

**INDEX TO SPECIFICATIONS
FOR
NKU SCIENCE BUILDING PLAZA PAVER REPLACEMENT**

VOLUME 1 OF 1

DIVISION 00 – PROPOSAL & CONDITIONS

007300 Supplementary Conditions

DIVISION 01 – GENERAL REQUIREMENTS

011000 Summary
013800 General Requirements
015713 Temporary Erosion and Sediment Control

DIVISION 31 – EARTHWORK

311000 Site Clearing
311500 Protection of Existing Trees
312200 Grading
312316 Excavation
312319 Dewatering
312323 Fill
312323.13 Flowable Fill

DIVISION 32 – EXTERIOR IMPROVEMENTS

321123 Aggregate Base Courses
321313 Concrete Paving
321373 Pavement Joint Sealants
321416 Precast Concrete Unit Paving
329223 Sodding

END OF INDEX TO SPECIFICATIONS

SECTION 007300 - SUPPLEMENTARY CONDITIONS

PART 1 GENERAL

1.01 SUMMARY

- A. These Supplementary Conditions supplement the General Conditions, Special Conditions and other provisions of the Contract Documents as indicated below. Provisions that are not so amended or supplemented remain in full force and effect.
- B. The terms used in these Supplementary Conditions that are defined in the General Conditions have the meanings assigned to them in the General Conditions.

1.02 DEFINITIONS

- A. The term "ARCHITECT" as used throughout these documents means RossTarrant Architects, Inc., 101 Old Lafayette Avenue, Lexington, Kentucky 40502.
- B. The terms "PLANS" and "DRAWINGS" are used interchangeably and are construed to have the same meaning.

1.03 GENERAL

- A. Bidders, before submitting proposals, may visit and examine the site to satisfy themselves as to the nature and scope of the new construction and any difficulties attending the execution.
- B. By signing any Change Order/Application and Certificate of Payment, the Contractor indicates his agreement therewith, including any adjustment in the Contract Sum or Contract Time and waives any and all claims for additional compensation or Contract time against either the Owner or the Architect for work associated with the Change Order/Application and Certificate of Payment. The Contractor expressly agrees that the Architect shall be deemed a Third Party Beneficiary of this provision."

1.04 CODES AND ORDINANCES

- A. All branches of the work shown on the plans or specified, whether specifically mentioned or not, shall be executed in strict compliance with all local or state regulations and codes, and shall be in compliance with all National Codes when same have jurisdiction.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF DOCUMENT

SECTION 011000 - SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: NKU Science Building Plaza Paver Replacement.
- B. Owner's Name: Northern Kentucky University.

1.02 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.

1.03 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings. Do not disturb portions of the site beyond the areas in which the Work is indicated.
 - 1. Locate and conduct construction activities in ways that will limit disturbance to site.
- B. Provide access to and from site as required by law.
 - 1. Do not obstruct roadways, sidewalks, or other public ways without permit.
- C. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to these areas. If additional storage is necessary, obtain and pay for such storage off site.
- D. Pressure wash driveways where mud and debris from construction is generated on a regular basis.
- E. Workers shall abide by a code of conduct to include wearing shirts at all times. Alcohol, smoking, drugs, firearms, foul language, and fraternizing with students or staff is strictly prohibited.

END OF SECTION

SECTION 013800 - GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Price and Payment Procedures.
- B. Unit Prices.
- C. Administrative Requirements.
- D. Construction Progress Reports.
- E. Quality Requirements.
- F. Product Requirements.
- G. Execution and Closeout Requirements.

1.02 RELATED REQUIREMENTS

- A. General Conditions, Special Conditions and Document 007300 – Supplementary Conditions.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Schedule of Values:
 - 1. Form to be used: Use forms outlined in Special Conditions.
 - 2. Forms filled out by hand will not be accepted.
 - 3. Revise schedule to list approved Change Orders, with each Application For Payment.
- B. Applications for Progress Payments:
 - 1. Payment Period: Submit at intervals of once per month.
 - 2. Forms filled out by hand will not be accepted.
 - 3. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
 - 4. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.

1.04 UNIT PRICES

- A. Costs Included:
 - 1. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.
- B. Measurement of Quantities:
 - 1. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.
 - 2. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect.
 - 3. Measurement Devices:
 - a. Weigh Scales: Inspected, tested and certified by the applicable state Weights and Measures department within the past year.
 - b. Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle.
 - c. Metering Devices: Inspected, tested and certified by the applicable State department within the past year.

4. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.
5. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.
6. Measurement by Area: Measured by square dimension using mean length and width or radius.
7. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.
8. Stipulated Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.
9. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Architect prior to starting work.
10. Contractor's Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes, calculate and certify quantities for payment purposes.
11. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at the Owner's expense, by an independent surveyor acceptable to Contractor.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Project Coordination:
 1. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend upon each other for proper installation, connection and operation.

1.06 CONSTRUCTION PROGRESS REPORTS

- A. Daily Construction Reports:
 1. Prepare a daily construction report recording the following information concerning events at Project site:
 2. Submit 1 copy at weekly intervals to project team members.
- B. Field Condition Reports:
 1. Immediately on discovery of a difference between field conditions and the contract documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the contract documents.
- C. Special Reports:
 1. Submit special reports directly to Architect within one day of occurrence. Distribute copies of report to parties affected by the occurrence.
 2. When an event of an unusual and significant nature occurs at project site, whether or not related directly to the work, prepare and submit a special report. List chain of events, persons participating, response by contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Architect in advance when these events are known or predictable.

1.07 QUALITY REQUIREMENTS

- A. Testing and Inspection:
 1. See individual specification sections for testing required.
 2. Testing Agency Duties:
 - a. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - b. Perform specified sampling and testing of products in accordance with specified standards.

- c. Ascertain compliance of materials and mixes with requirements of Contract Documents.
- d. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
- e. Perform additional tests and inspections required by Architect.
- f. Attend preconstruction meetings and progress meetings.
- g. Submit reports of all tests/inspections specified.
- 3. Limits on Testing/Inspection Agency Authority:
 - a. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - b. Agency may not approve or accept any portion of the Work.
 - c. Agency may not assume any duties of Contractor.
 - d. has no authority to stop the Work.
- 4. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.

1.08 PRODUCT REQUIREMENTS

- A. New Products:
 - 1. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Product Options:
 - 1. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
 - 2. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
 - 3. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.
 - 4. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.
 - a. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - b. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - c. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - d. Where products are accompanied by the term "as selected," Architect will make selection.
 - e. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 - f. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 - 5. Product Selection Procedures: Procedures for product selection include the following:
 - a. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
 - b. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
 - c. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.

- d. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 - e. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed.
 - f. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specific product or system indicated.
 - g. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches satisfactorily.
 - h. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
 - 1) Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
 - 2) Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.
- C. Maintenance Materials:
- 1. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
 - 2. Deliver to Project site; obtain receipt prior to final payment.
- D. Substitution Procedures:
- 1. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
 - 2. Timing: Architect will consider requests for substitution if received within 60 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Architect.
 - 3. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Substitution request is fully documented and properly submitted.
 - e. Requested substitution will not adversely affect Contractor's Construction Schedule.
 - f. Substitution request includes a release from the supplier/manufacturer listed in the contract documents and the Contractor's Form of Proposal.
- E. Substitution Submittal Procedure:

1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
 2. Substitution Request Form: Use CSI Form 13.1.A.
 3. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
 4. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
 5. The Architect will notify Contractor in writing of decision to accept or reject request.
 6. The Contractor's submittal and Architect's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.
- F. Transportation and Handling:
1. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
 2. Transport and handle products in accordance with manufacturer's instructions.
- G. Storage and Protection:
1. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
 2. Store and protect products in accordance with manufacturers' instructions.

1.09 EXECUTION AND CLOSEOUT REQUIREMENTS

- A. Qualifications:
 - 1. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located.
- B. Project Conditions:
 - 1. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
 - 2. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
 - 3. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
 - 4. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
 - 5. Erosion and Sediment Control: Comply with all project requirements.
 - 6. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 - 7. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
 - 8. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.
- C. Examination:
 - 1. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
 - 2. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
 - 3. Examine and verify specific conditions described in individual specification sections.
 - 4. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
 - 5. Verify that utility services are available, of the correct characteristics, and in the correct locations.
 - 6. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.
- D. General Installation Requirements:
 - 1. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
 - 2. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
 - 3. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
 - 4. Make neat transitions between different surfaces, maintaining texture and appearance.
- E. Progress Cleaning:
 - 1. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- F. Protection of Installed Work:
 - 1. Protect installed work from damage by construction operations.
- G. Final Cleaning:
 - 1. Execute final cleaning prior to final project assessment.

- a. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.

END OF SECTION

SECTION 015713 - TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.
- D. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.02 RELATED REQUIREMENTS

- A. Section 311000 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.
- B. Section 312200 - Grading: Temporary and permanent grade changes for erosion control.
- C. Section 321123 - Aggregate Base Courses: Temporary and permanent roadways.
- D. Section 329223 - Sodding: Permanent turf for erosion control.

1.03 REFERENCE STANDARDS

- A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus; 2014.
- B. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a (Reapproved 2014).
- C. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2011.
- D. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2015a.
- E. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2012.
- F. ASTM D4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2002 (Reapproved 2009).
- G. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.
- H. FHWA FLP-94-005 - Best Management Practices for Erosion and Sediment Control; 1995.
- I. USDA TR-55 - Urban Hydrology for Small Watersheds; USDA Natural Resources Conservation Service; 2009.

1.04 PERFORMANCE REQUIREMENTS

- A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, for Phases I and II, and in compliance with requirements of Construction General Permit (CGP), whether the project is required by law to comply or not.
- B. Also comply with all more stringent requirements of State of Kentucky Erosion and Sedimentation Control Manual.
- C. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.

- D. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
 - 1. Obtain and pay for permits and provide security required by authority having jurisdiction.
 - 2. Owner will withhold payment to Contractor equivalent to all fines resulting from non-compliance with applicable regulations.
- E. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- F. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
 - 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
 - 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.
- G. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
 - 1. Control movement of sediment and soil from temporary stockpiles of soil.
 - 2. Prevent development of ruts due to equipment and vehicular traffic.
 - 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- H. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
 - 1. Prevent windblown soil from leaving the project site.
 - 2. Prevent tracking of mud onto public roads outside site.
 - 3. Prevent mud and sediment from flowing onto sidewalks and pavements.
 - 4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- I. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
 - 2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
- J. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
- K. Open Water: Prevent standing water that could become stagnant.
- L. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.05 SUBMITTALS

- A. See Division 1 for submittal procedures.
- B. Erosion and Sedimentation Control Plan:

1. Submit within 2 weeks after Notice to Proceed.
 2. Include:
 - a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
 - b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
 - c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
 - d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
 - e. Other information required by law.
 - f. Format required by law is acceptable, provided any additional information specified is also included.
 3. Obtain the approval of the Plan by authorities having jurisdiction.
 4. Obtain the approval of the Plan by Owner.
- C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
- D. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.
- E. Maintenance Instructions: Provide instructions covering inspection and maintenance for temporary measures used during construction and temporary measures that must remain after Substantial Completion.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Mulch: Use one of the following:
1. Straw. Do not use hay.
 2. Wood waste, chips, or bark.
 3. Erosion control matting or netting.
- B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.
- C. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
 2. Permittivity: 0.05 sec^{-1} , minimum, when tested in accordance with ASTM D4491.
 3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
 4. Tensile Strength: 100 pounds-force, minimum, in cross-machine direction; 124 pounds-force, minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
 5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632/D4632M.
 6. Tear Strength: 55 pounds-force, minimum, when tested in accordance with ASTM D4533.
 7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.
 8. Manufacturers: subject to compliance with requirements, manufacturers offering the following products that may be incorporated into the work include:
 - a. TenCate: www.tencate.com/#sle.

- b. North American Green: www.nagreen.com/#sle.
 - c. Propex Geosynthetics: www.geotextile.com/#sle.
- D. Silt Fence Posts: One of the following, minimum 5 feet long:
 - 1. Steel U- or T-section, with minimum mass of 1.33 pound per linear foot.
 - 2. Hardwood, 2 by 2 inches in cross section.
- E. Gravel: See Section 321123 for aggregate.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.
- B. Construction Entrances: Traffic-bearing aggregate surface.
 - 1. Width: As required; 20 feet, minimum.
 - 2. Length: 50 feet, minimum.
 - 3. Provide at each construction entrance from public right-of-way.
 - 4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.
- C. Linear Sediment Barriers: Made of silt fences.
 - 1. Provide linear sediment barriers:
 - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
 - b. Along the top of the slope or top bank of drainage channels and swales that traverse disturbed areas.
 - c. Along the toe of cut slopes and fill slopes.
 - d. Perpendicular to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas; space at maximum of 200 feet apart.
 - e. Across the entrances to culverts that receive runoff from disturbed areas.
 - 2. Space sediment barriers with the following maximum slope length upslope from barrier:
 - a. Slope of Less Than 2 Percent: 100 feet..
 - b. Slope Between 2 and 5 Percent: 75 feet.
 - c. Slope Between 5 and 10 Percent: 50 feet.
 - d. Slope Between 10 and 20 Percent: 25 feet.
 - e. Slope Over 20 Percent: 15 feet.
- D. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.
- E. Crushed Stone Silt Checks: Stone check dams located along drainage swales and above headwalls. Silt checks are to be installed as required to reduce the sediment load of the runoff to local, State and Federal requirements. Construction is to be in accordance with the contract documents and KTC requirements.
- F. Soil Stockpiles: Protect using one of the following measures:
 - 1. Cover with polyethylene film, secured by placing soil on outer edges.

2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw; do not use hay.
- G. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
 1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.
- H. Temporary Seeding: Use where temporary vegetated cover is required.

3.04 INSTALLATION

- A. Traffic-Bearing Aggregate Surface:
 1. Excavate minimum of 6 inches.
 2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
 3. Place and compact at least 6 inches of 1 1/2 to 3 1/2 inch diameter stone.
- B. Silt Fences:
 1. Store and handle fabric in accordance with ASTM D4873.
 2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
 3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
 4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
 5. Install with top of fabric at nominal height and embedment as specified.
 6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
 7. Fasten fabric to wood posts using one of the following:
 - a. Four nails per post with 3/4 inch diameter flat or button head, 1 inch long, and 14 gage, 0.083 inch shank diameter.
 - b. Five staples per post with at least 17 gage, 0.0453 inch wire, 3/4 inch crown width and 1/2 inch long legs.
 8. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
 9. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.
- C. Mulching Over Large Areas:
 1. Dry Straw: Apply 2-1/2 tons per acre; anchor using dull disc harrow or emulsified asphalt applied using same spraying machine at 100 gallons of water per ton of mulch.
 2. Wood Waste: Apply 6 to 9 tons per acre.
 3. Erosion Control Matting: Comply with manufacturer's instructions.
- D. Mulching Over Small and Medium Areas:
 1. Dry Straw: Apply 4 to 6 inches depth.
 2. Wood Waste: Apply 2 to 3 inches depth.
 3. Erosion Control Matting: Comply with manufacturer's instructions.
- E. Temporary Seeding:
 1. When hydraulic seeder is used, seedbed preparation is not required.
 2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
 3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.

4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
5. Incorporate fertilizer into soil before seeding.
6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
8. Repeat irrigation as required until grass is established.

3.05 MAINTENANCE

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Silt Fences:
 1. Promptly replace fabric that deteriorates unless need for fence has passed.
 2. Remove silt deposits that exceed one-third of the height of the fence.
 3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- D. Stone Silt Checks: Remove accumulated sediment when it reaches 1/3 of the height of the check.
- E. Clean out temporary sediment control structures weekly and relocate soil on site.
- F. Place sediment in appropriate locations on site; do not remove from site.

3.06 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION

SECTION 311000 - SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Protection of vegetation.
- B. Removal of existing debris.
- C. Removal of existing site improvements including pavements, or other site improvements.

1.02 RELATED REQUIREMENTS

- A. Section 011000 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- C. Section 015713 - Temporary Erosion and Sediment Control.
- D. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.
- E. Section 312323 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.
- F. Section 311500- Protection of Existing Trees

PART 2 PRODUCTS

2.01 MATERIALS

- A. Fill Material: As specified in Section 312323 - Fill and Backfill

PART 3 EXECUTION

3.01 SITE CLEARING

- A. Comply with other requirements specified in Section 017000.
- B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 EXISTING UTILITIES AND BUILT ELEMENTS

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Protect existing structures and other elements that are not to be removed.
- E. Pavements and slabs are to be saw cut to provide a clean edge. Concrete pavements are to be cut at the nearest control joint to the required demolition area.

3.03 VEGETATION

- A. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
 - 1. At vegetation removal limits.
 - 2. Around trees to remain within vegetation removal limits; locate no closer to tree than at the drip line.
 - 3. Around other vegetation to remain within vegetation removal limits.

- B. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.04 DEBRIS

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 311500 - PROTECTION OF EXISTING TREES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Protection of existing and newly planted trees is to be performed on the project site and at any areas adjacent to or near the site where construction activities impact the Tree Protection Zone (TPZ). Tree protection will function as follows:
 - 1. The foliage canopy and branching structure are to be kept clear from contact with equipment, vehicles, materials and activities
 - 2. The roots and soil conditions are to be preserved in an intact and non-compacted state
 - 3. No Soil disturbance is permitted within the identified Tree Protection Zone (TPZ) unless otherwise approved.
- B. Work included: Furnish all labor, materials, equipment and services necessary to protect existing trees on site and on adjacent road right-of-way and sites, including but not limited to:
 - 1. Survey and layout, installation, maintenance, adjustment during construction, and final removal of protective barriers and signs.
 - 2. Pruning as required, including hand excavation and root pruning if required and approved by the landscape architect and/or arborist.
 - 3. Excavation, soil stabilizing

1.02 RELATED REQUIREMENTS

- A. Section 011000 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.
- B. Section 013000 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.
- C. Section 024100 - Demolition: Selective demolition, site demolition, structure removal.

1.03 DEFINITIONS AND PROCEDURES

- A. Tree Protection Zone (TPZ) (May be interchanged with Critical Root Zone (CPZ) and Drip-Line below): An area around the base of a tree with a radius of 10 times the diameter of the tree's trunk or twenty feet, whichever is greater.
- B. Tree Protection Barrier: any fencing or other barrier material, including supports and bracing for such, to be used to surround and enclose the TPZ.
- C. Critical Root Zone Area (CRZ): The area of undisturbed natural soil around a tree defined by a horizontal circle drawn at grade with the trunk at the center and extending for a radial distance equal to the distance from the center of the trunk to the outermost portion of the drip line.
- D. Drip Line: the area surrounding a tree directly below the outermost portions of the tree canopy, or a circular area with a radius of one-half of the height of the tree extending outward from the center point of the tree.
- E. Warning Sign: A warning sign is to be prominently displayed on each fence at 25- foot intervals.
- F. Root Protection: Materials or devices installed at ground level to protect the root system of trees from compaction during construction.
- G. Root Boring for utility installation: Directional micro-tunneling and boring may be permitted within the limits of the TPZ subject to approval by the Landscape Architect.
- H. Tree Topping: Practice of removing a substantial portion or all of the upper canopy of a tree. Tree Topping will not be allowed in this project.
- I. Root Boring: Boring beneath protected trees to provide a tunnel for the installation of utilities.

PART 2 PRODUCTS

2.01 TREE PROTECTION PRODUCTS

- A. Fencing: 4'-0" high orange plastic 'snow' or barrier fence. Provide steel posts spaced at 6 ft. minimum.
- B. Tree Protection Area Signs: minimum size 12" x 18", may be lettered vertically or horizontally.
 - 1. Size: minimum 12" x 18", vertical or horizontal placement.
 - 2. Text: CAUTION - TREE PROTECTION ZONE - DO NOT REMOVE. NO DUMPING, BURNING, STORAGE, CUTTING, MACHINERY OR VEHICLES.
 - 3. Material to be painted plywood or other weather resistant material.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Prior to the beginning of demolition or construction work, field verify the TPZ for each existing tree to be preserved. Perform any root exploratory excavation necessary to determine root location and condition and/or other existing conditions.
- B. Instruct all construction workers to observe the TPZ limits.

3.02 INSTALLATION

- A. No construction activity including grade changes, surface treatments or excavations of any kind is permitted within the TPZ of any existing tree to remain unless otherwise indicated on the project plan drawings. The area within the TPZ must remain undisturbed at all times.
- B. No root cutting is permitted unless done with the approval of the landscape architect and requiring the services of a qualified arborist or approved tree professional. An exploratory excavation by hand or using a low water pressure hydro vac method must be completed prior to commencing with open face cuts outside the TPZ.
- C. Do not store materials or fill within the TPZ.
- D. Do not allow movement, parking or storage of vehicles or equipment within the TPZ.
- E. Do not discharge exhaust into foliage or allow fires under and adjacent to trees.
- F. Do not allow run off of spillage of damaging materials into the TPZ, including but not limited to concrete overflow or sleuth, gas, oil, paint, etc.
- G. Protection Barrier Fencing Layout:
 - 1. Typical Layout: Fencing is to enclose the entire area under the canopy drip line or TPZ (whichever is greater) of each tree or group of trees to be protected throughout the demolition and construction period.
 - 2. Special Layout:
 - a. For trees located within a planting strip or island, and where existing vehicular and/or pedestrian pathways must be kept open for use, only the planting strip or island and landscaped side of the TPZ is to be enclosed with the required fencing type.
 - b. For trees located in a tree well or sidewalk planter pit, the tree is to be wrapped with 2 inches of orange plastic fencing from the ground to the height of the first branch and overlaid with 2 inch thick wooden slats bound securely. Protect the tree bark from direct contact with the slats. Use caution during installation to avoid damage to branches and tree stem.
- H. Install Tree Protection Barrier Fencing

1. Chain Link: Fencing to be mounted on two-inch diameter galvanized steel posts, driven into the ground to a depth of at least 30 inches at no more than 10 foot spacing. Stanchions, concrete or blocks may be substituted for embedded posts at existing paved areas to be maintained open during the demolition/construction period.
 2. Orange safety fence: Embed posts a minimum 18 inches at no more than 5 (five) foot spacing. Fencing is to be tied closed completely surrounding the TPZ.
- I. Install Tree Protection Area and Enclosure Signage.
 - J. Water retained trees thoroughly and deeply as necessary to supplement rainfall to maintain plant turbidity without prolonged saturation of the root zone. The method, amount and frequency of watering is to be per the recommendation of the arborist. Monitor soil moisture on a continual basis.
 - K. Retained trees may require fertilizing and other measures to stimulate regeneration of lost roots and foliage. Fertilization and other measures are to be per the recommendation of the arborist.
 - L. Tree Topping: No Tree Topping will be allowed.
 - M. Tree Pruning: Branches which are found to be a barrier to construction or a health and safety hazard may be removed subject to the approval of the landscape architect/arborist.
 1. When removing a branch, cut outside the branch bark ridge and collar. Do not make a flush cut adjacent to the trunk of the tree or branch being pruned.
 2. Make a partial cut from beneath at a point several inches away from the trunk.
 3. Make a second cut from above several inches out from the first cut to allow the limb to fall safely.
 4. Complete the removal with a final cut just outside the branch collar (the raised area that surrounds the branch where it joins the trunk).
 5. Make all cuts clean and remove any jagged edges carefully.

3.03 INTERFACE WITH OTHER WORK:

- A. Coordinate tree protection with all demolition, excavation and utility work in the area..

3.04 FIELD QUALITY CONTROL

- A. See Division 1 for Quality Requirements.
- B. Inspect for existing soil conditions which may be detrimental to tree health and survival; existing utilities within or adjacent to the TPZ; and extent of root system beyond the visible drip line.
- C. Any trees which are found to be in poor or damaged condition are to be evaluated by the landscape architect or arborist. Trees that are deemed to have a minimal chance of survival or which pose a health or safety risk may be removed or pruned by more than one-third subject to approval of the landscape architect/arborist and Owner.

3.05 MAINTENANCE

- A. See Division 1 for additional requirements relating to maintenance service.
- B. Trees are to be watered, aerated and maintained as necessary to ensure survival.
- C. Repair or replace any fencing, ground protection or signage that has been removed or damaged. Inspect installations on a continuous basis.
- D. Tree protection devices are to be removed at the end of the project (after final completion) and the area beneath the TPZ returned to original condition.

END OF SECTION

SECTION 312200 - GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Rough grading the site for site structures.
- B. Finish grading.

1.02 RELATED REQUIREMENTS

- A. Section 015713 - Temporary Erosion and Sediment Control.
- B. Section 312316 - Excavation.
- C. Section 312323 - Fill: Filling and compaction.

1.03 SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Kentucky, Highway Department standards.

1.05 PROJECT CONDITIONS

- A. It is recommended that earthwork be done during the warm and dry months. If earthwork is to be done during cold or wet months, the use of DGA in lieu of general soil fill should be considered for structural and pavement areas. Time extensions will not be considered for any delays due to the Contractor choosing to not use DGA in lieu of general soil fill during cold or wet months.
- B. A Geotechnical Investigation was not performed for the project site. As such, it is highly recommended that the contractor excavate test pits prior to preparation of their bids in order to further clarify the extent of materials which may be encountered.
- C. The soils found on this site are very sensitive to changes in the moisture content and will quickly degrade in such conditions and when subjected to construction traffic. The Contractor should carefully evaluate equipment to be used on the site so as to minimize degradation of the soils. In addition, the Contractor is to include in their bid the stabilization or repair of soils that will be affected by construction activities.
- D. The new vehicular pavement and stone base areas are not designed for construction traffic and should not be used for construction activities unless they are stabilized using #2 crushed stone and geogrid. Stabilization should include any undercutting and material handling, borrow or disposal necessary to maintain the design subgrade elevations after stabilization has been done. Any areas of subgrade, road base or pavement damage are to be repaired.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.
- B. Verify the absence of standing or ponding water.

3.02 PREPARATION

- A. All site grading is unclassified.

- B. Identify required lines, levels, contours, and datum.
- C. Stake and flag locations of known utilities.
- D. Locate, identify, and protect from damage above- and below-grade utilities to remain.
- E. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading. Refer to Specification Section 312319 for additional Dewatering requirements.
- F. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.
- G. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.
- H. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.

3.03 ROUGH GRADING

- A. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
- B. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.
- C. See Section 312323 for filling procedures.
- D. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.
- E. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

3.04 SOIL REMOVAL and STOCKPILING

- A. Stockpile subsoil that is to be re-used on site; remove remainder from site. Cover stockpile to prevent erosion and saturation of the material. Contractor to repair any area used for construction activities back to its original condition. Contractor to coordinate location of stockpile with Owner.
- B. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

3.05 FINISH GRADING

- A. Before Finish Grading:
 - 1. Verify subgrade has been contoured and compacted.
- B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products and legally dispose of it off-site.
- C. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.
- D. Remove roots, weeds, rocks, and foreign material while spreading.

3.06 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.
- B. Top Surface of Finish Grade: Plus or minus 0.02 foot (1/4 inch).

3.07 REPAIR AND RESTORATION

- A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.

- B. Trees to Remain: If damaged due to this work, Contractor is to notify the Architect immediately. Contractor is responsible for all repair and/or replacement of any existing vegetation damaged by construction activities.

3.08 FIELD QUALITY CONTROL

- A. See Section 312323 for compaction density testing.

3.09 CLEANING

- A. Sediment Control/Silt Fencing: Provide fabric silt fencing and other erosion control devices as required and shown on plans to control erosion and allow lawn crew to establish grass uniformly across slope areas.
- B. Remove unused stockpiled subsoil. Grade stockpile area to prevent standing water.
- C. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 312316 - EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Excavating for paving.

1.02 RELATED REQUIREMENTS

- A. Section 015713 - Temporary Erosion and Sediment Control: Slope protection and erosion control.
- B. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring. General requirements for dewatering of excavations and water control.
- C. Section 311000 - Site Clearing: Vegetation and existing debris removal.
- D. Section 312200 - Grading: Soil removal from surface of site.
- E. Section 312200 - Grading: Grading.
- F. Section 312319 - Dewatering
- G. Section 312323 - Fill: Fill materials, backfilling, and compacting.

1.03 Definitions

- A. Finish Grade Elevations: Indicated on Drawings.
- B. Zone of Influence: Area beneath a footing or foundation that extends out from the bottom edge of the footing/foundation at a 45-degree angle down to a depth equal to 3 times the footing width.
- C. Fat Clays: Soil types with the classification of CH and a Plasticity Index (PI) above 30%.

1.04 PROJECT CONDITIONS

- A. All excavation is unclassified including bedrock excavation.
- B. Verify that survey bench mark and intended elevations for the Work are as indicated.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench mark and intended elevations for the work are as indicated.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. See Section 311000 for removal of existing debris.
- C. Locate, identify, and protect utilities that remain and protect from damage.
- D. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- E. Protect plants, lawns, rock outcroppings, and other features to remain.
- F. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Architect. Refer to Specification Section 312319 for additional Dewatering requirements.

3.03 EXCAVATING

- A. Excavate to accommodate new structures and construction operations.
- B. Fill areas that do not pass proof-roll are to be undercut and/or stabilized as necessary to provide a stable platform for fill placement.
- C. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- D. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.
- E. Do not interfere with 45 degree bearing splay (zone of influence) of foundations without approval from the Architect and approved specific backfill requirements.
- F. Hand trim excavations. Remove loose matter.
- G. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 312323.
- H. Provide temporary means and methods, as required, to remove all water from excavations until directed by Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control. Refer to Specification Section 312319 for additional Dewatering requirements.
- I. Determine the prevailing groundwater level prior to excavation. If the proposed excavation extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Architect. If the proposed excavation extends more than 1 foot into the excavation, control groundwater intrusion with a comprehensive dewatering procedures, or as directed by the Geotechnical Engineer. Refer to Specification Section 312319 for additional Dewatering requirements.
- J. Remove excavated material that is unsuitable for re-use from site.
- K. Stockpile excavated material to be re-used in area designated on site 312200.
- L. Remove excess excavated material from site.

3.04 FIELD QUALITY CONTROL

- A. See Division 1 for general requirements for field inspection and testing.
- B. Provide for visual inspection of load-bearing excavated surfaces by Architect before placement of foundations.

3.05 PROTECTION

- A. Divert surface flow from rains or water discharges from the excavation.
- B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.
- D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION

SECTION 312319 - DEWATERING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Dewatering of site during construction.

1.02 RELATED SECTIONS

- A. Section 312316 - Excavation: Excavating for subdrainage system piping and surrounding filter aggregate.
- B. Section 312323 - Fill: Filter aggregate, up to subgrade elevation.

1.03 REFERENCES

- A. ASTM D 2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2003.

1.04 PROJECT CONDITIONS

- A. Damage or destabilization/degradation of the on-site soils due to failure to dewater or otherwise prepare the site will be repaired at the Contractors expense.

1.05 PERFORMANCE REQUIREMENTS

- A. Dewatering Performance:
 - 1. Design, furnish, install, test, operate, monitor and maintain dewatering system of sufficient scope, size and capacity to control surface and ground water flow into excavations and permit construction to proceed on dry stable subgrades.

PART 2 - NOT USED

PART 3 EXECUTION

3.01 INSTALLATION

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades and from flooding the Project site and surrounding areas.
- B. Reroute surface water away from excavated areas. Do not allow water to accumulate in excavations that have not been backfilled. Do not use utility, foundation or other trenches as temporary drainage ditches unless specifically designed for only that purpose.
- C. Prevent water from ponding inside excavations and in pavement areas.
- D. The Contractor is to provide and maintain pumps, well points, sumps, suction and discharge lines and other dewatering system components necessary to convey water away from excavations and control the groundwater to a level at least 3'-0" below the lowest point of the excavation.
- E. Do not use open-sump pumping that leads to loss of fines, soil piping, subgrade softening and slope instability.
- F. Dispose of water removed by dewatering in a manner that avoids endangering public health, property and portions of work under construction or completed. Avoid creating an inconvenience to others, and maintain sedimentation controls as required by authorities having jurisdiction.
- G. All dewatering discharge is to be routed to a sediment pond or sediment bags so that the sediment can settle prior to the discharge water leaving the site or entering any waterway or storm sewer.

3.02 FIELD QUALITY CONTROL

- A. Dewatering systems are to be inspected at least weekly and any and all repairs or refinements performed to maintain a fully operational system that achieves the intended purpose.
- B. Standby equipment is to be maintained on site so that it can be immediately installed if failure of primary equipment occurs.

3.03 PROTECTION

- A. Protect pipe and dewatering system from other construction activities.
- B. Remove dewatering system at the completion of construction or when determined by the Architect that it is no longer needed. Any voids under pavement slabs are to be repaired using lean concrete for the voids and a non-shrink concrete repair grout for the slabs.

END OF SECTION

SECTION 312323 - FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Filling, backfilling, and compacting for paving.
- B. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

- A. Section 015713 - Temporary Erosion and Sediment Control: Slope protection and erosion control.
- B. Section 312200 - Grading: Site grading.
- C. Section 312316 - Excavation: Removal and handling of soil to be re-used.
- D. Section 312323.13 - Flowable Fill

1.03 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.
- B. Zone of Influence: Area beneath a footing or foundation that extends out from the bottom edge of the footing/foundation at a 45-degree angle down to a depth equal to 3 times the footing width.

1.04 REFERENCE STANDARDS

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; 2010.
- B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012.
- C. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.
- D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012.
- E. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.
- F. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- G. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.
- H. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.
- I. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

1.05 SUBMITTALS

- A. See Division 1 Sections for submittal procedures.
- B. Materials Sources: Submit name of imported materials source.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.

- D. Compaction Density Test Reports.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. General Fill - Fill Type Lean Clay: Subsoil excavated on-site and imported as necessary for new work.
 - 1. Graded.
 - 2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
 - 3. Conforming to ASTM D2487 Group Symbol CL.
 - 4. Having no more than 5-percent rock/gravel in the top 24-inches in landscape areas, and no more than 15-percent rock/gravel in any location.
- B. Structural Fill - Fill Type DGA: Conforming to State of Kentucky Highway Department standard.
- C. Flowable Fill: A controlled low-strength material made of cement, water, sand, and an air-entraining admixture that it can be excavated by hand or use of a backhoe. See Section 312323.13.

2.02 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for testing and analysis of soil material.
- B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

- A. All fill material is unclassified.
- B. Verify that survey bench marks and intended elevations for the Work are as indicated.
- C. Identify required lines, levels, contours, and datum locations.
- D. Proof roll all areas to receive fill prior to placing fill. Proof rolls should only be done when the soils are near optimum moisture content. Any areas that do not pass proof roll are to be stabilized in accordance with the Project Documents. Any suitable soils removed as part of the stabilization process due to moisture content issues are to be moisture conditioned and used as fill in other locations.
- E. Confirm that fat clay (CH) material has been removed under all floor slab and pavement areas so that no fat clay is located within 24-inches of the top of subgrade.
- F. Verify areas to be filled are not compromised with surface or ground water. Refer to Specification Section 312319 for Dewatering requirements.

3.02 PREPARATION

- A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.

- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill or as outlined per over-excavation below.
- C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

- A. Fill to contours and elevations indicated using unfrozen materials.
- B. Soils are not to be "over-compacted" or worked in a manner that will cause them to break down and lose strength.
- C. Employ a placement method that does not disturb or damage other work.
- D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.
- F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth for heavy equipment compaction, and layers not exceeding 4 inches for small or hand operated compaction equipment.
- G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth for heavy equipment compaction, and layers not exceeding 4 inches for small or hand operated compaction equipment.
- H. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- I. Correct areas that are over-excavated.
 - 1. Pavement areas: Use structural fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.
- J. Compaction Density Unless Otherwise Specified or Indicated:
 - 1. Under paving and similar construction: 98 percent of maximum dry density.
 - 2. At paving/paver areas: 95 percent of maximum dry density.
- K. Reshape and re-compact fills subjected to vehicular traffic.
- L. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control. Refer to Specification Section 312319 for Dewatering requirements.

3.04 FILL AT SPECIFIC LOCATIONS

- A. Use general fill unless otherwise specified or indicated.
- B. Excavations within the zone of influence (ZOI) of any footing or foundation:
 - 1. Use Flowable Fill. Flowable fill is to extend to a minimum of 1-foot above the Zone of Influence.

3.05 TOLERANCES

- A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

3.06 FIELD QUALITY CONTROL

- A. See Division 1 Sections for general requirements for field inspection and testing.

- B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.
- C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- E. Frequency of Tests: One (1) test for every 2000 sq. ft. or less of paved area or building slab per lift, but in no case fewer than two (2) tests per lift.
- F. The Contractor should anticipate and allow for testing time of encountered and imported materials. Some testing can take three to four business days.
- G. Proof roll compacted fill at surfaces that will be under slabs-on-grade and paving.

3.07 CLEANING

- A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 312323.13 - FLOWABLE FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flowable Fill or Controlled Low Strength Materials (CLSM)
- B. Backfill for excavations made within the zone-of-influence of any foundation/footing.

1.02 RELATED REQUIREMENTS

- A. Section 312323 - Fill: Filling and Compaction.

1.03 REFERENCE STANDARDS

- A. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2010.
- B. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.
- C. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 2010.
- D. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 2010.
- E. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2011a.
- F. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2012.
- G. ASTM C150/C150M - Standard Specification for Portland Cement; 2012.
- H. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2010b.
- I. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.
- J. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2011.
- K. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2011.
- L. ASTM D4832 - Preparation and Testing of Controlled Low Strength Material Test Cylinders
- M. ASTM D5971 - Sampling Freshly Mixed Controlled Low Strength Material
- N. ASTM D6103 - Flow Consistency of Controlled Low Strength Material
- O. ASTM D6023 - Unit Weight, Yield, Cement Content and Air Content (Gravimetric) of Controlled Low Strength Material

1.04 SUBMITTALS

- A. See Division 1 Sections for submittal procedures.
- B. Product Data: Provide data on mix materials and admixtures.
- C. Design Data: Mix design and test results showing that the mix design meets the mix and performance requirements.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

- A. Obtain cementitious materials from same source throughout.

- B. Cement: ASTM C150/C150M Air Entraining - Type IA portland type, grey color.
- C. Fine Mix Aggregates: ASTM C33.
- D. Fly Ash: ASTM C 618, Class F - Optional for Non-Excavatable flowable fill.
- E. Water: Clean, and not detrimental to concrete.
- F. Air Entrainment Admixture: ASTM C260.
- G. Chemical Admixtures: ASTM C494/C494M, Type A - Water Reducing.
 - 1. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

2.02 ACCESSORIES

2.03 FLOWABLE FILL/CLSM MIX DESIGN

- A. The Flowable Fill/CLSM material is to be a self-leveling and self-compacting, cementitious material with low compressive strength (see below).
- B. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
- C. If flowable fill is to be pumped, a modified mixture shall be submitted along with test results that indicate that the mix will meet the strength restrictions. In addition, the supplier is to ensure that the air content at the point of discharge from the pump meets the below requirements.
- D. Excavatable Flowable Fill Properties (not-pumped):
 - 1. Compressive Strength, when tested in accordance with ASTM D4832 at 28 days: 30 to 80 psi maximum. Strength shall not exceed 130 psi at 180-days.
 - 2. Fly Ash Content: None
 - 3. Cement Content: 50 to 100 lb per cubic yard.
 - 4. Water: Content to provide self-leveling mix with flowability per below and without excess bleed water.
 - 5. Total Air Content: 20-30 percent, determined in accordance with ASTM D6023.
 - 6. Flowability: 6 to 8 inches in accordance with ASTM D6103.
 - 7. Unit Weight (wet): 90-115 pcf
 - 8. Aggregate Size: Concrete Sand

2.04 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.
- B. Do not add water to the mix once the truck has left the concrete plant.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify trench subgrade is acceptable and ready to support fill and future loads.
- B. Verify gradients and elevations of base are correct.
- C. Verify that utilities have been properly anchored to eliminate vertical and horizontal movement.

3.02 PREPARATION

- A. Wrap utilities with protective felt paper or other protective wrap as approved by the governing body for the utility.
- B. Notify Testing Agent minimum 24 hours prior to filling operations.

3.03 FORMING

- A. Place and secure forms as necessary at the ends of each pour.

3.04 COLD AND HOT WEATHER INSTALLATION

- A. Follow recommendations of ACI 305R when installing during hot weather.
- B. Follow recommendations of ACI 306R when installing during cold weather.
- C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.
- D. Protect from freezing for a minimum of 36-hours after placement.

3.05 PLACING FLOWABLE FILL/CLSM

- A. Place fill in accordance with ACI 304R.
- B. Place fill material continuously over the full width of the trench/excavation.

3.06 TOLERANCES

- A. The contractor should anticipate a 1/8-inch per foot of depth shrinkage of the Flowable Fill/CLSM material during the initial 7-day curing period.
- B. Maximum Variation From True Position Post-Cure: Plus 1/4 inch (no minus).

3.07 FIELD QUALITY CONTROL

- A. The Owner will employ an independent testing agency to perform field quality control tests, as specified in Division 1 Sections.
 - 1. Provide free access to Flowable Fill/CLSM operations at project site and cooperate with appointed firm.
 - 2. Submit proposed mix design of each class of Flowable Fill/CLSM to inspection and testing firm for review prior to commencement of installation operations.
 - 3. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
- B. Compressive Strength Tests: ASTM D4832. For each test, mold and cure five Flowable Fill/CLSM test cylinders. Obtain test samples for every truck delivered.
 - 1. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as material it represents.
 - 2. Perform one flowability test and one air content test for each set of test cylinders taken.
 - 3. Perform compression tests at 7-days, 14-days, 28-days, 56-days and 180-days
- C. Maintain records of placed Flowable Fill/CLSM items. Record date, pour time, batch time, location of pour, quantity, air temperature, and test samples taken. All test reports are to be typed.
- D. Any tests or time limits that do not meet the specified requirements are to be reported to the Contractor and that material shall be considered unacceptable. Any material placed that is deemed unacceptable shall be removed and replaced with acceptable material.

3.08 PROTECTION

- A. Immediately after placement, protect from premature drying, excessive hot or cold temperatures, and mechanical injury for a minimum of 36-hours.
- B. Do not subject the fill material to foundation or other loads that may exceed the material strength.

END OF SECTION

SECTION 321123 - AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aggregate base course.
- B. Paving aggregates.

1.02 RELATED REQUIREMENTS

- A. Section 312200 - Grading: Preparation of site for base course.
- B. Section 312323 - Fill: Compacted fill under base course.
- C. Section 321313 - Concrete Paving: Finish concrete surface course.
- D. Section 321413 - Precast Concrete Unit Paving.

1.03 REFERENCE STANDARDS

- A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; 1965 (2004).
- B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; 2010.
- C. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.
- D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012.
- E. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012.
- F. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- G. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.
- H. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.
- I. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

1.04 SUBMITTALS

- A. See Division 1 Sections for submittal procedures.
- B. Materials Sources: Submit name of imported materials source.
- C. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- D. Compaction Density Test Reports.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. Aggregate Storage, General:

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
2. Prevent contamination.
3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Blended Aggregate Type DGA: Pug DGA conforming to State of Kentucky Highway Department standard.
- B. Herbicide: In accordance with State of Kentucky Highway Department Standards .

2.02 SOURCE QUALITY CONTROL

- A. See Division 1 for Quality Requirements for testing and analysis of aggregate materials.
- B. Where aggregate materials are specified using ASTM D2487 classification, test and analyze samples for compliance before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench marks and intended elevations for the work are as indicated.
- B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.
- C. Proof-roll areas to receive aggregate base course material and have proof-roll approved by the soils testing agent.
- D. Due to the type of soils encountered on the site, proof-rolling during wet periods or when the existing soils are above optimum moisture content will not be acceptable. All proof-rolling will need to be done during dry conditions.

3.02 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 INSTALLATION

- A. Under Portland Cement Concrete Paving:
 1. Place Blended Aggregate Type DGA to thickness identified on the drawings.
 2. Compact to 95 percent of maximum dry density.
- B. Place aggregate in maximum 4 inch layers and roller compact to specified density.
- C. Level and contour surfaces to elevations and gradients indicated.
- D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.
- G. Apply herbicide to finished surface.

3.04 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
- B. Scheduled Compacted Thickness: Within 1/4 inch.

3.05 FIELD QUALITY CONTROL

- A. See Division 1 Sections for general requirements for field inspection and testing.
- B. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.
- C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with AASHTO T 180, ASTM D698 ("standard Proctor"), or ASTM D1557 ("modified Proctor").
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- E. Frequency of Tests: One (1) test for every 2000 sq. ft. or less of paved area per lift, but in no case fewer than two (2) tests per lift.
- F. Proof roll compacted aggregate at surfaces that will be under slabs-on-grade.

3.06 CLEANING

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 321313 - CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete sidewalks.
- B. Stainless Steel Embed Lettering

1.02 RELATED REQUIREMENTS

- A. Section 031000 - Concrete Forming and Accessories.
- B. Section 312200 - Grading: Preparation of site for paving and base.
- C. Section 312323 - Fill: Compacted subbase for paving.
- D. Section 321123 - Aggregate Base Courses: sub base course.
- E. Section 321373 - Joint Sealers: Sealant for joints.

1.03 REFERENCE STANDARDS

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- B. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
- C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.
- D. ACI 305R - Hot Weather Concreting; 2010.
- E. ACI 306R - Cold Weather Concreting; 2010.
- F. ASTM A36 - Steel plate for plate dowel systems.
- G. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.
- H. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.
- I. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
- J. ASTM B633 Type II - Electroplated zinc for plate dowel systems
- K. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.
- L. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.
- M. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.
- N. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.
- O. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2014.
- P. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.
- Q. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
- R. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.

- S. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2014.
- T. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).
- U. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2004a (Reapproved 2013).

1.04 SUBMITTALS

- A. See Division 1 Sections for submittal procedures.
- B. Product Data: Provide data on stainless steel embed lettering, joint filler, admixtures, curing compound, and fiber reinforcement .
- C. Installer qualifications using Macro Fiber reinforcement in finished, exterior concrete pavement.
- D. Samples: Submit 4 min. stainless steel sample, 2 x 2 inch in size illustrating finish options available.
- E. Design Data: Indicate pavement thickness, designed concrete strength, reinforcement, and typical details. For stainless steel lettering, indicate lettering font, finish, thickness, size, endbed rod locations and installation method details.

PART 2 PRODUCTS

2.01 FORM MATERIALS

- A. Form Materials: As specified in Section 031000, conform to ACI 301.
- B. Joint Filler: Preformed; sponge rubber or cork (ASTM D1752).
 - 1. Thickness: 3/8 inch.

2.02 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 80 (80,000 psi) yield strength; deformed billet steel bars; unfinished.
- B. Steel Welded Wire Reinforcement: Plain type, ASTM A1064/A1064M; in flat sheets; unfinished.
- C. Bar Dowels: Heavy Duty Concrete - ASTM A615/A615M Grade 40 (280); deformed billet steel bars; unfinished finish.
- D. Plate Dowels: Light and Medium Duty Concrete - ASTM A36 steel plates with electroplated zinc coating meeting ASTM B633 Type II. Plate sizes and spacing to meet specified concrete thickness.

2.03 CONCRETE MATERIALS

- A. Obtain cementitious materials from same source throughout.
- B. Concrete Materials: Provide in accordance with State of Kentucky Highways standards.
- C. Cement: ASTM C150/C150M, Normal - Type I Portland cement, gray color.
- D. Fine and Coarse Mix Aggregates: ASTM C33/C33M.
- E. Water: Clean, and not detrimental to concrete.
- F. Fiber Reinforcement: Shrinkage crack control, micro synthetic, fibrillated, polypropylene fibers shown to have long-term resistance to deterioration when in contact with alkalis and moisture; 3/4 to 1 inch length and designed to reduce shrinkage cracking of concrete.
 - 1. Acceptable Products:

- a. PSI FIBERSTRAND F by Euclid Chemical
 - b. Procon F-E by Nycon Corporation
 - c. Fibermesh 300 by Propex Operating Company
 - d. Econo-Net by Forta Corporation
- G. Air-Entraining Admixtures: ASTM C260/C260M.
- H. Chemical Admixtures: ASTM C494/C494M, Type A - Water Reducing.
- 1. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

2.04 ACCESSORIES

- A. Curing Compound: ASTM C309, Type 1, Class A.
- B. Curing Compound:
- 1. Sonneborn's Sonosil
 - 2. L&M's L&M Cure
 - 3. Dayton Superior's Day Chem Sil-Cure (J-13)
- C. Joint Sealer: Type as specified in Section 321373.
- D. Stainless Steel Embed Lettering
- 1. Basis of Design Manufacturer: Montana Letting Inc.; signlettersource.com., 1-888-737-8280
 - 2. Size: 24" height x width may vary depending on letter and font selected. Font to be per style provided/selected by Owner. Font sizing and style to be selected during shop drawing review.
 - 3. Thickness: 1/2" minimum
 - 4. Material Type: 316 Stainless Steel
 - 5. Finish: 1189 Polished
 - 6. Anchor Method: Replaceable stud mount, 4" minimum embedment length. 1/4 20 thread per inch.
 - 7. Lettering to be installed so that front face of lettering is level with adjacent pavement elevation(s) with flush edge condition where lettering and pavement meet. Do not exceed 1/16 inch difference between planes of lettering and adjacent pavement.
 - 8. Contractor is to protect stainless steel finish during installation. Contractor is responsible for repair of any finish damaged during installation. To be repaired per manufacturer's recommendation.
 - 9. If concrete panels with embed letters have cracks from shrinkage or movement, the concrete panel(s) and letter(s) are to be removed and replaced.

2.05 CONCRETE MIX DESIGN

- A. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
- B. Micro Fiber Reinforcement: Add to mix at rate of 1.5 pounds per cubic yard, or as recommended by manufacturer for specific project conditions. Fiber is to be added at the plant after all other materials have been added, and have a minimum mix time of 5-minutes..
- C. Concrete Properties:
- 1. Compressive strength (prior to fiber), when tested in accordance with ASTM C39/C39M at 28 days; 4500 psi. Testing of the concrete mix prior to adding fiber and again after fiber has been added is required to set the compressive strength requirement for fiber reinforced concrete. This should be done for the first pour of each mix design and the results used to confirm future pours.
 - 2. Cement Content: Minimum 600 lb per cubic yard.
 - 3. Water-Cement Ratio: Maximum 0.44 percent by weight.
 - 4. Total Air Content: 6 percent +/- 1%, determined in accordance with ASTM C 173/C 173M.

5. Maximum Slump: 4 inches using base design, 5 inches when using fiber and mid-range water reducer, 6 inches when using a mid-range water reducer, +/- 1-inch.
6. Maximum Aggregate Size: 1 inch.

2.06 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.
- B. Do not add water to the mix once the truck has left the concrete plant.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.02 SUBBASE

- A. See Section 321123 for construction of base course for work of this Section.

3.03 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. When using Macro Fiber reinforcement, a representative of the fiber manufacturer must be on-site during the first pour and finishing process.

3.04 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.05 REINFORCEMENT

- A. Place reinforcement as indicated and per the manufacturers recommendations.
- B. Provide doweled joints at all isolation joints with one end of dowel set in capped sleeve to allow longitudinal movement.

3.06 COLD AND HOT WEATHER CONCRETING

- A. Follow recommendations of ACI 305R when concreting during hot weather.
- B. Follow recommendations of ACI 306R when concreting during cold weather.
- C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

3.07 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Do not add water to concrete.
- C. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.
- D. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

- E. Place concrete to indicated pattern.

3.08 JOINTS

- A. Align curb, gutter, and sidewalk joints.
- B. Place 3/8 inch wide isolation joints at 20 foot intervals or at locations shown on drawings and to separate paving from vertical surfaces and other components and in pattern indicated.
 - 1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface.
 - 2. Secure to resist movement by wet concrete.
- C. Provide tooled contraction control joints:
 - 1. In pattern shown on drawings.

3.09 FINISHING

- A. Area Paving: Light broom, texture perpendicular to pavement direction.
- B. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius. Remove tooling marks to prevent a picture frame effect.
- C. Remove "slop" created by the concrete finishing from all joints and edges.
- D. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.10 JOINT SEALING

- A. See Section 321373 for joint sealer requirements.

3.11 TOLERANCES

- A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.
- B. Maximum Variation From True Position: 1/4 inch.

3.12 FIELD QUALITY CONTROL

- A. Allow the independent testing agency to perform field quality control tests, as specified in Division 1.
 - 1. Provide free access to concrete operations at project site and cooperate with appointed firm.
 - 2. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
 - 3. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
- B. Compressive Strength Tests: ASTM C39/C39M; for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd or less of each class of concrete placed.
 - 1. Test fiber reinforced concrete prior to the addition of fiber and again after fiber has been added to set the baseline for the fiber reinforced compressive strength, slump and air content. This is to be done for the first pour of each mix design, and the results used for later pour strength requirements.
 - 2. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
 - 3. Perform one slump test and one air content test for each set of test cylinders taken.
- C. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken. All test reports are to be typed.
- D. Any tests or time limits that do not meet the specified requirements are to be reported to the Contractor and that concrete shall be considered unacceptable.

3.13 PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.
- B. Do not permit pedestrian traffic over pavement for 2 days minimum after finishing.
- C. Do not permit vehicular traffic over pavement until 75 percent design strength of concrete has been achieved.
- D. All pavements that are soiled or otherwise dirty are to be pressure washed and rinsed upon completion of the construction and landscaping work.

END OF SECTION

SECTION 321373 - PAVEMENT JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Expansion and contraction joints within cement concrete pavement.
 - 2. Joints between concrete and precast concrete unit pavers.
- B. Related Sections include the following:
 - 1. Section 321313 - Concrete Paving: constructing joints in concrete pavement.
 - 2. Section 321413 - Precast Concrete Unit Paving

1.03 SUBMITTALS

- A. Product Data: For each joint sealant product indicated.
- B. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- C. Qualification Data: For Installer.
- D. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for sealants.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- B. Preconstruction Compatibility and Adhesion Testing: Submit to joint sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Use ASTM C 1087 or manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint sealant backings, secondary seals, and miscellaneous materials.
 - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 4. For materials failing tests, obtain joint sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
 - 5. Testing will not be required if joint sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
- C. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing of current sealant products within a 36-month period preceding the Notice to Proceed with the Work.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 for testing indicated, as documented according to ASTM E 548.

1.05 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.

1.06 PROJECT CONDITIONS

- A. All expansion, isolation and cold joints, including those in concrete curbs, are to receive joint sealant.
- B. 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.
 - 2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F (4.4 deg C), whichever is higher.
 - 3. When joint substrates are wet or covered with frost.
 - 4. Where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
 - 5. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.02 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 Architect from manufacturer's full range.

2.03 COLD-APPLIED JOINT SEALANTS

- A. Type S, Grade NS, Class 25 Polyurethane Sealant for Concrete: Single-component, low-modulus, neutral-curing, nonsag urethane sealant complying with ASTM C920
 - 1. Sikaflex-1a
 - 2. Bostik Seal 'N' Flex FC
 - 3. Tremco Vulkem 116

2.04 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. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.05 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

3.01 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.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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 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.

3.03 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in 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 using proven techniques that 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.

3.04 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.

3.05 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 and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.
- B. Apply clean, white, silica sand dusting to the finished tooled surface of the joint sealant to help prevent tracking of the material.

END OF SECTION

SECTION 321413 - PRECAST CONCRETE UNIT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-interlocking concrete paver units.
- B. Sand setting bed.

1.02 RELATED REQUIREMENTS

- A. Section 312200 - Grading: Preparation of subsoil for pavers.
- B. Section 312323 - Fill: Compacted fill for pavers.
- C. Section 321123 - Aggregate Base Courses: Pavement subbase.
- D. Section 321313 - Concrete Paving: Concrete subbase for pavers.

1.03 PRICE AND PAYMENT PROCEDURES

- A. See Section 012200 - Unit Prices, for additional unit price requirements.

1.04 REFERENCE STANDARDS

- A. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.
- B. ASTM C936/C936M - Standard Specification for Solid Concrete Interlocking Paving Units; 2013.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Non-interlocking Concrete Pavers:
 - 1. Hanover Architectural Products, Inc; _____: www.hanoverpavers.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

- A. Non-interlocking Pavers: Precast concrete.
 - 1. Basis of Design: Hanover Architectural Products, www.hanoverpavers.com, 1-800-426-4242, 5000
 - 2. Type: Prest Paver
 - 3. Compressive Strength: Minimum of 8500 pounds per square inch.
 - 4. Absorption: 5 percent or less average, with maximum of 1 percent tolerance.
 - 5. Density: 155lb/ft³
 - 6. Size: 4" x 8" inches.
 - 7. Thickness: 2 3/8 inches.
 - 8. Edge Condition: 3/16" bevel
 - 9. Color #1: Quarry Red.
 - 10. Finish: Tudor
- B. Sand for Setting Bed: Clean washed natural sand or crushed stone complying with gradation requirements of ASTM C33/C33M for fine aggregates.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate is level or to correct gradient, smooth, capable of supporting pavers and imposed loads, and ready to receive work of this Section.
- B. Verify dry weather forecast without rain for a minimum of 24 hours with temperatures above 55 degrees Fahrenheit.

3.02 PREPARATION

- A. Treat soil with herbicide to retard plant growth.

3.03 INSTALLATION OF SOLID PAVER UNITS

- A. Spread sand bedding evenly over prepared substrate surface to a maximum thickness of 1-1/2 inch.
- B. Dampen and roller compact sand to level and even surface.
- C. Screed and scarify top 1 inch to 1 1/2 inch of sand.
- D. Place paver units in design pattern shown on drawings. Final installation design to be coordinated with landscape architect and Owner and verified prior to placement.
- E. Cut paver units at edges with masonry saw.
- F. Place half units at edge and interruptions. Maintain tight, evenly spaced joints.
- G. Tamp and level paver units with mechanical vibrator until units are firmly bedded, level, and to correct elevation and gradients. Do not tamp unrestrained edges.

3.04 CLEANING

- A. Clean soiled surfaces using cleaning solution. Do not harm pavers, joint materials, or adjacent surfaces.
- B. Use non-metallic tools in cleaning operations.
- C. Rinse surfaces with clean water.
- D. Broom clean paving surfaces. Dispose of excess sand.

3.05 PROTECTION

- A. Do not permit traffic over unprotected paver surface.
- B. Do not permit traffic for 48 hours after pavement placement.

3.06 MAINTENANCE

- A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION

SECTION 329223 - SODDING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preparation of subsoil.
- B. Placing topsoil.
- C. Fertilizing.
- D. Sod installation.

1.02 RELATED REQUIREMENTS

- A. Section 312200 - Grading: Topsoil material.
- B. Section 312200 - Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.
- C. Section 312323 - Fill: Topsoil material.

1.03 DEFINITIONS

- A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.04 REFERENCE STANDARDS

- A. TPI (SPEC) - Guideline Specifications to Turfgrass Sodding; 2006.

1.05 DEFINITIONS

- A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.06 SUBMITTALS

- A. See Division 1 Sections for submittal procedures.
- B. Certification: Submit certification of grass species and location of sod source.
- C. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer .
- D. Submit sod watering schedule.
- E. Submit a planting schedule. Coordinate the schedule with the construction work of the project and with expected climatic conditions.
- F. Submit topsoil analysis reports. Provide subsoil analysis reports where needed.
- G. Submit a list of soil amendments as recommended by the topsoil and subsoil analyses and recommendations.

1.07 QUALITY ASSURANCE

- A. Sod Producer: Company specializing in sod production and harvesting with minimum five years experience, and certified by the State of Kentucky.

- B. Installer Qualifications: Company approved by the sod producer.

1.08 REGULATORY REQUIREMENTS

- A. Comply with regulatory agencies for fertilizer and herbicide composition.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sod on pallets. Protect exposed roots from dehydration.
- B. Do not deliver more sod than can be laid within 24 hours.
- A. Furnish service and maintenance of sodded areas for three months from Date of Substantial Completion.
- B. Maintain sodded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Sod: TPI (SPEC), Certified Turfgrass Sod quality; cultivated grass sod; type indicated in plant schedule on Drawings; with strong fibrous root system, free of stones, burned or bare spots; containing no more than 5 weeds per 1000 sq ft. Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.
 - 1. Tall Fescue Grass Type: 40 percent. (Firecracker LS, Aggressor, Falcon IV, Col-M, 3rd Millenium or similar to be approved by the Landscape Architect).
 - 2. Fine Fescue Grass Type: 30 percent. (Reliant IV, Firefly, Epic, Fortitude, Finelawn Petite or similar to be approved by the Landscape Architect)
 - 3. Kentucky Blue Grass Type: 20 percent. (Freedom III, Blue Velvet, Midnight, Barrister, Nu Destiny, Quantum Lelap, Brilliant, Everglade or similar to be approved by the Landscape Architect).
 - 4. Annual Rye: 10 percent.
 - 5. Thickness: "Thick" sod, minimum 1 inch and maximum 1-3/8 inch topsoil base.
 - 6. Machine cut sod and load on pallets in accordance with TPI (SPEC) Guidelines.
- B. Topsoil: as specified in Section 312200.
- C. Fertilizer: per soil test requirements; recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated by analysis.
- D. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

2.02 ACCESSORIES

- A. Wood Pegs: Softwood, sufficient size and length to ensure anchorage of sod on slope.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this section.

3.02 PREPARATION

- A. Prepare subgrade in accordance with Section 312200.
- B. Place topsoil in accordance with Section 312200.

3.03 FERTILIZING

- A. Apply fertilizer in accordance with manufacturer's instructions.
- B. Apply after smooth raking of topsoil and prior to installation of sod.
- C. Apply fertilizer no more than 48 hours before laying sod.
- D. Mix thoroughly into upper 2 inches of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

3.04 LAYING SOD

- A. Moisten prepared surface immediately prior to laying sod.
- B. Lay sod immediately after delivery to site to prevent deterioration.
- C. Lay sod smooth and tight with no open joints visible, and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces.
- D. Lay smooth. Align with adjoining grass areas. Top of sod surface to meet and match adjoining pavements.
- E. On slopes 6 inches per foot and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at maximum 2 feet on center. Drive pegs flush with soil portion of sod.
- F. Water sodded areas immediately after installation. Saturate sod to 4 inches of soil.
- G. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities.

3.05 MAINTENANCE

- A. Maintain sodded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.
- B. Mow grass at regular intervals to maintain at a maximum height of 3 inches. Do not cut more than 1/3 of grass blade at any one mowing.
- C. Water to prevent grass and soil from drying out.
- D. Roll surface to remove irregularities.
- E. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- F. Immediately replace sod to areas that show deterioration or bare spots.
- G. Protect sodded areas with warning signs during maintenance period.

END OF SECTION