

ISSUED FOR CONSTRUCTION

Stantec Consulting Services Inc. One Team. Infinite Solutions 1901 Nelson Miller Parkway Louisville, KY 40223-2177 Tel: (502) 212-5000 • Fax: (502) 212-5055 www.stantec.com **Technical Specifications**

Johnsonville Fossil Plant Ash Disposal Area No. 2 Southeast Dike Stability Improvements Work Plan 7 (JOF-100702-WP-7) Humphreys County, Tennessee

Prepared for

Tennessee Valley Authority Chattanooga, Tennessee

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SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This specification covers site preparation activities including sediment control, clearing, grubbing and stripping and disposal of waste materials.

1.2 RELATED DOCUMENTS

A. The conditions and description of work shown in other sections of these Specifications, the Plans for Construction, Construction Quality Control (CQC) Plan, and the Storm Water Pollution Prevention Plan (SWPPP) apply to this Section.

1.3 SUMMARY

- A. Section Includes:
 - 1. Surveying and photographing trees to be removed.
 - 2. Removing trees and other vegetation.
 - 3. Grubbing of rootwads.
 - 4. Filling voids from tree rootwad removal.
 - 5. Grading or smoothing of surface to allow placement of graded filter
 - 6. Temporary erosion- and sedimentation-control measures.
 - 7. Stripping and stockpiling topsoil.
- B. Related Sections:
 - 1. Division 31 Section 312000 "Earth Moving" for excavation, filling and backfilling, and rough grading.
 - 2. Division 32 Section 329200 "Turfs and Grasses" for establishing vegetation on disturbed areas.

1.4 DEFINITIONS

- A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- B. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing inplace surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

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

1.5 MATERIAL OWNERSHIP

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

1.6 SUBMITTALS

- A. Survey Data of Existing Trees to be Removed: Locate and survey trees to be removed to document their position in case seeps occur. Provide sufficiently detailed photograph of trees to relate them to the survey positions.
- B. Certification statements shall be provided by each supplier that the products conform to these specifications. In addition all materials shall meet the testing schedules noted in the CQC Plan.

1.7 PROJECT CONDITIONS

- A. Utility Locator Service: Contractor shall locate and verify all utilities prior to construction activities to ensure there is no conflict with the construction improvements.
- B. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.
- C. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete Sand: Concrete sand shall meet the requirements of Section 903.01 – Fine Aggregate for Concrete of the Tennessee Department of Transportation (TDOT) "Standard Specifications for Road and Bridge Construction" (Standard Specifications) latest edition.

Other sources of sand may be approved by QC Manager subject to filter analysis based on gradation and the quality of the sand.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks, survey control points, and geotechnical instrumentation (piezometers and slope inclinometers) from disturbance during construction as shown on Plans for Construction.
- B. Locate and survey trees at least 2 inches in diameter to be removed to document their position in case seeps occur. Photograph trees and relate them to the survey positions.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or fugitive dust to Kentucky Lake. Install measures according to erosion- and sedimentation-control drawings and as outlined in the (SWPPP) prepared for this project.
- B. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established and approved by QC Manager or the designated QC representative.
- C. Work shall be performed in segments and disturbance shall be limited as practicable to limit exposure of exposed soils to rainfall events and subsequent erosion.
- D. Silt fencing or other sediment control devices that must be removed to allow work to be performed shall be removed immediately before work occurs and re-installed as soon as practicable afterward.

3.3 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade. In general, all trees and brush with a mean diameter of 2-inches or greater at ground level shall be grubbed out. Where it is not reasonable to remove trees by mowing with a bush hog or with similar mowing equipment the following guidelines apply.
 - 1. All trees shall be cut or removed using a handsaw, chainsaw, or excavator.
 - 2. Remove the remaining tree trunk, stump, and rootwad.
 - 3. Grub any remaining roots of the tree so that only 2 inches or smaller roots are left in place.
 - 4. The resulting cavity from removal of the rootwad shall be cleaned of loose soil and debris.

- B. The cavity left by removal of the rootwad shall be backfilled with concrete sand or soil fill depending on the location of the cavity.
 - 1. Cavities along the lower bench or bank shall be backfilled with concrete sand. Place the concrete sand in horizontal layers not exceeding a loose depth of 12 inches and tamp each layer with a backhoe bucket.
 - 2. Cavities along the dike slope shall be backfilled with soil fill. Refer to Section 312000 of these specifications for the method to place and compact soil fill.
 - 3. Grade the backfill to blend and match existing slopes.
- C. From stations 73+50 to 80+00, all trees shall be removed from areas within 5 feet of the access road or within 20 feet of the dike toe as indicated on the Plans for Construction.
- D. From stations 80+00 to 93+20, all trees and vegetation shall be removed from the bank..
- E. All wood debris and trash deposited from the flood event of May 1-2, 2010 shall be removed and disposed of by the Contractor.
- F. During graded filter construction, the Contractor shall only clear and grub the areas that will have the graded filter constructed on them in the same day.

3.4 TOPSOIL STRIPPING

- A. Remove sod, grass, and other vegetation before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials. Strip surface soil of unsuitable materials, including trash, debris, weeds, roots, and other waste materials.
- C. Stockpile suitable topsoil on site to be used for final cover. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
- D. Topsoil stockpiles shall not be permitted on the lower bench where eroded topsoil may enter Kentucky Lake. Stockpiles shall be located in the laydown areas as shown on the Plans for Construction or at other locations on plant property approved by TVA. Silt fence or other appropriate BMPs shall still be required around stockpiles.
- E. During construction of the access road, only topsoil from areas that will have the access road constructed on them in the same day shall be stripped.

3.5 DISPOSAL OF SURPLUS AND WASTE MATERIALS

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

END OF SECTION 311000

SOUTHEAST DIKE STABILITY IMPROVEMENTS ISSUED FOR CONSTRUCTION

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This specification covers activities associated with flattening the dike slopes using soil including benching, placing, spreading and compacting soil fill, final grading and protection.

1.2 RELATED DOCUMENTS

A. The conditions and description of work shown in other sections of these Specifications, the Plans for Construction, Construction Quality Control (CQC) Plan, and the Storm Water Pollution Prevention Plan (SWPPP) apply to this Section.

1.3 SUMMARY

- A. Section Includes:
 - 1. Geotextile fabric.
 - 2. Soil fill.
 - 3. Benching into existing dike slope.
 - 4. Placing and compacting soil fill.
- B. Related Sections:
 - 1. Division 31 Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil.

1.4 DEFINITIONS

- A. Fill: Soil material used to raise existing grades.
- B. Borrow Soil: Satisfactory soil imported from off-site for use as fill.
- C. Slope Bench: Step-like surface excavated in the existing dike slope consisting of horizontal surfaces with step risers 2 to 3 feet in height. Purpose is to eliminate slip plane and allow proper bonding and compaction of fill.
- D. Subgrade: Uppermost surface of an excavation or the top surface of fill.

1.5 SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
 - 1. Geotextiles.
- B. Samples for Testing: For each borrow site, the Contractor shall provide a representative sample of the borrow soil to the QC Manager.

1.6 PROJECT CONDITIONS

- A. Utility Locator Service: Contractor shall locate and verify all utilities prior to construction activities to ensure there is no conflict with the construction improvements.
- B. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures are in place. Install measures according to erosion- and sedimentation-control drawings and as outlined in the (SWPPP) prepared for this project.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soils: Soils used for fill must meet the following requirements unless otherwise approved by the QC Manager.
 - 1. Soil material shall consist primarily of clay materials that, in the opinion of the QC Manager, are suitable for dam construction.
 - 2. Unless otherwise permitted, soils shall exhibit a classification of CL, CL-ML, CL-CH, or CH in accordance with ASTM D-2487.
 - 3. Soil must be within plus or minus 2 percent of optimum moisture content at time of compaction in accordance with ASTM D 698.
 - 4. The material shall be free of organic matter, topsoil, rubbish, debris, waste materials, and rock pieces greater than 3 inches (maximum dimension) in size, and shall be at a moisture content that is suitable for acceptable compaction.

2.2 GEOTEXTILES

- A. Separation Geotextile: Non-Woven geotextile fabric, manufactured for separation applications; complying with AASHTO M 288 and the following, measured per test methods referenced:
 - 1. Unit Weight: 8 oz/yd^2 ; ASTM D 5261
 - 2. Grab Tensile Strength: 200 lbs; ASTM D 4632.
 - 3. Elongation: 50%; ASTM D 4632
 - 4. Trapezoidal Tear Strength: 80 lbf; ASTM D 4533.
 - 5. Puncture Strength: 110 lbs; ASTM D 4833.
 - 6. Apparent Opening Size: No. 80 sieve, maximum; ASTM D 4751.

- 7. Permittivity: 1.5 sec^{-1} , minimum; ASTM D 4491.
- 8. UV Stability: 70 percent after 500 hours exposure; ASTM D 4355.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations. Refer to the erosion- and sedimentation-control drawings and the (SWPPP) prepared for this project.

3.2 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions.

3.3 EXCAVATION FOR SLOPE BENCHES

A. Slope benches will provide a horizontal surface for fill compaction. Benches shall be excavated along the dike slope as fill material is brought up the slope. The maximum step-height of each bench shall be 2 to 3 feet. Excavated benches shall be backfilled at the end of the work shift for each day.

3.4 SOIL FILL

- A. Place fill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact soil fill in benches promptly, but not before completing the following:
 - 1. Place separation geotextile over areas of lower bench prior to placing first lift of soil fill. Geotextile shall be placed in all lower bench areas where soil fill will come in contact with crushed stone. Install geotextile according to manufacturer's written instructions, overlapping sides, and ends.
- C. Scarify or break up smooth surfaces of compacted fill prior to placing the next lift of material to promote bonding with subgrade.

3.5 COMPACTION OF SOIL FILL

A. Place soil fill in lifts not more than 10 inches loose depth for material compacted by heavy compaction equipment.

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- B. Each lift of soil fill shall be compacted with a tamping, sheepsfoot roller, or equivalent approved by the QC Manager. Compact soil fill to at least 98% of the standard proctor dry density at moisture contents within plus or minus 2 percent of the optimum moisture content as determined by ASTM D-698.
- C. Compacted soil fill will be subject to the testing schedule noted in the CQC Plan.
- D. Following initial compaction, the surface shall be sealed with a smooth drum roller to reduce the potential for surface water infiltration.

3.6 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated on the Plans for Construction.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with dimensions and configurations shown on the Plans for Construction. Backfill soft spots and low spots with soil fill utilizing the methods described in the section.
- B. Site Rough Grading: Slope grades to direct water away from dike slope and to prevent ponding.

3.7 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to a depth specified by the QC Manager; reshape and recompact according to Section 3.5.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by QC Manager.

END OF SECTION 312000

SECTION 312100 – RIPRAP BUTTRESS, GRADED FILTER AND CONSTRUCTION ACCESS ROAD

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This specification covers placement of sand, crushed stone, and riprap to construct the graded filter, drainage blanket, riprap buttress, and construction access road.

1.2 RELATED DOCUMENTS

A. The conditions and description of work shown in other sections of these Specifications, the Plans for Construction, Construction Quality Control (CQC) Plan, and the Storm Water Pollution Prevention Plan (SWPPP) apply to this Section.

1.3 SUMMARY

- A. Section Includes:
 - 1. Concrete sand.
 - 2. No. 57 crushed stone.
 - 3. No. 3 crushed stone.
 - 4. Machined riprap (Class B)
 - 5. Machined riprap (Class A-1)
 - 6. Crusher run.
 - 7. Graded filter and drainage blanket construction.
 - 8. Riprap buttress construction.
 - 9. Construction access road.
- B. Related Sections:
 - 1. Division 31 Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil.
 - 2. Division 31 Section 312000 "Earth Moving" for excavation, filling and backfilling, and rough grading.

1.4 SUBMITTALS

A. Certification statements shall be provided by each material supplier that the product conforms to these specifications. In addition all materials shall meet the testing schedules noted in the CQC Plan.

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SECTION 312100 - 1 RIPRAP BUTTRESS, GRADED FILTER COMPONENTS, AND CONSTRUCTION ACCESS ROAD R0 07/02/10 PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete Sand: Concrete sand shall meet the requirements of Section 903.01 – Fine Aggregate for Concrete of the Tennessee Department of Transportation (TDOT) "Standard Specifications for Road and Bridge Construction" (Standard Specifications) latest edition.

Other types of sand may be approved by QC Manager subject to filter analysis based on gradation and the quality of the sand.

- B. Crushed Stone: No 57 crushed stone and No. 3 crushed stone shall consist of quarried stone meeting the requirements of Section 903 of the Tennessee Department of Transportation (TDOT) "Standard Specifications for Road and Bridge Construction" (Standard Specifications) latest edition. The gradation shall conform to Table 1 (AASHTO M43) in Section 903.22 of the Standard Specifications.
- C. Machined Riprap (Class A-1 and B): Riprap shall consist of quarry stone meeting the requirements of Section 709 of the Tennessee Department of Transportation "Standard Specifications for Road and Bridge Construction" latest edition.
- D. Crusher Run: 'Crusher Run' shall meet the requirements of Section 903.04 Aggregate for Lean Concrete Base of the Tennessee Department of Transportation (TDOT) "Standard Specifications for Road and Bridge Construction" (Standard Specifications) latest edition.

PART 3 - EXECUTION

3.1 PREPARATION

- A. The exposed soil subgrade of the bank on which the graded filter will be constructed shall be prepared in accordance with Section 311000 Site Clearing. No filter shall be placed until the subgrade is approved by the QC Manager or the designated representative on the QC Team.
- B. The drainage blankets over Seep 3A, Seep 3C-1, and Seep 3C-2 shall be constructed prior to any other improvements in the work area. This includes clearing and grubbing operations along the bank (except those required to construct the drainage blankets).

3.2 PREPARE SURFACE FOR GRADED FILTER

A. Contractor shall prepare the exposed surface of the bank (steep slope below lower bench to the condenser water inlet channel) to receive graded filter placement by grading, blading, or tamping to provide a relatively even, smooth surface free of protrusions, rocks, roots and other items that would keep the filter from making contact with the soil. This may also be achieved using an excavator equipped with a bucket having no teeth and a welded plate.

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SECTION 312100 - 2 RIPRAP BUTTRESS, GRADED FILTER COMPONENTS, AND CONSTRUCTION ACCESS ROAD R0 07/02/10

- B. Contractor shall prepare the lower bench areas at Seeps 3A, 3C-1, and 3C-2 by mowing close to the ground surface using hand operated mowing equipment and shall avoid ground disturbance to the extent possible.
- C. Work shall be performed in segments to limit soil disturbance and minimize exposed soils to rainfall events and subsequent erosion. Silt fencing or other sediment control devices shall be removed immediately before graded filter placement and reinstalled immediately afterwards. In no event shall a disturbed area on the bank remained exposed when the Contractor leaves the job site at the end of the word day

3.3 CONSTRUCTION ACCESS ROAD

- A. The construction access road on the lower bench shall be constructed of Class A-1 riprap and No. 3 crushed stone as shown in the Plans for Construction. Additional stone shall be added throughout construction as needed.
 - 1. Construct road in lifts not exceeding three feet. Do not dump the rock into final position but distribute by blading to minimize voids, pockets, and bridging. Blade and compact using a smooth drum vibratory compactor as required for a stable surface.
 - 2. Excavate slope benches as required and described in Section 312000.

3.4 GRADED FILTER AND DRAINAGE BLANKET

- A. The graded filter and drainage blanket shall consist of a minimum of six inches concrete sand placed on soil subgrade with the sand then overlain by six inches TDOT No. 57 crushed stone which is in turn overlain by six inches TDOT No. 3 crushed stone.
 - 1. The sand component of the graded filter and drainage blanket shall be placed to the minimum thickness and dimensions indicated on the Plans for Construction. Measurement shall be made perpendicular to the surface of the dike. Placed sand shall be covered with No. 57 stone as quickly as practicable. In no event shall sand remain exposed (other than stockpiles) when the Contractor leaves the job site at the end of the work day.
 - 2. The layers of crushed stone shall be placed to the minimum thickness and dimensions indicated on the Plans for Construction. Measurement shall be made perpendicular to the slope.
- B. Underwater Placement
 - 1. Components of the graded filter placed under water shall be performed in such a manner as to provide a minimum thickness of six inches. One such method involves placement by excavator of overlapping buckets of material.
- C. Contamination Issues
 - 1. Any contamination of sand from soil or ash shall be cause to remove and replace the sand.

SOUTHEAST DIKE STABILITY IMPROVEMENTS ISSUED FOR CONSTRUCTION

SECTION 312100 - 3 RIPRAP BUTTRESS, GRADED FILTER COMPONENTS, AND CONSTRUCTION ACCESS ROAD R0 07/02/10

3.5 RIPRAP BUTTRESS

- A. Riprap shall not be placed until the graded filter has been approved by the QC Manager or the designated representative on the QC Team.
- B. Riprap shall be placed to the minimum thicknesses and dimensions indicated on the Plans for Construction. Measurements shall be made perpendicular to the slope. The surface of the buttress, upon completion, shall be graded as practicable into final position to ensure proper thickness and uniformity.
- C. Riprap may be placed by mechanical means using an excavator or loader. The maximum allowable drop height for riprap placement is two feet. Larger rocks shall be uniformly distributed with the small rocks and spalls filling the voids between the larger rocks.
- D. Riprap shall be placed in lifts with a maximum thickness of three feet. The Contractor shall complete each lift throughout the entire length of the riprap buttress prior to starting the subsequent lift.

3.6 CRUSHER RUN

A. Upon completion of dike regrading and riprap buttress construction, place crusher run as shown on the Plans for Construction. Provide positive drainage towards the Condenser Water Inlet Channel. Compact the crusher run with at least two passes of a vibratory smooth drum roller.

3.7 ACCESS TO CONSTRUCTION

- A. In order to access locations of graded filter construction and riprap placement, temporary access ramps or roads may be needed. Where operating heavy equipment or trucks over the filter, additional cover shall be placed to a minimum total depth of 36 inches over the sand component of the filter. This cover shall consist of the 6 inch layer of No. 57 crushed stone spread over the sand and at least 30 inches of No. 57 or No. 3 crushed stone. The No. 57 crushed stone layer which is part of the graded filter shall be spread in a single lift.
- B. The temporary road surface can be reclaimed and re-used as needed. The road shall be removed to the degree to allow the riprap to be placed to the minimum thicknesses, final grade, and configuration specified on the Plans for Construction.
- C. Where the No. 57 crushed stone surface has been contaminated with ash or soil, it shall be removed and wasted as directed by the QC Manager.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

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

END OF SECTION 311000

SOUTHEAST DIKE STABILITY IMPROVEMENTS ISSUED FOR CONSTRUCTION

SECTION 312100 - 4 RIPRAP BUTTRESS, GRADED FILTER COMPONENTS, AND CONSTRUCTION ACCESS ROAD R0 07/02/10

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This specification covers installation of turf on disturbed areas. The Contractor has the option of using seed, straw, and erosion control blank or sod to re-vegetate the disturbed areas. Both methods are covered in this section.

1.2 RELATED DOCUMENTS

A. The conditions and description of work shown in other sections of these Specifications, the Plans for Construction, Construction Quality Control (CQC) Plan, and the Storm Water Pollution Prevention Plan (SWPPP) apply to this Section.

1.3 SUMMARY

- A. Section Includes:
 - 1. Seeding.
 - 2. Sodding.
 - 3. Erosion-control blankets.

B. Related Sections:

- 1. Division 31 Section 311000 "Site Clearing" for topsoil stripping and stockpiling.
- 2. Division 31 Section 312000 "Earth Moving" for excavation, filling and backfilling, and rough grading.

1.4 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.
- C. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing inplace surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably

free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

1.5 SUBMITTALS

- A. Certification of Grass Seed: From seed vendor for each grass-seed mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
 - 1. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.
- B. Certifications of Erosion Control Blanket: From supplier of erosion control blanket stating material content.
- C. Qualification Data: For qualified landscape Installer.
- D. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required initial maintenance periods.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.
 - 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 - 2. Experience three years' experience in turf installation.
 - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:
 - a. Certified Landscape Technician Exterior, with installation specialty area(s), designated CLT-Exterior.
 - b. Certified Turfgrass Professional, designated CTP.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.
- B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in Turfgrass Producers International's (TPI) "Guideline Specifications to Turfgrass Sodding."

Deliver sod in time for planting within 36 hours of harvesting. Protect sod from breakage and drying.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.9 MAINTENANCE SERVICE

- A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:
 - 1. Seeded Turf: 60 days from date of planting completion.
 - a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.
 - 2. Sodded Turf: 30 days from date of planting completion.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Furnish fresh, clean, dry, new-crop seed.
- B. Seed Species: Seed species to be planted will depend on the time of year planting is executed. Refer to Section 801 of the Tennessee Department of Transportation (TDOT) "Standard Specifications for Road and Bridge Construction" (Standard Specifications) latest edition.

2.2 TURFGRASS SOD

- A. Turfgrass Sod: Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.
- B. Turfgrass Species: For Turfgrass sod species, refer to Section 803 of the Tennessee Department of Transportation (TDOT) "Standard Specifications for Road and Bridge Construction" (Standard Specifications) latest edition.

2.3 EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.
 - 1. Products: Subject to compliance with requirements, provide the following or Engineer approved equivalent:
 - a. North American Green; SC150

PART 3 - EXECUTION

3.1 EXAMINATION

A. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by QC Manager and replace with new planting soil.

3.2 PREPARATION

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

3.3 TURF AREA PREPARATION

- A. Limit turf subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. If seed and erosion control blanket will be used, spread topsoil to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if topsoil on subgrade if frozen, muddy, or excessively wet.
- C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
- D. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- E. Before planting, obtain QC Manager's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 1. Do not use wet seed or seed that is moldy or otherwise damaged.
 - 2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. For sowing rates, refer to Section 801 of the Tennessee Department of Transportation (TDOT) "Standard Specifications for Road and Bridge Construction" (Standard Specifications) latest edition.
- C. Protect seeded areas with erosion-control blankets installed and stapled according to the Plans for Construction. Erosion-control blanket shall be installed from top of slope, working downward, and as recommended by material manufacturer for site conditions

3.5 SODDING

- A. Lay sod within 36 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
 - 1. Lay sod across angle of slopes exceeding 4:1.
 - 2. Anchor sod on slopes exceeding 4:1 with wood pegs or steel staples spaced as recommended by sod manufacturer, but not less than one anchor per four feet per edge of the strip.
- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.6 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by QC Manager:
 - 1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, and free of surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 12 by 12 inches.
 - 2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, evencolored, viable turf has been established, free of open joints, bare areas, and surface irregularities.

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.7 CLEANUP AND PROTECTION

- A. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- B. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 329200