by cutting plastic with a sharp knife, tight to the concrete/tile interface. If concrete bled under plastic, clean the residue with a soft brush without damage to tile surface.

3.4 PROTECTION

A. Protect tiles against damage during construction period to comply with manufacturer's specification.

B. Protect tiles against damage from rolling loads following installation by covering with plywood or hardwood.

C. Clean tiles not more than four days prior to date scheduled for inspection intended to establish date of substantial completion in each area of project. Clean tile by method specified by tile manufacturer.

D. Comply with manufacturer's maintenance manual for cleaning and maintaining tile surface.

END OF SECTION 321726

SECTION 02731 - PADOT WORK ZONE REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Pennsylvania Department of Transportation:

1. Publication 408, Specifications
2. Publication 72, Standards for Roadway Construction (RC Drawings)
3. Publication 213, Work Zone Traffic Control
4. Publication 148, Traffic Standards – (TC8800 Series)
5. PADOT Certificate of Insurance Form

C. PADOT Highway Occupancy Permit (HOP) requirements.

D. Supplemental Drawings as listed on Drawing C0.00 to include:

1. PennDOT RC-67, 14 Sheets

1.2 SUMMARY

A. This Section includes the following:

1. All construction activities within the PADOT Right-of-Way to include:

a. Drainage improvements
b. Curbing
c. Sidewalks
d. Pavement markings
e. Signage
f. Maintenance and protection of traffic
g. Signal installation
h. Utility installation where required and coordination with Authorities
i. Surface restoration
j. Grade adjustment of utility facilities

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.
2. Division 2 Section “Erosion and Sedimentation Control” for controlling sediment within the work zone.

1.3 PADOT CONTACT PERSON

A. For information related to PADOT requirements contact:

1. Mr. Jesse Theys
Pennsylvania Department of Transportation
PADOT District 9-0, County Permit Inspector
Phone: 1-814-935-1901

1.4 SUBMITTALS

B. Record drawings, according to Division 1 Section "Project Record Documents," identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

C. Copies of all PADOT required documentation to include:

1. Bonds
2. Insurance
3. Inspection and testing reports
4. Material certificates

1.4 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during construction of the new work.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing. Contact PA One Call System at 1-800/242-1776, 3 to 10 days prior to any excavation.

C. Do not commence work within the PADOT Right-of-Way until proper notification is given to the PADOT District 3-0 Permit Office.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 2 Section "Earthwork."

1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

2.2 CONSTRUCTION MATERIALS

A. All materials used in the construction of improvements within the DOT right-of Way must comply with the quality standards of PADOT.

2.2 PADOT INSURANCE AND BONDING REQUIREMENTS

A. Contractor shall include in it's bid sufficient funds to cover the cost of the following PADOT requirements based upon PADOT's estimated roadway improvement cost for the work within the right-of-way, plus 10%:

1. Bonding requirements to comply with PADOT HOP requirements
2. Insurance requirements to comply with current State standards with PADOT named as an "Additional Insured". Minimum coverage levels are:

   a. 250,000 each person
   b. 1,000,000 each occurrence
   c. Provide certificate of insurance on State form M945X. This form has been included with this specification.
   d. All PADOT inspection fees.

PART 3 - EXECUTION

3.1 PREPARATION

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

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 WORK ZONE RESTRICTIONS

A. The following is PADOT's restriction for work within the State right-of-Way.

1. "No traffic restrictions or lane closures are permitted between the hours of 6:00 AM to 9:00 AM and 3:00 PM to 6:00 PM, Monday through Friday, Legal Holidays, or the weekend associated with legal holidays."

3.3 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.4 TREE PROTECTION

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

1. Do not store construction materials, debris, or excavated material within fenced area.
2. Do not permit vehicles, equipment, or foot traffic within fenced area.
3. Maintain fenced area free of weeds and trash.

B. Do not excavate within tree protection zones, unless otherwise indicated.

3.5 UTILITIES

A. Owner will arrange for disconnecting and sealing indicated utilities when requested by Contractor.

1. Verify that utilities have been disconnected and capped before proceeding with work.

B. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.
2. Owner will arrange to shut off indicated utilities when requested by Contractor.

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

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

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

E. Removal of underground utilities is included in Division 2 Sections covering site utilities.

F. Coordinate relocations and conflicts with existing utilities. Coordinate and perform grade adjustments to manhole tops, inlets, valve boxes, etc.

3.6 SITE IMPROVEMENTS

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

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

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

3.7 DISPOSAL

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

1. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION 02731

M-945X (9-07) Highway Occupancy Permit No. _____

CERTIFICATE OF INSURANCE
(Single Permit Only)
Utility Facility Occupancy
67 Pa. Code, Chapter 459 "Occupancy of State Highways by Utilities"

Insured*: _____

Address: _____

_____

Insurer: _____

Insurance Agency: _____

_____

Additional Insured: Commonwealth of Pennsylvania, Department of Transportation

This is to certify that:

(a) The occurrence-based Commercial General Liability (CGL) policy(-ies) of insurance listed below have been issued to the Insured named above and are in force at this time.

(b) The following coverage is provided by the policy(-ies) of insurance listed below. Initial in the space provided as certification of the insurance coverage provided (**all blocks must be initialed**):

_____ (producer's initials) The Commonwealth of Pennsylvania, Department of Transportation is an additional insured for at least $250,000 per person and $1,000,000 per occurrence.

_____ (producer's initials) Contractual liability

_____ (producer's initials) Care, custody, and control

_____ (producer's initials) XCU - explosion (X), collapse (C), and underground (U) hazards

* Insured may attach Exhibit A to include subsidiary entities.

(c) The CGL policy(-ies) of insurance (occurrence-based or claims made with a two (2) year extended reporting period) listed below shall not be cancelled unless sixty (60) days (ten (10) days in the case of non-payment of premium) advance written notice of such intention to cancel delivered to the Department at the Bureau of Highway Safety and Traffic Engineering, 400 North Street, Harrisburg, PA 17120, Attention Central Office Permit Manager.

(d) The CGL policy(-ies) of insurance listed below are without deductibles or the Insured has provided the Department with a pre-approved plan of self-insurance for the amount of the deductible.

Policy Number(s):_____

_____

Policy Expiration Date(s):_____

_____

We certify that the foregoing is true and correct and this Certificate of Insurance is made subject to the penalties provided in 18 Pa.C.S. § 4904 for purpose of obtaining a highway occupancy permit pursuant to 67 Pa. Code, Chapter 459.

_____
Permittee/Permittee's Contractor
☐ President
☐ Vice-President
☐ Sole Proprietor
☐ Managing Partner
☐ Other

Date:_____

_____
Insurance Producer

Date:_____

SECTION 02741 - HOT- MIX ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Hot-mix asphalt paving.
2. Hot-mix asphalt patching.
3. Pavement-marking paint.

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for aggregate subbase and base courses and for aggregate pavement shoulders.
2. Division 2 Section "Pavement Joint Sealants" for joint sealants and fillers at paving terminations.

1.3 DEFINITIONS

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

B. DOT: Department of Transportation.

1.4 SYSTEM DESCRIPTION

A. Provide hot-mix asphalt paving according to materials, workmanship, and other applicable requirements of standard specifications of state or local DOT.

B. Commonwealth of Pennsylvania Department of Transportation (PADOT):

1. PADOT Publication 408, Specifications, 2007 edition.

a. Section 108 - Performance and Progress
b. Section 305 - Bituminous Concrete Base Course
c. Section 350 - Subbase
d. Section 401 - Plant-Mixed Bituminous Concrete Courses
e. Section 420 - Bituminous Wearing Course ID-2 and Bituminous
f. Wearing Course ID-2, RPS
g. Section 421 - Bituminous Binder Course, ID-2 and Bituminous Binder Course, ID-2, RPS

h. Section 460 - Bituminous Tack Coat
i. Section 480 - Bituminous Surface Treatment
j. Section 703 - Aggregates
k. Section 900 - Traffic Accommodation and Control
l. Section 962 - Painting Traffic Lines and Markings
m. Section 1103 - Traffic Signing and Marking

2. PADOT Publication #111 - Traffic Signing Standards.
3. PADOT Publication #203 - Work Zone Traffic Control.

1.5 SUBMITTALS

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

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

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

D. Samples: For each paving fabric, 12 inches by 12 inches minimum.

E. Qualification Data: For manufacturer having prior approval of PADOT.

F. Material Certificates: For each paving material, signed by manufacturers. Submit imported material certificates to Engineer which is signed by material producer and Contractor, certifying that materials comply with, or exceed, the requirements herein.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer.

1. Manufacturer shall be a paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of the state in which Project is located.

B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated, as documented according to ASTM E 548.

C. Regulatory Requirements: Comply with PADOT Pub. 408 for asphalt paving work.

D. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
2. Review condition of subgrade and preparatory work.
3. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.7 DELIVERY, STORAGE, AND HANDLING

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

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

1.8 PROJECT CONDITIONS

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

1. Tack Coat: Minimum surface temperature of 50 degrees F and rising.
2. Asphalt Base Course: Minimum surface temperature of 40 degrees F and rising at time of placement.
3. Asphalt Surface Course: Minimum surface temperature of 60 degrees F at time of placement.

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

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel.

C. Fine Aggregate: ASTM D 1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel.

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: ASTM D 242 or AASHTO M 17, rock, hydraulic cement, or inert material approved by the Engineer.

2.2 ASPHALT MATERIALS

A. Bituminous Concrete Base Course: Shall consist of constructing one or more layers of hot-mixed, hot-laid bituminous concrete base course in accordance with PADOT Publication 408, Section 305.

B. Bituminous Concrete Binder Course: Shall consist of constructing one or more layers of hot-mixed hot laid bituminous concrete binder course in accordance with PADOT Publication 408, Section 421.

C. Wearing Course: Shall consist of constructing an ID-2 wearing course hot-mixed, hot-laid asphalt concrete to requirements of PADOT Publication 408, Section 420.

D. Asphalt Cement: Homogeneous, free of water, will not foam when heated to 177EC; Class AC-20, conforming to requirements of PADOT Bulletin No. 25.

E. Mineral Filler: Limestone dust, cement, cement dust, fly ash, or fines free of clay resulting from crushing of stone, gravel or slab, graded in accordance with PADOT Publication 408, Section 703.1(c) 1 within the following limits:

Sieve Size	Percent Passing
No. 30	100
No. 50	95 - 100
No. 100	90 - 100
No. 200	70 - 100

F. Tack Coat: Emulsified asphalt, Class E-6 or E-8 in accordance with PADOT Publication 408, Section 460.

G. Joint and crack sealer and filler material shall conform to PADOT Pub 408 Specifications, 2007 edition, asphalt cement filler

H. Water: Potable.

2.3 AUXILIARY MATERIALS

A. Granular Subbase Course: Shall consist of constructing a stabilizing granular base in accordance with PADOT Publication 408, Section 350.

B. Sand: ASTM D 1073 or AASHTO M 29, Grade Nos. 2 or 3.

C. Joint Sealant: ASTM D 3405 or AASHTO M 301, hot-applied, single-component, polymer-modified bituminous sealant.

D. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, with drying time of less than 3 minutes.

1. Color: White, Yellow, Blue, as indicated.

E. Wheel Stops: Precast, air-entrained concrete, 4000-psi minimum compressive strength, 4 1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners and drainage slots on underside and holes for anchoring to substrate.

1. Dowels: Galvanized steel, 3/4-inch diameter, 10-inch minimum length.

2.4 MIXES

A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction; designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types"; and complying with the following requirements:

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

B. Asphalt Pavement Mix: Combine mineral constituents in proportions to produce a mixture conforming to PADOT Publication 408, Section 305 for the bituminous concrete base course, Section 421 for the binder course and Section 420 (ID-2) for the surface course within the following gradation requirements:

Sieve Size (Bituminous Concrete Base Course)	Percent Passing
2"	100
1-1/2"	95-100
3/4"	52-100
3/8"	36-70
No. 8	16-38
No. 30	8-14
N0. 50	6-18
No. 100	4-10

Sieve Size (Binder Course – ID-2)	Percent Passing
1-1/2"	100
1"	90-100
1/2"	40-75
No. 4	20-47

Sieve Size (Binder Course – ID-2)	Percent Passing
No. 8	15-37
No. 16	10-30
No. 30	5-24
No. 50	4-17
No. 100	3-10
No. 200	2-5

Sieve Size (Wearing Course – ID-2)	Percent Passing
1/2"	100
3/8"	80-100
No. 4	45-80
No. 8	30-60
No. 16	20-45
No. 30	10-35
No. 50	5-25
No. 100	4-14
No. 200	3-6

C. Percent by weight of asphalt cement in mixture; 3.0 percent to 6.0 percent for bituminous concrete base course, 4.0 percent to 7.0 percent for ID-2 binder course and 4.5 percent to 8.0 percent for ID-2 wearing course.

D. Maintain thorough and uniform mixture.

E. Bring asphalt cement and mineral constituents to required temperature before mixing. Ensure aggregates are sufficiently dry so as not to cause foaming in mixture.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

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

3.2 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

1. Mill to a depth of 1 1/2 inches.
2. Mill to a uniform finished surface free of gouges, grooves, and ridges.
3. Control rate of milling to prevent tearing of existing asphalt course.
4. Repair or replace curbs, manholes, and other construction damaged during cold milling.
5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
6. Transport milled hot-mix asphalt-to-asphalt recycling facility.
7. Keep milled pavement surface free of loose material and dust.

3.3 PATCHING

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd..

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

C. Patching: Fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.

3.4 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

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

B. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.15 gal./sq. yd.

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

3.5 HOT-MIX ASPHALT PLACING

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

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lift.
3. Spread mix at minimum temperature of 250 degrees F.
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place asphalt pavement within 24 hours of priming subbase course in accordance with PADOT Publication 408, Section 305, Section 420, and Section 421.

C. Equipment:

1. Paver: Place asphaltic concrete only with self-powered unit equipped with an activated screed or strike-off assembly, and capable of spreading and finishing widths and depths shown, in accordance with PADOT Publication 408, Section 401.
2. Hand Placement: Areas inaccessible to paver, upon approval by Engineer, may be placed by hand, maintaining required course depth.
3. Roller: Self-propelled, smooth steel wheel with nominal weight of 10 tons, or approved equivalent vibratory compactor, in accordance with PADOT, Publication 408, Section 108.05(c) 3.

    a. 3 M.P.H. maximum speed during compaction.
    b. Use mechanical tampers in areas not accessible to roller.

D. Place bituminous concrete base course to compacted depth indicated.

E. Place bituminous binder course to compacted depth indicated.

F. Place wearing course to compacted depth indicated.

G. Ensure asphalt pavement is minimum 245 degrees F immediately after placing and prior to initial rolling.

H. Compact each lift of asphalt paving course to required density with approved rolling equipment in accordance with PADOT Publication 408. Start compaction as soon as pavement will bear equipment without checking or undue displacement.

I. Carry out compaction in three operations in pass sequence. Ensure each pass of roller overlaps previous passes to ensure a smooth surface free of roller marks. Keep roller wheels sufficiently moist so as not to pick up material.

J. Perform hand tamping in areas not accessible to rolling equipment. Remove areas that are loose, broken, mixed with dirt, or otherwise defective, or that show an excess or deficiency of bituminous material. Replace with fresh hot mixture and compact to conform to surrounding area.

K. Ensure joints made during paving operations are straight, clean, vertical and free of broken or loose material. Prime the vertical surfaces of joints to ensure a tight bond.

L. Tolerances: Maximum allowable deviation from elevations and grades indicated for pavement courses:

1. Bituminous Concrete Base Course: 1/4-inch in 10 inches
2. Binder Course: 1/4-inch in 10 feet.
3. Wearing Course: 3/16-inch in 10 feet.
4. Depressions retaining or ponding water or mounds in pavement, or ridges at joints will not be acceptable.

M. Apply a tack coat to the existing pavement, structures, and curb line prior to paving.

N. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

O. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.6 JOINTS

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

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of six inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Construct transverse joints as described in AI MS-22, "Construction of Hot Mix Asphalt Pavements."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within two percent of specified course density.

B. Seal all joints along the curb line and joints along the existing pavement with hot bituminous material or emulsified asphalt.

3.7 COMPACTION

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

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

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

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

1. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent nor greater than 100 percent.
2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.8 INSTALLATION TOLERANCES

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

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

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

1. Base Course: 1/4-inch.
2. Surface Course: 1/8-inch.
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4-inch.

3.9 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow paving to age for 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage and pay for a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.

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

B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

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

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

E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979 or AASHTO T 168.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than three cores taken.
b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

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

3.11 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.

1. Do not allow excavated materials to accumulate on-site.

END OF SECTION 02741

SECTION 02764 - PAVEMENT JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Expansion and contraction joints within Portland cement concrete pavement.
2. Joints between Portland cement concrete and asphalt pavement.

B. Related Sections include the following:

1. Division 2 Section "Hot-Mix Asphalt Paving" for constructing joints between concrete and asphalt pavement.
2. Division 2 Section "Site Concrete" for constructing joints in concrete paving.
3. Division 2 Section "Decorative Cement Concrete Pavement" for patterned concrete or stamped paving.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Verification: For each type and color of joint sealant required. Install joint-sealant samples in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.

D. Product Test Reports: From a qualified testing agency indicating joint sealants comply with requirements, based on comprehensive testing of current product formulations.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 degrees F.
2. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than that allowed by joint sealant manufacturer for application indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Owner from manufacturer's full range for this characteristic.

2.2 COLD-APPLIED JOINT SEALANTS

A. Single-Component Jet-Fuel-Resistant Urethane Sealant for Concrete: Single-component, pourable, coal-tar-modified, urethane formulation complying with ASTM C 920 for Type S; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.

B. Type NS Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, nonsag silicone sealant complying with ASTM D 5893 for Type NS.

C. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.

D. Multicomponent Low-Modulus Sealant for Concrete and Asphalt: Proprietary formulation consisting of reactive petropolymer and activator components producing a pourable, self-leveling sealant.

E. Products: Subject to compliance with requirements, provide one of the following:

1. Single-Component Jet-Fuel-Resistant Urethane Sealant for Concrete:

   a. Vulkem 200; Mameco International.
   b. Sonomeric 1; Sonneborn Building Products Div., ChemRex, Inc.

2. Type NS Silicone Sealant for Concrete:

   a. Roadsaver Silicone-SL; Crafco Inc.
   b. 888; Dow Corning.

3. Type SL Silicone Sealant for Concrete and Asphalt:

   a. 890-SL; Dow Corning.

2.3 JOINT-SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint sealant manufacturer based on field experience and laboratory testing.

B. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.

2.4 PRIMERS

A. Primers: Product recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint- sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions applicable to products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of backer materials.
2. Do not stretch, twist, puncture, or tear backer materials.
3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

D. Install sealants by proven techniques to comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses provided for each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealants from surfaces adjacent to joint.
2. Use tooling agents that are approved in writing by joint sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint sealant manufacturer's written instructions, unless otherwise indicated.

G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants 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 sealants immediately so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 02764

SECTION 02846 – SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes

1. Traffic control signs listed below to be installed only when specifically indicated on the Drawings and shall comply with U.S. Department of Transportation, Federal Highway Administration's Manual "Uniform Traffic Control Devices" and as specified. See Construction Drawings for type, location, and quantity of signs required.

B. Related Requirements

1. Construction Drawings
2. Manufacturer's mounting instructions.

C. Submittals

1. Product Data: Submit product data in the form of manufacturer's technical data, specifications, and application instructions for the post and sign mounting system.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

A. Signs to be equivalent to those manufactured by SA-SO, Inc., Grand Prairie, TX.

B. Kohl's Pylon Sign: Manufactured by Imageworks, Ashland, VA; phone: 804/798-5582.

2.2 SIGNS

A. "STOP" Signs: PADOT standard 30" x 30", white legend on red reflective or baked enamel background.

B. "HANDICAPPED SYMBOL" Signs: 12" x 18", blue legend on white reflective baked enamel background.

C. "SPEED LIMIT 15" Signs: 24" x 30", black legend on white reflective baked enamel background.

D. "NO PARKING, LOADING ZONE" Signs: 12" x 18", red legend on white reflective baked enamel background.

E. "NO PARKING, ANY TIME" Signs: 12" x 18", red legend on white reflective baked enamel background.

F. "DO NOT ENTER" Signs: PADOT standard red and white sign (R5-1) except 30" x 30" size with reflective baked enamel finish.

G. "DO NOT PASS" Signs: 18" x 24", black legend on white reflective baked enamel background.

H. "STOP AHEAD" Signs: red stop sign symbol and text with black legend on white reflective baked enamel background.

I. "EXCEPT RIGHT TURN" Signs: 18" x 24", black legend on white reflective baked enamel background.

J. "AUTHORIZED PARKING ONLY" Signs: 18" x 18", black legend on white reflective baked enamel background.

2.3 POSTS

A. Square tube, multi-hole Uni-strut, galvanized; schedule 40 steel posts 2 1/2-inches by 2 1/2-inches with galvanized sign mounting hardware for each sign.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install posts in 18-inches round x 24-inches deep concrete foundations. Set posts vertical and plumb with bottom of sign at 7-feet above finish grade. Mount Disabled parking signs in accordance with ADA requirements and site details. Mount signs in accordance with manufacturer's instructions.

B. Kohl's Pylon Sign: Installation to comply with Manufacturer's written recommendations for a complete installation to include foundations and electric power to the sign from the power source.

END OF SECTION 02846

SECTION 02920
TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Seeding:

   a. Lawns.
   b. Disturbed Areas.

2. Planting soil.

B. Related Sections:

1. Division 2 Section "Site Clearing" for topsoil stripping and stockpiling.
2. Division 2 Section "Earth Moving" for excavation, filling and backfilling, and rough grading.
3. Division 2 Section "Plants" for plantings, planting soils, and tree grates.
4. Division 2 Section "Subdrainage" for subsurface drainage.

1.3 REFERENCE STANDARDS

A. Commonwealth of Pennsylvania Department of Transportation (PADOT)

1. PENNDOT Standard 408, latest edition

1.4 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 specified; 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.

1.5 SUBMITTALS

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

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

C. Product Certificates: For soil amendments and fertilizers, signed by product manufacturer.

D. Qualification Data: For Landscape Installer.

E. Material Test Reports: For imported soil and for existing surface soil as required, in addition to requirements in Division 1 Section "Quality Control Services".

F. Planting Schedule: Indicating anticipated planting dates for each type of seed.

G. Maintenance Instructions: Recommended procedures to be established by Government for maintenance of lawns during a calendar year. Submit before expiration of required maintenance periods.

H. Posting Requirements: For application of all herbicides and pesticides.

1.6 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.
   a. The field supervisor must ensure that sufficient topsoil has been provided and that the topsoil is of the quality and depth in accordance with the specifications so a healthy coverage of lawn will be provided.

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. Planting Soils Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; 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.

D. Preinstallation Conference: Conduct conference at project site to comply with requirements in Division 1.

E. Review of fertilizer and mulch maintenance plans and Specifications based on soil test results by qualified soil-testing laboratory or manufacturer.
1. Fertilizer shall be in bags showing weight, analysis, and manufacturer's name.

F. Provide seed mixture in containers showing percentage of seed mix, producer's tests for purity and germination of seed, dated within nine months of sewing, net weight, date of packaging and locations of packaging.

G. Seed shall be clean, fresh, and shall be blue tagged certified. The seed must not contain more than 0.1% by weight weed seed, no more than 1.5% inert matter, no more than 0.1% other crop seed, and no noxious weed seed or undesirable grass species.

1.7 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture.

C. Comply with Commonwealth of Pennsylvania Department of Transportation standard specifications.

D. All seed and seed labels shall be in accordance with State and Federal laws, rules and regulations including Article 9, Section 137 of the Agricultural and Markets Law.

E. Posting Requirements: Comply with PA Department of Agriculture requirements for posting relative to application of herbicides and pesticides. Coordinate scheduling and execution of posting with Government.

F. Comply with Pennsylvania DEP "Clean Fill" requirements.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

B. Delivery fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.9 SCHEDULING

A. Planting Restrictions: Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

B. Turf placement operations shall be performed in a timely fashion when the Contractor feels it is the appropriate time, because it is their responsibility to provide a healthy, weed free stand of grass.

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit. Do not perform seeding operations when wind velocity exceeds 5 mph.

1.10 LAWN MAINTENANCE

A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

1. Seeded areas: 60 days from date of Substantial Completion.

a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.

B. 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. Any depressions or irregularities in the lawn surface shall be leveled off and re-seeded.

1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch. Anchor as required to prevent displacement.

C. 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 4 inches.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water lawn at a minimum rate of 1 inch per week.
3. Keep soil moist during seed germination period.
4. The above watering schedule is a minimum and may be changed at the discretion of the Contracting Officer and Government according to climatic conditions.

D. Mow lawn as soon as top growth is 3 inches tall. Repeat mowing to maintain specified height without cutting more than 40 percent of grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

1. Mow turf grass to 3 inches high.

E. Rework and reseed of any areas that fail to show a uniform stand of grass shall be done at the Contractor's expense with the same mixture applied at the rate originally used and repeated until all areas are covered with a satisfactory stand of grass.

F. Make weekly inspections to determine the moisture content of the soil and adjust the watering schedule if necessary. Watering shall be done in such a manner and as frequently as is deemed necessary by the Contracting Officer to assure continued growth of healthy grass. All areas of the site shall be watered in such a way as to prevent erosion due to excessive quantities applied over small areas and to avoid damage to the finished surface due to the watering equipment.

G. Reseed, fertilize and mulch areas larger than 5-inches by 5-inches not having uniform stand of grass. All areas and spots, which do not show a prompt catch of grass, shall then be reseeded, and the operations repeated until complete coverage is obtained. When the area does not need to be reseeded, it shall be thoroughly wetted every time the surface shows evidence of drying out, and this shall continue through the entire period of maintenance.

H. If any portion of the seeded surface becomes gullied or otherwise damaged following seeding, the affected areas shall be regraded and reseeded as specified herein.

1.11 INSPECTION REQUIREMENTS

A. The following list of minimal compliance standards are to be inspected and brought into compliance by the Contractor during construction. Discovery and correction of non-complying work is the responsibility of the Contractor. The Contractor shall identify and correct all non-complying items prior to requesting the processing of the Certificate of Substantial Completion.

B. Complying Lawns and Grasses work shall be capable of withstanding dead and live loads under normal use.

C. Non-complying work includes but is not limited to the following:

1. Dead grass.
2. Sparse grass (can see topsoil beneath 3-inch high mown grass).
3. Erosion gullies with grass missing.
4. Top soil not rolled prior to seeding

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed.

B. Seed Species: State-certified seed of grass species, as follows:

1. Lawn Seed Mixture. (PennDOT Formula B). Seed at a rate of 4 to 5 lbs. per 1000 sf.

Species	% By Weight	% Purity	% Germination
Kentucky Bluegrass Mixture*	50	98	80
Perennial Ryegrass Mixture**	20	98	90
Creeping Red Fescue or Spreading Fescue	30	98	85

*A combination of improved certified varieties with no one variety exceeding 25% of the bluegrass component.

**A combination of improved certified varieties with no one variety exceeding 50% of the total.

2. Temporary Seeding Grass. The temporary grass seed mixture shall be seeded at a rate of 50 lbs. per acre or 1.1 lbs. per 1000 sf.

Species	% By Weight	% Purity	% Germination
Annual Ryegrass	100	98	90

2.2 PLANTING SOIL FOR TURF AND GRASSES

A. Planting Soil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.

1. Planting Soil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, weeds, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

   a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs or marshes.

2. Planting Soil Source: Import topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs or marshes.

2.3 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:

1. Class: Class T, with a minimum 99 percent passing through No. 8 sieve and a minimum 75 percent passing through No. 60 sieve.

2. Provide lime in form of dolomitic limestone.

B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 sieve and a maximum 10 percent passing through No. 40 sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Aluminum Sulfate: Commercial grade, unadulterated.

E. Perlite: Horticultural perlite, soil amendment grade.

F. Agricultural Gypsum: Finely ground, containing a minimum of 90 percent calcium sulfate.

G. Sand: Clean, washed, natural or manufactured, free of toxic materials.

H. Diatomaceous Earth: Calcined, diatomaceous earth, 90 percent silica, with approximately 140 percent water absorption capacity by weight.

2.4 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1/2-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 20 to 30 percent of dry weight.
2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

2.5 PLANTING ACCESSORIES

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

2.6 FERTILIZER

A. Bonemeal: Commercial, raw or steamed, finely ground; percent of nitrogen and percent of phosphoric acid. Per soil test results.

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

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic

sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

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

1. Commercial Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.7 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- weed and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley free of foreign matter detrimental to plant life.

B. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic; free of plant-growth or germination inhibitors; with maximum moisture content of 14 percent +/- 3%, pH range of 4.5 to 6.5, ash content 1.4 percent +/- 0.2 percent, and a 1,000 percent minimum water holding capacity.

C. Non-asphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors. Use natural gum blended with jelling and hardening agents (Terra Tack AR) as manufactured by Grass Growers Company or approved equal.

D. Cut-back asphalt shall conform to PADOT Standards.

E. Other mulch binders as approved by the local County Conservation District and PA Department of Environmental Protection (PADEP).

2.8 MULCH NETTINGS

1. Jute or excelsior blanket, paper, plastic and cotton mulch mattings of a kind and type approved by the local County Conservation District and the PADEP. Do not use metal staples in areas to be mowed.

   a. Staples shall be as recommended by the netting manufacturer and local County Conservation District and the PADEP.
   b. Other mulch nettings as approved by the Contracting Officer, local Conservation District and PADEP.

2. Use SC150 erosion control matting by North American Green or an approved equal on all sloped areas greater than 3:1.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from seeding overspray.

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.

3.3 LAWN PREPARATION

A. Limit lawn subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off of Government's property.

1. Spread topsoil to a depth of 6 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

   a. Spread approximately one-half the thickness of topsoil over loosened subgrade. Mix thoroughly into top 3 inches of subgrade. Spread remainder of topsoil.

2. Apply soil amendments and fertilizer to surface and thoroughly blend planting soil mix.

   a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
   b. Apply lime if required by soil test at the rate recommended. Mix lime with dry soil before mixing fertilizer. Wait at least one full week after lime has been spread before applying fertilizer.
   c. Add organic matter 1 inch deep (if required by soil test).
   d. Till soil with a spike drag or roto-tiller and loosen surface at least 3 inches deep and then hand-rake to a smooth, even surface.

C. Unchanged Subgrades: If lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare surface soil as follows:

1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
2. Loosen surface soil to a depth of at least of 6 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 3 inches of soil. Till soil to a homogeneous mixture of fine texture.

    a. Apply fertilizer in accordance with soil test results directly to surface soil before loosening.

3. Remove stones larger than 1 inch in any dimension and sticks, roots, trash, and other extraneous matter.
4. Legally dispose of waste material, including grass, vegetation, and turf, off of Government'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 fine grading to areas that can be planted in the immediate future.

E. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

3.4 TURF RENOVATION

A. Renovate existing turf.

B. Renovate existing turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
2. Install new planting soil as required.

C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.

D. Remove topsoil containing foreign materials such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.

E. Mow, dethatch, core aerate, and rake existing turf.

F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Government's property.

H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches (150 mm).

I. Apply soil amendments and initial fertilizers required for establishing new turf and mix thoroughly into top 4 inches (100 mm) of existing soil. Install new planting soil to fill low spots and meet finish grades.

J. Water newly planted areas and keep moist until new turf is established.

3.5 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph, in adverse weather, or on wet or frozen ground. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged.

B. Sow Lawn Seed Mixture at a rate of 5 pounds per 1000 square feet.

C. Rake seed lightly into top 1/8-inch of topsoil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes exceeding 3:1 with erosion-control blankets installed and stapled according to manufacturer's written instructions.

E. Protect seeded areas with slopes not exceeding 3:1 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1 1/2-inches in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into topsoil with suitable mechanical equipment.
2. Bond straw mulch by spraying with non-asphaltic tackifier at the rate recommended by the manufacturer. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.

3.6 SATISFACTORY LAWNS

A. Satisfactory Seeding: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of washouts, surface irregularities, weeds, and large off-color areas, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches.

B. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.7 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 barricades and warning signs as required to protect newly planted areas from foot and vehicular traffic. Maintain barricades throughout maintenance period and remove after lawn is established.

END OF SECTION 32 9200

SECTION 02923 - LANDSCAPE GRADING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Spreading topsoil.

B. Final grade topsoil for finish landscaping.

C. Agricultural testing.

1.2 RELATED SECTIONS

A. Section 01410 - Testing Laboratory Service.

B. Section 02200 - Earthwork

C. Section 02937 - Fine Grading and Sod

D. Section 02950 - Trees, Plants and Ground Cover.

E.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Topsoil: from stockpiled material, or imported from an approved source.

B. Soil Amendments: As required, to bring planting zone soil into compliance.

PART 3 - EXECUTION

3.1 SUBGRADE PREPARATION

A. Eliminate uneven areas and low spots.

B. Remove subsoil contaminated with petroleum products, roots, rocks, weeds and foreign material in excess of 2".

C. Scarify subgrade to depth of 3" where topsoil is scheduled.

3.2 TESTING

A. Provide laboratory test results that the topsoil is in compliance with specifications.

3.3 PLACING TOPSOIL

A. Place topsoil in areas where designated on the drawings to a nominal depth after settlement indicated in the Schedules (3.6). Place topsoil during dry weather.

B. Apply soil amendments to bring topsoil in compliance with specifications. Agricultural testing shall define performance standards.

C. Remove weeds, oversize rocks and foreign material while spreading.

1. Manually spread topsoil close to trees, plants, and building to prevent damage to completed and/or existing work.

2. Lightly compact and roll placed topsoil.

3. Remove surplus subsoil and topsoil from site, unless instructed not to by Owner.

4. Leave stockpile area and site clean and raked, ready to receive landscaping products.

3.4 TOLERANCES

A. Top of Topsoil: Plus or minus ½" of finished grades indicated on drawings.

B. Maximum particle size of topsoil material 1".

3.5 PROTECTION

A. Protect landscaping and other features remaining as final work.

B. Protect existing structures, sidewalks, utilities, paving and curbs.

C. Contractor's responsibility: Correction/Compensation for damage.

3.6 SCHEDULES

A. Compacted topsoil thickness at the following areas:

1. Sod: 8".

2. Shrub Beds: as shown on detail drawings.

3. Tree Beds: as shown on detail drawings.

END OF SECTION

SECTION 02930
PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Plants.

    a. Trees.
    b. Shrubs.
    c. Ground covers.
    d. Herbaceous plants.

2. Planting Soil.

B. Related Sections:

1. Division 2 Section "Site Clearing" for protection of existing trees and plantings, topsoil stripping and stockpiling, and site clearing.
2. Division 2 Section "Earth Moving" for excavation, filling, and rough grading and for subsurface aggregate drainage and drainage backfill materials.
3. Division 2 Section "Turf and Grasses" for lawn planting.
4. Division 2 Section "Subdrainage" for below-grade drainage of landscaped areas, paved areas, and wall perimeters.

1.3 REFERENCES

A. American Joint Committee on Horticultural Nomenclature (AJCHN):

1. AJCHN Standardized Plant Names.

B. United States Department of Agriculture (USDA):

1. USDA Standards for Nursery Stock.

C. American Nursery and Landscape Association (ANLA):

1. ANLA Standards for Nursery Stock.

D. American Association of Nurserymen, Inc. (AAN).

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

1. ASTM C602 – Agricultural Liming Materials.

F. Association of Official Analytical Chemists (AOAC):

1. AOAC – Official Method of Analysis.

G. FS O-F-241 – Fertilizers, Mixed, Commercial.

1.4 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum-laced as recommended by ANSI Z60.1.

C. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for kind, type, and size of exterior plant required.

D. Finish Grade: Elevation of finished surface of planting soil.

E. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

F. Planting Bed: The grouping of two or more plantings shall constitute a planting bed or area.

G. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil specified; mixed with soil amendments.

H. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots. The lower area of the tree trunk that needs to be exposed and not covered by soil or mulch after planting.

I. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

J. Subsoil: Designated soil beneath the planting soil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated; including soils.

1. Plant Materials: Include quantities, sizes, quality, and sources for each type of plant material.

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

1. Organic Mulch: Two pounds of each type of mulch required, in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Provide an accurate representation of color, texture, and organic composition of material to be furnished.
2. Weed Control Barrier: 12 by 12 inches.
3. Pea Gravel: Two pounds, in sealed plastic bags labeled. Provide an accurate representation of color, texture.

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

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

D. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of Government's contact persons.

E. Material Test Reports: For imported soil and for existing surface soil as required, in addition to requirements in Division 1 Section "Quality Control Services".

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

G. Maintenance Instructions: Recommended procedures to be established by Government for maintenance of exterior plant materials during a calendar year. Submit before expiration of required maintenance periods. Maintenance instructions shall be type-written.

1.6 QUALITY ASSURANCE

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

1. Experience: Minimum five years' experience in successful landscape installation.
2. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when exterior planting work is in progress.

B. Soil-Testing Laboratory Qualifications: An independent or university 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. Native Soil Analysis: For each unamended soil type, furnish soil analysis and a written report 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 the soil.

1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
2. The soil-testing laboratory shall oversee soil sampling; with depth, location, and number of samples to be taken per instructions from the Landscape Architect. A minimum of six (6) representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
3. Report suitability of tested soil for plant growth.

    a. Based upon the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. (92.9 sq. m) or volume per cu. yd. (0.76 cu. m) for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
    b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

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

E. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.

1. Tree and Shrub Measurements: Measure with branches and trunks or canes in their normal position. Take caliper measurements 6 inches above ground for trees up to 4-inch caliper size, and 12 inches above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip. Requirements for the measurement, branching, grading, quality, balling, and burlapping of plants in the plant list shall follow the code of standards currently recommended by the American Association of Nurserymen, Inc. in the American Standard for Nursery Stock, amended to date.
2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

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

1. Notify Contracting Officer of sources and schedule of planting materials at least seven (7) days in advance of delivery to site.
2. All plants shall equal or exceed the measurements specified in the plant list, which are minimum acceptable sizes.

G. Preinstallation Conference: Conduct conference at project site to comply with requirements in Division 1.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways, in accordance with measures presented in the approved associated Erosion & Sedimentation Control Plan.
3. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

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

D. Handle planting stock by root ball.

E. Deliver exterior plant materials after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plant materials trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
2. Do not remove container-grown stock from containers before time of planting.
3. Water root systems of exterior plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet, condition.
4. Remove any excess soil over the plant root flare.

1.8 PROJECT CONDITIONS

A. Planting Restrictions: Unless the ground is frozen, plants can be planted at most times of the year if care is taken, because the Contractor is responsible for the initial survivability of the plants. However, caution should be exercised when transplanting flowering plants after they bloom and certain plants in the fall. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit. Do not install plants during windy conditions that exceed 15 mph average wind speed.

C. Coordination with Lawns (Turf): Plant trees and shrubs after finish grades are established and before planting lawns, unless otherwise acceptable to Contracting Officer.

1. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.

1.9 WARRANTY

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

1. Warranty Period for all exterior plants: One year from date of Substantial Completion.
2. Remove dead exterior plants immediately. Replace immediately unless required to plant in the succeeding planting season. All replacements shall be the same genus, species and size as the original.
3. Replace exterior plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
4. A limit of one replacement of each exterior plant will be required, except for losses or replacements due to failure to comply with requirements.
5. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.10 MAINTENANCE

A. Trees and Shrubs: Maintain for the following maintenance period by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease.

1. Maintenance Period: One year from date of Substantial Completion.

B. Ground Cover and Herbaceous Plants: Maintain for the following maintenance period by watering, weeding, fertilizing, and other operations as required to establish healthy, viable plantings:

1. Maintenance Period: One year from date of Substantial Completion.

C. No spraying of herbicides, insecticides, fungicides, nematicides, fumigants or other chemicals shall be done without first submitting a spray program to the Government for approval. After approval, application will only be permitted by licensed applicators. Applicators should follow Notification Requirements and consult any Chemical Hypersensitivity Registries for the area.

PART 2 - PRODUCTS

2.1 TREE AND SHRUB MATERIAL

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

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

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

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

2.2 SHADE AND FLOWERING TREES

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

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

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

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

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

1. Stem Form: Clump or multistem; number of canes as indicated.
2. Provide balled and burlapped trees as indicated.

2.3 DECIDUOUS SHRUBS

A. Form and Size: Deciduous shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of shrub.

1. Provide balled and burlapped or container-grown shrubs as indicated.

2.4 CONIFEROUS EVERGREENS

A. Form and Size: Normal-quality, well-balanced, coniferous evergreens, of type, height, spread, and shape required, complying with ANSI Z60.1.

B. Form and Size: Specimen-quality where noted, exceptionally heavy, tightly knit, symmetrically shaped coniferous evergreens, complying with ANSI Z60.1.

1. Provide balled and burlapped or container-grown trees as indicated.

2.5 BROADLEAF EVERGREENS

A. Form and Size: Normal-quality, well-balanced, broadleaf evergreens, of type, height, spread, and shape required, complying with ANSI Z60.1.

1. Provide balled and burlapped or container-grown shrubs as indicated.

2.6 GROUND COVER PLANTS

A. Ground Cover: Provide ground cover of species indicated, established and well rooted in pots of similar containers, and complying with ANSI Z60.1 and the following requirements:

1. Provide 2 1/4-inch pot size minimum, with a minimum of three to six runners not less than 6 to 8 inches long.

2.7 HERBACEOUS PLANTS

A. Perennials and Grasses: Provide healthy, field-grown plants from a commercial nursery, of species and variety shown or listed.

1. Provide container-grown or deep root plug plants as indicated. Deep root plugs shall be 2 inches in diameter minimum, and 4.5 inches in depth, minimum.

2.8 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:

1. Class: Class T, with a minimum 99 percent passing through No. 8 sieve and a minimum 75 percent passing through No. 60 sieve.
2. Provide lime in form of dolomitic limestone.

B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 sieve and a maximum 10 percent passing through No. 40 sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Aluminum Sulfate: Commercial grade, unadulterated.

E. Perlite: Horticultural perlite, soil amendment grade.

F. Agricultural Gypsum: Finely ground, containing a minimum of 90 percent calcium sulfate.

G. Sand: Clean, washed, natural or manufactured, free of toxic materials.

H. Diatomaceous Earth: Calcined, diatomaceous earth, 90 percent silica, with approximately 140 percent water absorption capacity by weight.

I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.9 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.
2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

B. Sphagnum Peat: Sphagnum peat moss, partially decomposed, finely divided or granular texture, with a pH range of 3.4 to 4.8.

C. Muck Peat: Finely divided or granular texture, with a pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having a water-absorbing capacity of 1100 to 2000 percent.

D. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.10 FERTILIZERS

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 10 percent of phosphoric acid.

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

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

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

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

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight and 16-8-16 analysis controlled release for trees, shrubs and ground covers.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.11 PLANTING SOIL

A. Planting Soil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.

1. Planting Soil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, weeds, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs or marshes.

2. Planting Soil Source: Import topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs or marshes.

2.12 MULCHES

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

1. Type: Double-shredded hardwood.
2. Color: Dark brown.

2.13 WEED-CONTROL BARRIERS

A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally-encountered chemicals, alkalis, and acids.

2.14 TREE STABILIZATION MATERIALS

A. Stakes and Guys:
1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, or pressure-preservative-treated softwood, free of knots, holes, cross grain, and other defects, 2 by 2 inches by length indicated, pointed at one end.
2. Guy and Tie Wire: ASTM A 641/A 641M, Class 1, galvanized-steel wire, 2-strand, twisted, 0.106 inch in diameter.
3. Guy Cable: 5-strand, 3/16-inch- diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3-inches long, with two 3/8-inch galvanized eyebolts.
4. Hose Chafing Guard: Reinforced rubber or plastic hose at least 1/2-inch in diameter, black, cut to lengths required to protect tree trunks from damage.
5. Flags: Standard surveyor's plastic flagging tape, white, 6-inches long.

2.15 MISCELLANEOUS PRODUCTS

A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

B. Wood Pressure-Preservative Treatment: AWPA C2, with waterborne preservative for soil and freshwater use, acceptable to authorities having jurisdiction, and containing no arsenic; including ammoniacal copper arsenate, ammoniacal copper zinc arsenate, and chromated copper arsenate.

C. Burlap: Non-synthetic, biodegradable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive exterior plants for compliance with requirements and conditions affecting installation and performance. Examine previous work, related work, and conditions under which work is to be performed. Proceed with installation only after unsatisfactory conditions have been corrected. Performing work under this Section means that the Contractor accepts conditions present to be acceptable.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Remove stones over 1 inch and organic debris over 2 inches.

3.2 COORDINATION

A. Coordinate with all other work including pacing operations and utility installation to be completed in areas surrounding and within the areas to be planted.

B. Coordinate activities with other work so that there is no soil disturbance from traffic or other construction activities, subsequent to planting operations.

3.3 PREPARATION

A. All unwanted vegetation shall be completely removed from site.

B. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.

C. Suspend soil mixing, spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches less than 10 percent by volume.

D. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

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

F. 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.

G. Lay out individual tree and shrub locations and areas for multiple exterior plantings. Stake locations, outline areas, adjust locations when requested, and obtain Contracting Officer's acceptance of layout before planting. Make minor adjustments as required.

H. Lay out exterior plants at locations directed by Contracting Officer. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

I. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

3.4 EXCAVATION AND SCARIFICATION

A. The grouping of two or more plantings shall constitute a planting bed or area. All unwanted vegetation shall be completely removed from site.

B. Excavation of planting beds shall be accomplished to a minimum depth of 36 inches.

C. Do not work soil when moisture content is 10 percent or above.

D. Scarification of planting beds shall be accomplished with the use of a roto-tiller, agricultural disks, chisel plow, or hand tools following final rough grade, to a depth of 4 to 6 inches prior to placement of planting soil profile.

E. The subgrade shall have a permeability of not less than 0.5 inches per hour. Determine permeability of the subgrade using a single ring infiltrometer method after it has been scarified. If infiltration of the subgrade is below 0.5 inches per hour, scarify perpendicular to previous scarification to a depth of 6 to 8 inches and retest for infiltration.

3.5 SOIL MIXING

A. When mixing of soils with amendments is required to produce products specified, mixing shall be accomplished in a ball mill or tub mill fitted with proper screening and paddles. Windrowing is not an acceptable means of soil mixing.

B. Mixing operations shall produce a homogeneous soil mixture.

C. Mixing of the compost for the planting soil layer shall be accomplished in the same manner as the other mixing procedures. Compost shall be moist, but not so wet that water can be squeezed out by hand, or so dry as to be easily blown by wind.

3.6 TREE AND SHRUB EXCAVATION

A. Do not work soil when moisture content is 10 percent or above.

B. Pits and Trenches: Excavate circular pits with sides sloping inward at a 45 degree angle. Trim base leaving center area raised slightly to support root ball and assist in drainage. Do not further disturb base. Scarify sides of plant pit 2 inches after excavation.

1. Excavate approximately two times the diameter of root ball diameter for balled and burlapped or container grown stock.
2. All construction debris such as plaster, concrete, stone, brick, and wood shall be removed.
3. If drainage is shown or required under planted areas, excavate only to top of porous backfill over pipe

C. Obstructions: Notify Contracting Officer if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch diameter holes into free-draining strata or to a depth of 10-feet, whichever is less, and backfill with free-draining material.

D. Drainage: Notify Contracting Officer if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.

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

3.7 TREE AND SHRUB PLANTING

A. Set balled and burlapped stock plumb and in center of pit or trench with top of root ball flush with adjacent finish grades.

1. Remove burlap, wire baskets, or other bindings from tops of root balls and partially from sides, but do not remove from under root balls. All rot-proof, rot resistant, plastic burlap shall be removed before planting. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
2. Place soil mix as detailed around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix. Fill remainder of hole with loose planting soil without further packing. Provide a soil berm around the edge of each plant pit to form a shallow saucer.

B. Set balled and potted or container grown stock plumb and in center of pit or trench with top of root ball flush with adjacent finish grades.

1. Carefully remove root ball from container without damaging root ball or plant.

2. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix. Fill remainder of hole with loose planting soil without further packing. Provide a soil berm around the edge of each plant pit to form a shallow saucer.

C. Organic Mulching: Where specified, apply 3-inch average thickness of organic mulch extending 12 inches beyond edge of planting pit or trench. Do not place mulch within 6 inches of trunks or stems.

3.8 TREE AND SHRUB PRUNING

A. Prune, thin, and shape trees and shrubs as directed by Contracting Officer.

B. Prune, thin, and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise indicated by Contracting Officer, do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character. Shrub sizes indicated are sizes after pruning.

3.9 GUYING AND STAKING

A. Upright Staking and Tying: Stake trees of 2- through 5-inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip-out. Use a minimum of 2 stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend at least 72 inches above grade. Set vertical stakes and space to avoid penetrating root balls or root masses. Support trees with two strands of tie wire encased in hose sections at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree. Use the number of stakes as follows:

1. Use 2 stakes for trees up to 12 feet high and 2 1/2-inches or less in caliper; three stakes for trees less than 14 feet high and up to 4 inches in caliper. Space stakes equally around trees.

B. Guying and Staking: Guy and stake trees exceeding 14-feet in height and more than 3-inches in caliper, unless otherwise indicated. Securely attach no fewer than three guys to stakes 30-inches long, driven to grade.

1. For trees more than 6 inches in caliper, anchor guys to pressure-preservative-treated deadmen 8 inches in diameter and 48 inches long buried at least 36 inches below grade. Provide turnbuckles for each guy wire and tighten securely.
2. Attach flags to each guy wire, 30 inches above finish grade.
3. Paint turnbuckles with luminescent white paint.

3.10 GROUND COVER AND HERBACEOUS PLANT PLANTING

A. Set out and space ground cover and herbaceous plants as indicated on drawings.

B. Dig holes large enough to allow spreading of roots, and backfill with planting soil.

C. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

D. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

E. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.11 PLANTING BED MULCHING

A. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched; overlapping edges a minimum of 6 inches.

1. Material and Seam Treatment: Nonwoven fabric with seams pinned.

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

1. Organic Mulch: Apply 3-inch average thickness of organic mulch, and finish level with adjacent finish grades. Do not place mulch against plant stems.

3.12 CLEANUP AND PROTECTION

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

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

3.13 DISPOSAL

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off of Government's property.

3.14 FINAL COMPLETION

A. At the end of the maintenance period and prior to final inspection, the Contractor shall remove remaining tags from plant materials, shall remove plant saucers from around

plants on level terrain, shall cut smooth edge between planting areas and lawn areas and shall restore and top-dress all mulched areas.

B. At the end of the warranty period, inspection will be made by the Government and the Contractor. Any plant required under this contract that is dead or not in satisfactory growth, as determined by the Government, shall be removed from the site and replaced at the Contractor's expense. These plants shall be replaced as soon as conditions permit during a normal planting season.

END OF SECTION 32 9300