

**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 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. 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:  $0.05 \text{ sec}^{-1}$ , 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](http://www.tencate.com/#sle).
    - b. North American Green: [www.nagreen.com/#sle](http://www.nagreen.com/#sle).
    - c. Propex Geosynthetics: [www.geotextile.com/#sle](http://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.

### **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. 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.
- F. 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. 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. Clean out temporary sediment control structures weekly and relocate soil on site.
- E. 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. Clearing and protection of vegetation.
- B. Removal of existing site improvements including bases/plate/rubber, utilities, utility pipe and structures, sod, sod rootzone, or other site improvements.

**1.02 RELATED REQUIREMENTS**

- A. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- B. Section 015713 - Temporary Erosion and Sediment Control.
- C. Section 312200 - Grading: Topsoil/rootzone removal.
- D. Section 312323 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.
- E. Section 312316.13 - Trenching: Filling holes, pits, and excavations generated as a result of removal operations.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Fill Material: Section 329117 - Athletic Field Natural Grass Root Zone and Section 312316.13 - Trenching

**PART 3 EXECUTION**

**3.01 SITE CLEARING**

- A. 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.

**3.03 VEGETATION**

- A. Scope: Remove sod and root zone material as required for new work and as described in these contract documents.
- B. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
  - 1. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
- C. 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 312200  
GRADING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Removal of topsoil.
- B. Rough grading the site for new work.

**1.02 RELATED REQUIREMENTS**

- A. Section 015713 - Temporary Erosion and Sediment Control.
- B. Section 311000 - Site Clearing.
- C. Section 312316 - Excavation.
- D. Section 312316.13 - Trenching: Trenching and backfilling for utilities.
- E. Section 329117 - Athletic Field Natural Grass Root Zone
- F. Section 329227 - Athletic Field Sod Installation

**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 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.

**1.05 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. 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.
- C. The existing concrete pavements and stone base areas are not designed for construction traffic and should not be used for construction activities unless they are protected from all damage. Any areas of subgrade, road base or pavement damage are to be repaired.

**PART 3 EXECUTION**

**2.01 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. Refer to Specification Section 312319 for Dewatering requirements.

## **2.02 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 plants, lawns, and other features to remain as a portion of final landscaping.

## **2.03 ROUGH GRADING**

- A. Remove topsoil/root zone from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
- B. Do not remove topsoil when wet.
- C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
- D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.
- E. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.
- F. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

## **2.04 SOIL REMOVAL and STOCKPILING**

- A. Remove excavated topsoil from site.
- B. Stockpile subsoil that is to be re-used on site; remove remainder from site. Cover stockpile to prevent erosion and saturation of the material.
- C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

## **2.05 TOLERANCES**

- A. Top Surface of Subgrade: Plus or minus 0.04 foot (1/2 inch) from required elevation.

## **2.06 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. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

## **2.07 FIELD QUALITY CONTROL**

- A. See Section 312323 for compaction density testing.

**2.08 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 312217  
ATHLETIC FIELD NATURAL GRASS SUBGRADE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Filling, backfilling, and compacting of subgrade for natural grass athletic field areas.
- B. Filling holes, pits, and excavations generated as a result of removal (demolition) operations in natural grass athletic field areas.

**1.02 RELATED REQUIREMENTS**

- A. Section 015713 - Temporary Erosion and Sediment Control: Slope protection and erosion control.
- B. Section 311000 - Site Clearing.
- C. Section 312319 - Dewatering

**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. Sports Field Contractor: Contractor that specializes in athletic field construction and meeting the requirements in the Quality Assurance section below.

**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 C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.
- C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)); 2012.
- D. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- E. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.
- F. 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. Project Schedule: Critical path schedule showing start and completion of each phase of work being performed by the Sports Field Contractor.
- C. Submit the following within 48 hours of bid opening:
  - 1. List of most recent installation/reference for all projects of similar scope to this project completed in the last ten (10) years (see requirements in Quality Assurance below).
  - 2. Resume and current American Sports Builder Association (ASBA) Certification of proposed Certified Field Builder (CFB).
- D. Conformance survey of finished subgrade elevations (see Field Quality Control below).

- E. Conformation report from the Special Inspector that all test results have met the contract requirements.
- F. List of all grading equipment expected to be used.
- G. Materials Sources: Submit name of imported materials source.
- H. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- I. Compaction Density Test Reports.

#### **1.06 QUALITY ASSURANCE**

- A. All material approvals must be obtained prior to delivery of materials to the site.
- B. The Sports Field Contractor shall be responsible for all work associated with this specification section, and meet the following requirements:
  - 1. Be an active member of the American Sports Builder Association (ASBA) with a minimum of one (1) Certified Field Builder (CFB) on staff who will be on site and responsible for all work performed within this section.
  - 2. Have experience in constructing and renovation of sand based or sand capped athletic fields under the current company name and ownership.
  - 3. Have successfully completed a minimum of five (5) NCAA Division 1, NFL, MLS or MLB sand based or sand capped natural grass fields in the past ten (10) years.
  - 4. All grading equipment shall be high-floatation, turf tire or low ground pressure agricultural equipment. Fully automatic laser controlled grading box or blade should be used to achieve the specified tolerance from the required elevations.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where approved by the Owner.
  - 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 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 and no more than 15-percent rock/gravel in any location.

#### **2.02 ACCESSORIES**

- A. Geotextile Fabric: Water pervious type, black polypropylene, non-biodegradable, non-woven, needlepunched, 6 oz minimum weight.

#### **2.03 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 and approved in accordance with the Contract 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. Verify areas to be filled are not compromised with surface or ground water.

#### **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. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches loose depth when using heavy compaction equipment (sheepsfoot rollers, smooth drums, etc.), and layers not exceeding 4 inches loose depth when using hand operated or remote controlled equipment.
- G. Correct areas that are over-excavated.
  - 1. Sand cap areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.
- H. Compaction Density Unless Otherwise Specified or Indicated:
  - 1. At sand cap areas: 97 percent of maximum dry density.
  - 2. At non-athletic landscape areas more than 15-feet beyond the sand cap area perimeter: 92 percent of maximum dry density.
- I. Reshape and re-compact fills subjected to vehicular traffic.

- J. 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 additional Dewatering requirements.

### **3.04 TOLERANCES**

- A. Top Surface of Athletic Field Subgrade: Plus or minus 1/4 inch from required elevations.
- B. The Contractor is to have a licensed land surveyor perform a topographical survey of the finished subgrade surface on a 25-foot grid, or continuously if flown, over the full sand base area. The surveyor is to provide a stamped and signed certification drawing to the Architect to ensure that the above requirements are met.

### **3.05 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 D6938.
- C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard 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 5000 sq. ft. or less of field area, 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 sand cap areas.
- H. Upon completion, the prepared subgrade is to be surveyed by a Licensed Land Surveyor to ensure that it is within a tolerance of 0.5-inches within a 25-foot grid. The surveyor is to provide a drawing of the actual survey locations and elevations.

### **3.06 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 312316  
EXCAVATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Excavating for athletic field renovation and sand cap natural grass installation..

**1.02 RELATED REQUIREMENTS**

- A. Section 015713 - Temporary Erosion and Sediment Control: Slope protection and erosion control.
- B. Section 312200 - Grading: Grading.
- C. Section 312316.13 - Trenching: Excavating for utility trenches to utility main connections.
- D. Section 312319 - Dewatering
- E. Section 312323 - Fill: Fill materials, backfilling, and compacting for clay infields.
- F. 312217 - Athletic Field Natural Grass Subgrade: Fill materials, backfilling, and compaction.
- G. Section 334100 - Subdrainage: Filter aggregate and filter fabric for sub drainage systems.

**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 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.
- B. 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 Architect. If the proposed excavation extends more than 1 foot into the prevailing groundwater, control groundwater intrusion with a comprehensive dewatering procedures, or as directed by Geotechnical Engineer. Refer to Specification Section 312319 for additional Dewatering requirements.

**3.02 PREPARATION**

- A. Identify required lines, levels, contours, and datum locations.
- B. See Section 312200 for topsoil removal.
- C. Locate, identify, and protect utilities that remain and protect from damage.
- D. Notify utility company to remove and relocate utilities.
- E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.



- F. Ensure that dewatering measures have been implemented and are functioning prior to excavation activities. Refer to Specification Section 312319 for additional Dewatering requirements.
- G. 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.

### **3.03 EXCAVATING**

- A. Excavate to accommodate 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. Do not interfere with 45 degree bearing splay (zone of influence) of foundations without approval from the Architect and approved specific backfill requirements.
- E. Cut utility trenches wide enough to allow inspection of installed utilities.
- 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. Remove excavated material that is unsuitable for re-use from site.
- J. Stockpile excavated material to be re-used in area designated on site 312200.
- K. Remove excess excavated material from site.

### **3.04 REPAIR**

- A. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 312323.

### **3.05 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.

### **3.06 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 312316.13  
TRENCHING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Excavation, backfilling and compacting for utilities and irrigation systems.

**1.02 RELATED REQUIREMENTS**

- A. Section 015713 - Temporary Erosion and Sediment Control.
- B. Section 312200 - Grading: Site grading.
- C. Section 312316 - Excavation: Mass excavation
- D. Section 312323 - Fill: Backfilling for clay infield areas.
- E. Section 312217 - Athletic Field Natural Grass Subgrade: Fill materials, backfilling, and compaction in natural grass areas.
- F. Section 334100 - Subdrainage: Filter aggregate and filter fabric for foundation drainage systems.

**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/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)); 2012.
- C. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- D. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.
- E. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

**1.05 SUBMITTALS**

- A. Materials Sources: Submit name of imported materials source.
- B. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- C. 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 (CL): Subsoil excavated on-site and imported from off-site 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. Pipe Bedding Granular Fill - Fill Type #8 Crushed Limestone: Fine aggregate, conforming to State of Kentucky Highway Department standard.
- C. Root Zone Fill - See Section 329117.

## **2.02 ACCESSORIES**

- A. Geotextile Fabric: Non-biodegradable, non-woven, needle punched, 6-oz/sy(minimum weight) .

## **2.03 SOURCE QUALITY CONTROL**

- A. See Division 1 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. Verify that survey bench marks and intended elevations for the work are as indicated.

### **3.02 PREPARATION**

- A. All trenching is unclassified, including trenching in bedrock.
- B. Identify required lines, levels, contours, and datum locations.
- 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. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Architect. Refer to Specification Section 312319 for additional Dewatering requirements.

### **3.03 TRENCHING**

- A. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.
- C. Do not interfere with 45 degree bearing splay of foundations (Zone of Influence) without approval from the Architect and Structural Engineer and approved specific backfill procedures.
- D. Cut trenches wide enough to allow inspection of installed utilities, but no more than twice the pipe diameter or 12-inches, whichever is greater for the total trench width.
- E. Hand trim excavations. Remove loose matter.

- F. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.
- G. Remove excavated material that is unsuitable for re-use from site.
- H. Stockpile excavated material to be re-used in area designated in Section 312200.
- I. Provide temporary means and methods, as required, to remove all water from trenching 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 additional Dewatering requirements.
- J. Determine the prevailing groundwater level prior to trenching. If the proposed trench 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. Refer to Specification Section 312319 for additional Dewatering requirements.

### 3.04 PREPARATION FOR UTILITY PLACEMENT

- A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with:
  - 1. General Fill in areas outside of new sod and in areas where excavations extend below the root zone material.
- B. Remove loose soil and any debris from the excavation prior to installing the utility and backfill.
- C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- D. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

### 3.05 BACKFILLING

- A. Backfill to contours and elevations indicated using unfrozen materials.
- B. Employ a placement method that does not disturb or damage other work.
- C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- D. Maintain within 2% of the optimum moisture content of fill materials to attain required compaction density.
- E. Granular/Crushed Stone Fill: Place and compact materials in equal continuous layers not exceeding 6 inches loose depth when using heavy compaction equipment (sheepsfoot rollers, smooth drums, etc.) and not exceeding 4 inches loose depth when using hand operated or remote controlled equipment.
- F. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches loose depth when using heavy compaction equipment (sheepsfoot rollers, smooth drums, etc.) and not exceeding 4 inches loose depth when using hand operated or remote controlled equipment.
- G. Correct areas that are over-excavated.
  - 1. Infield areas: Use general fill, flush to required elevation, compacted to minimum 98 percent of maximum dry density.
  - 2. See Section 329117 for root zone material backfilling methods.
  - 3. Subgrade below root zone material: Use general fill, flush to required elevation, compacted to minimum [98] percent of maximum dry density.
- H. Compaction Density Unless Otherwise Specified or Indicated:
  - 1. At landscape locations: 85 percent of maximum dry density.
- I. Reshape and re-compact fills subjected to vehicular traffic.

### **3.06 BEDDING AND FILL AT SPECIFIC LOCATIONS**

- A. Utility Piping and Conduits:
  - 1. Bedding: Use Fill Type Pipe bedding granular fill for the initial 4-inch thick utility setting/leveling bed.
  - 2. Cover with pipe bedding granular fill or sand to 4-inches above the utility and finish with general fill in non-structural subgrade locations, and root zone material in sod locations.
  - 3. Compact to 98 percent of maximum dry density.
  - 4. Compact in maximum 4 inch loose lifts to 98 percent of maximum dry density.
- B. At utility trenches excavated as a result of demolition and removal of existing utility lines and structures.
  - 1. At all :
    - a. Trenches that will not be reused for new utilities are to be backfilled with General Fill up to the subgrade elevation immediately adjacent to the trench.

### **3.07 TOLERANCES**

- A. Top Surface of General Backfilling: Plus or minus 1/2 inch from required elevations.

### **3.08 FIELD QUALITY CONTROL**

- A. See Division 1 for general requirements for field inspection and testing.
- B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with AASHTO T 180 or ASTM D698 ("standard Proctor").
- C. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- D. Frequency of Tests: One (1) test for each 150 feet or less of trench length.

### **3.09 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 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.
- C. Section 312316.13 - Trenching: Excavating and backfilling for site subdrainage systems.
- D. Section 334600 - Subdrainage

**1.03 REFERENCES**

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

**1.04 PROJECT CONDITIONS**

- A. The Contractor is to provide any temporary piping required to reroute downspout and roof drains away from the work areas until the permanent drainage system is installed and in working order.
- B. Dewatering systems shall be installed prior to excavation activities in order to control surface and ground water flows. Dewatering measures shall be maintained and remain installed for the duration of project activities.
- C. 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.
  - 2. Dewatering systems shall be installed prior to excavation activities in order to control surface and ground water flows. Dewatering measures shall be maintained and remain installed for the duration of project activities.
  - 3. Prevent water from ponding inside foundation walls, including after the floor slabs have been installed, and causing the foundation soils to become saturated.

**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 or on footings that have already been installed but not backfilled. Do not use utility, foundation or other trenches as temporary drainage ditches unless specifically designed for only that purpose.

- C. Do not use open-sump pumping that leads to loss of fines, soil piping, subgrade softening and slope instability.
- D. 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.
- E. 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 holes in interior slabs and voids under the 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 athletic infields.
- 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 312316.13 - Trenching: Excavating and backfilling for utility trenches to termination..
- E. Section 312217 - Athletic Field Natural Grass Subgrade: Fill materials, backfilling, and compaction in natural grass areas.
- F. Section 329117 - Athletic Field Natural Grass Root Zone
- G. Section 334100 - Subdrainage: Filter aggregate and filter fabric for foundation drainage systems.

**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/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)); 2012.
- C. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.
- D. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.
- E. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.
- F. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.
- G. 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. Product Data for Manufactured Fill for:
  - 1. Infield Base Mix
  - 2. Mound Clay
  - 3. Calcined Clay Field Conditioner

4. Warning Track Material
- B. Samples:
  1. 10 pounds sample of each type of fill for the athletic fields; submit in air-tight containers.
  2. 5 gallon bucket of subdrainage pea gravel.
- C. Materials Sources: Submit name of imported materials source.
- D. Test reports showing that the proposed root zone sand successfully bridges the pea gravel drainage stone.
- E. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- F. 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. Infield Mix: Baseball & Softball infield base mix consisting of a blend of red sand and red clay
  1. Basis of Design: SAF Select Infield Mix, Southern Athletic Fields, 1309 Mainsail Drive, Columbia, Tennessee 38401, Phone: 800-837-8062
    - a. Other Manufacturer's of equal or similar systems may be submitted for review and approval by Architect by addendum during the bidding phase.
  2. Material: Blend of Clay, Silt, Fine and Medium Sand
    - a. Sand: 70% +/- 2%
    - b. Silt: 13% +/- 2%
    - c. Clay: 17% +/- 2%
    - d. SCR: 0.7-0.85
    - e. Medium Sand: > 42% +/- 2%
    - f. Color: Red
- B. Mound Clay: High Density Red Montmorillonite Calcined Clay Material.
  1. Basis of Design: SAF MAR Mound Clay, Southern Athletic Fields, 1309 Mainsail Drive, Columbia, Tennessee 38401, Phone: 800-837-8062.
    - a. Other Manufacturer's of equal or similar systems may be submitted for review and approval by Architect by addendum during the bidding phase.
  2. Material: High Density Red Clay
    - a. Sand: 25% +/-2%
    - b. Silt: 18% +/-2%
    - c. Clay: 56% +/- 2%
    - d. SCR: 0.20-0.40
    - e. Medium Sand: > 15% +/- 2%
    - f. Color: Red
- C. Calcined Clay Field Conditioner & Top Dressing for Baseball and Softball Fields:
  1. Basis of Design: PlayMaker Red Field Conditioner, Southern Athletic Fields, 1309 Mainsail Drive, Columbia, Tennessee 38401, Phone: 800-837-8062.
    - a. Other Manufacturer's of equal or similar systems may be submitted for review and approval by Architect by addendum during the bidding phase.
  2. Material: Kiln Dried super calcined and milled natural Montmorillonite, non-swelling illite and silica clay.
    - a. Porosity: Total 78%, with 41% capillary and 37% non-capillary
    - b. Oil Absorption: 55%

- c. Water Absorption: 71%
  - d. PH range: 6.25 +/- 0.25
  - e. CEC: 33.6mEq/100g
  - f. Partial Stability: Sulfate Soundness Testing (ASTM C-88) and static degradation test not to exceed 4% loss over 20 years.
  - g. Bulk Density: 40+/-2lb per cubic foot
  - h. Color Range: Red
- D. Warning Track: Baseball & Softball Field Granular Track Material.
- 1. Basis of Design: SAF Trac, Southern Athletic Fields, 1309 Mainsail Drive, Columbia, Tennessee 38401, Phone: 800-837-8062.
    - a. Other Manufacturer's of equal or similar systems may be submitted for review and approval by Architect by addendum during the bidding phase.
  - 2. Material: Dry Screened Expanded Red Shale
    - a. Color: Red
    - b. Infiltration Rate: 400 in/hr
    - c. Bulk Density: 1.39 g/cc
    - d. Gradation Requirements for warning track: Match existing gradation.

## 2.02 ACCESSORIES

- A. Geotextile Fabric: Water pervious type, black polypropylene, non-biodegradable, non-woven, needlepunched, 6 oz minimum weight.

## 2.03 SOURCE QUALITY CONTROL

- A. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
- B. If tests indicate materials do not meet specified requirements, change material and retest.
- C. 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. Verify subdrainage and storm drainage installation has been inspected.
- E. Verify areas to be filled are not compromised with surface or ground water.

### 3.02 PREPARATION

- A. Scarify subgrade surface to a depth of 2 inches to identify soft spots.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with infield mix.
- 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. 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. Soil Fill: Place and compact material in equal continuous layers not exceeding 4 inches loose depth when using heavy compaction equipment (sheepsfoot rollers, smooth drums, etc.), and layers not exceeding 4 inches loose depth when using hand operated or remote controlled equipment.
- G. Compaction Density Unless Otherwise Specified or Indicated:
  - 1. At skinned athletic areas: 92 percent of maximum dry density.
- H. Reshape and re-compact fills subjected to vehicular traffic.
- I. 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 additional Dewatering requirements.

#### **3.04 TOLERANCES**

- A. Top Surface of General Filling: Plus or minus 1/4 inch from required elevations.

#### **3.05 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") 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 fill area 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.

#### **3.06 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 321613  
CONCRETE CURBS AND GUTTERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Concrete header curbs for trench drain installation.

**1.02 RELATED REQUIREMENTS**

- A. Section 312200 - Grading: Preparation of site for new work .

**1.03 REFERENCE STANDARDS**

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).
- B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2005.
- C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.
- D. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 1999.
- E. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 1988 (Reapproved 2002).
- F. ASTM C 33 - Standard Specification for Concrete Aggregates; 2007.
- G. ASTM C 39/C 39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2005.
- H. ASTM C 94/C 94M - Standard Specification for Ready-Mixed Concrete; 2007.
- I. ASTM C 150 - Standard Specification for Portland Cement; 2007.
- J. ASTM C 173/C 173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2008a.
- K. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete; 2006.
- L. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2007.
- M. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete; 2008a.
- N. ASTM C 618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2008a.
- O. ASTM C 685/C 685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2007.

**1.04 SUBMITTALS**

- A. See Division 1 Sections for submittal procedures.
- B. Product Data: Provide data on admixtures, curing compound, and fiber reinforcement.
- C. Installer qualifications using Macro Fiber reinforcement in finished, exterior concrete.
- D. Design Data: Indicate curb/gutter thickness, designed concrete strength, reinforcement, and typical details. Separate mix designs are required for conventionally formed concrete and machine placed or slip-formed concrete.

## **PART 2 PRODUCTS**

### **2.01 FORM MATERIALS**

- A. Form Materials: Conform to ACI 301 and as follows.
- B. Wood form material, profiled to suit conditions.

### **2.02 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 C 150 Air Entraining - Type IA portland type, grey color.
- D. Fine and Coarse Mix Aggregates: ASTM C 33.
- E. Fly Ash: ASTM C 618, Class F - Optional for mixes used for slip forming of curb and gutter, or slip forming of concrete pavements. Fly ash is not to be used in concrete that is not slip formed or extruded..
- F. Water: Clean, and not detrimental to concrete.
- G. Fiber Reinforcement: Structural, macro synthetic, fibrilated, polypropylene fibers shown to have long-term resistance to deterioration when in contact with alkalis and moisture; 1.5 to 2 inch length and manufactured to provide post-cure concrete strength and increase freeze/thaw resistance.
  - 1. Acceptable Products:
    - a. TUF-STRAND SF by Euclid Chemical
    - b. Nycon-XL200 by Nycon Corporation
    - c. Fibermesh 650 by Propex Operating Company
    - d. Forta-Ferro by Forta Corporation
- H. Air Entrainment Admixture: ASTM C 260.
- I. Chemical Admixtures: ASTM C 494/C 494M, 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.

### **2.03 ACCESSORIES**

- A. Curing Compound: ASTM C 309, Type 1, Class A.

### **2.04 CONCRETE MIX DESIGN**

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
- C. Macro Fiber Reinforcement: Add to mix at rate of 7 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. Fiber reinforcement is only to be used when slip forming of concrete is performed.
- D. Concrete Properties:
  - 1. Compressive Strength (prior to adding fiber), when tested in accordance with ASTM C 39/C 39M at 28 days: 4000 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. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
3. Cement Content: Minimum 600 lb per cubic yard.
4. Water-Cement Ratio: Maximum 0.44 percent by weight.
5. Total Air Content: 6 percent +/- 1%, determined in accordance with ASTM C 173/C 173M.
6. 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.
7. Maximum Aggregate Size: 1 inch.

## **2.05 MIXING**

- A. Transit Mixers: Comply with ASTM C 94/C 94M.
- 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 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. Notify Architect minimum 24 hours prior to commencement of concreting operations. Architect is to review and approve sample pours prior to installation of permanent concrete.

### **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.

### **3.05 REINFORCEMENT**

- A. Use fiber reinforcement for all concrete.

### **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 place concrete when base surface is wet.
- C. Place concrete continuously over the full length of the run and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
- D. Place expansion joints at the beginning and ending of each pour.

### 3.08 FINISHING

- A. Curbs: Uniform float finish and round edges. Finish the top face while the concrete is plastic by wetting and rubbing with a carborundum brick. Provide uniform texture and color.
- B. Remove "slop" created by the concrete finishing from all joints and edges.
- C. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.
- D. Exposed macro fibers are to be removed using a propane torch and stiff brush after a minimum of 56-days curing of the concrete. Care should be taken to not overheat the concrete and cause it to be discolored, damaged or lose strength.

### 3.09 TOLERANCES

- A. Maximum Variation of Surface Flatness and Face Alignment: 1/8 inch in 10 ft.
- B. Maximum Variation From True Position: 1/4 inch.

### 3.10 FIELD QUALITY CONTROL

- A. Allow an 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 C 39/C 39M. For each test, mold and cure four concrete test cylinders. Obtain test samples for every 25 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.

### 3.11 PROTECTION

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

### END OF SECTION



**SECTION 321823.29  
ARTIFICIAL TURF**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Synthetic Turf System includes, but is not limited to, the following:
  - 1. Infill Type Competition Game Field Turf System consisting of both polyethylene monofilament fiber and polyethylene slit film fiber (full height), specifically designed, manufactured, and installed for the intended sport of baseball and softball.
    - a. The extent of synthetic turf work is shown on the drawings.
  - 2. Non-Infill Type Turf System consisting of both polyethylene monofilament fiber and polyethylene slit film fiber (full height), 5mm pad, specifically designed, manufactured, and installed for the intended sport of baseball and softball infield.
  - 3. Infill System
  - 4. Vertical draining base materials
  - 5. G-Max and Performance Testing
- B. The synthetic turf, and drainage base and pipe work is to be directly supervised in the field by an ASBA Certified Field Builder (CFB).

**1.02 RELATED REQUIREMENTS**

- A. Section 116833.23 - Athletic Equipment - Field
- B. Section 321123 - Aggregate Base Courses
- C. Section 334100- Subdrainage

**1.03 REFERENCE STANDARDS**

- A. ASTM D 5823 - Standard Test Method for Pile Height of Yarn
- B. ASTM D 5848 - Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Coverings (pile weight, primary and secondary backing, and total weight)
- C. ASTM D 5739 - Standard Test Method for Stitch Gauge
- D. ASTM D 1335 - Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings
- E. ASTM F 2765-09 - Standard Specification for Total Lead Content in Synthetic Turf Fibers
- F. ASTM F1015-03(2009) - Standard Test Method for Relative Abrasiveness of Synthetic Turf Playing Surfaces
- G. ASTM F 2898-11 - Standard Test Method for Permeability of Synthetic Turf Sports Field Base Stone and Surface System by Non-confined Area Flood Test Method
- H. EN 12616 - European Standards for Water permeability
- I. ASTM F355a - Standard Test Method for Shock-Absorbing Properties of Playing Surface systems and Materials
- J. ASTM F 1936-10 - Standard Specification for Impact Attenuation of Turf Playing Systems as Measured in the Field (g-Max)
- K. ASTM F 3189-17 - Standard Test Method for Measuring Force Reduction, Vertical Deformation, and Energy Restitution of Synthetic Turf Systems Using the Advanced Artificial Athlete
- L. EN 1969 - Surfaces for Sports Areas, Determination of Thickness of Synthetic Sports Surfaces, Infill Depth

- M. EN 12616 - European Standards for Planarity

#### 1.04 DEFINITIONS

- A. Synthetic Turf Manufacturer: company that makes and brands the synthetic turf carpet used for the project including any inlays and logos.
- B. Synthetic Turf Contractor: company responsible for the construction of the synthetic turf system including the base preparation, subdrainage system, drainage base and fabric, leveling stone, shock pad/underlayment pad, synthetic turf carpet and infill and inlays (including control and supervision of the Synthetic Turf Installer), and field/turf amenities including but not limited to bases, plates, and pitching rubbers.
- C. Synthetic Turf Installer - group responsible for the installation of the synthetic turf carpet, pad, infill and all inlays and logos.

#### 1.05 SUBMITTALS

- A. Submit the following within 48 hours of bid opening:
1. Certificate for Certified Field Builder (CFB) proposed for the project.
  2. One (1) copy of most recent installation/reference list for all projects of similar scope to this project completed in the last three years.
  3. One (1) copy of the resume of proposed installation foreman. Installation crew must meet or exceed all requirements outlined in this Section.
  4. One (1) copy of a manufacturers sample warranty.
  5. A list from the turf manufacturer of all turf fiber and turf backing failures experienced and reported in the past 10 years regardless of whether the turf was replaced under warranty or not. The list is to include the name, location, phone number and other contact data of the Owner.
- B. Submit the following as part of the shop drawing process and prior to ordering materials:
1. One (1) copy of a manufacturers seam layout plan, striping plan and any details of construction which deviate from the plans and specifications.
  2. Material Certificates: Three (3) copies for each material from material producer that will be used for this project. Each material certificate must be stamped and checked as approved by the Synthetic Turf Contractor before submittal to the Architect. Required material certificates include but are not limited to the following:
    - a. A statement of origin, composition, and manufacturer of all aggregate materials to be used, including testing information supporting that the proposed aggregates meet or exceed these specifications.
    - b. A statement of origin, composition, and manufacturer of all infill materials to be used, including testing information supporting that the proposed infill meets or exceeds these specifications.
    - c. Supplier's material certification for aggregate.
    - d. Suppliers material certification for concrete.
    - e. Product data sheets on all drainage pipe, fittings, and geotextiles fabrics.
  3. Provide a colored striping plan detailing lines and mowing pattern layout. Coordinate with Owner or Owner's Representative and Architect to get final approval of all designated colors, dimensions, mowing pattern and logo designs.
  4. Test reports for testing done within the past two (2) years verifying that the proposed turf meets the specifications for tuft binds, final tuft height, yarn size and thickness, face weight, total weight, and backing. If acceptable test data cannot be provided, then two (2) 24" x 24" samples of proposed synthetic turf carpet are to be provided and sent to an independent testing agency by the Contractor to be tested for tuft binds, final tuft height, yarn size and thickness, face weight, total weight and backing.
  5. Three (3) color yarn samples, 10-foot long for each color used.

6. One (1) five (5) gallon bucket of each type of drainage stone.
  7. One(1) two (2) gallon bucket of each type of infill material.
  8. Two (2) 12" x 12" samples of non-woven filter fabric.
  9. One (1) copy of product data and testing documents demonstrating that proposed product meets or exceeds all specified requirements.
  10. Copies of independent laboratory test reports on system or components:
    - a. ASTM D 792 Specific Gravity
    - b. ASTM D 1335 Tuft Bind
    - c. ASTM D 5034 Grab Breaking Strength
    - d. ASTM D 5793 Stitch Gauge
    - e. ASTM D 418 Pile Height
    - f. ASTM D 5848 Face, Backing (primary and secondary) and Total Weights
    - g. ASTM D 2859 Flammability (Pill test)
    - h. ASTM F 1551 Shoe Traction
    - i. ASTM F 1551 Water Permeability
    - j. ASTM F 1015 Abrasive Index
    - k. Lead Compliance testing showing that the turf and infill materials meet all applicable standards of the Consumer Product Safety Commission (CPSC) requirements.
  11. Product data on the turf maintenance equipment that is to be provided by the Contractor.
- C. Submit the following after the materials have been delivered to the site:
1. Provide to the Architect materials samples of the following: one (1) gallon each of rubber or combination of rubber and sand infill material,
  2. Eight (8) 24" x 24" samples of synthetic turf carpet cut from delivered rolls as selected by the Architect. These will be sent to an independent testing agency by the owner to be tested for tuft binds, final tuft height, yarn size and thickness, face weight and backing.
  3. One (1) five (5) gallon bucket of each type of drainage stone.
- D. Prior to Final Acceptance of the finished product, the Synthetic Turf Contractor shall submit to the owner three (3) copies of their maintenance manuals. These manuals will include all necessary instructions for the proper care and maintenance of the newly installed synthetic turf system.

## 1.06 QUALITY ASSURANCE

- A. The synthetic turf manufacturer shall meet the following criteria:
1. Operations:
    - a. The synthetic turf manufacturer is to provide proof that they have been in business under the same name for a minimum of five (5) years.
  2. Experience:
    - a. The synthetic turf manufacturer must have a minimum of one (1) successful Power Five NCAA game or practice field installation and must provide documentation of such.
    - b. The synthetic turf manufacturer must be experienced in the manufacturing of this type of artificial turf system and provide project references of the synthetic grass system being installed at ten (10) similar exterior sites in the last three (5) years, a minimum of 40,000 square feet each.
    - c. A letter from the turf manufacturer stating that the installation crew and foreman are manufacturer certified must be submitted and approved prior to the start of turf installation.
- B. The synthetic turf contractor shall meet the following criteria:
1. Operations:
    - a. The synthetic turf contractor is to provide proof that they have been in business under the same name for a minimum of ten (10) years.

- b. The synthetic turf contractor must provide competent workmen skilled in this type of artificial turf installation. The designated Supervisory personnel on the project must be approved in writing by the turf manufacturer as competent in the installation of this material, including gluing and sewing seams and proper installation of the infill mixture. The synthetic turf manufacturer shall have a qualified inspector certify the installation and warranty compliance.
  - c. The synthetic turf installer must provide a qualified installation foreman to coordinate and review the component parts of the synthetic turf system. Submit a resume of experience for Architects approval prior to starting work.
  - d. The turf, pad, infill, drainage layer, subdrainage installation and all laser grading activities must be directly supervised by a American Sports Builders Association (ASBA) Certified Field Builder (CFB).
2. Experience:
- a. The synthetic turf contractor must specialize in athletic field projects and the associated drainage and fine grading to tight tolerances.
  - b. The synthetic turf installer must provide factory-trained technicians skilled in the installation of athletic-caliber infilled synthetic turf systems to undertake the placement of the turf.
  - c. The synthetic turf installation crew shall have installed a minimum of six (6) similar exterior rubber or rubber and sand filled synthetic turf systems of 60,000 square feet or greater in the past three (3) years.

C. Warranties:

- 1. Turf Manufacturer's Warranty: this warrants the usability and playability of the artificial turf fiber and backing system for its intended uses for a minimum of an eight (8) year period commencing with the date of Substantial Completion. The warranty coverage shall not be prorated nor place limits on the amount of the fields usage, and should include, but not be limited to the following:
  - a. Include unusual wear and damage caused from UV degradation as determined by tensile strength decreasing by 50% or more. The warranty shall specifically exclude vandalism and acts of God beyond the control of the manufacturer or installer.
  - b. Assure the availability of exact or substantially the same replacement materials for the artificial turf installed for the full warranty period.
- 2. Contractor's Warranty: this warrants the field installation including, but not limited to the turf seams, infill, stone base, subdrainage, and subgrade, and is held by the General Contractor for the project, or the bid package contractor if done via Construction Management. The warranty must have the following characteristics and cover all items :
  - a. Provide full system coverage including any settlement, stone base migration, turf seams and edge attachment.
  - b. Warrant materials and workmanship of the infill, drainage base, drainage piping system, and sub-base. If sub-base work and drainage base are installed by separate sub-contractors, the General Contractor shall still provide full warranty for all work as described in these documents.
  - c. Warrant that the infill, drainage stone, piping and filter fabric materials installed meet or exceed the product specifications.
  - d. Cover defects in the installation and workmanship. Assure the installation was done in accordance with both the manufacturer's recommendations and any written directives of the manufacturer's on-site representative.
  - e. Shall be limited to repair or replacement of the affected areas, (unless the field fails to meet the required G-Max rating in which case a full field renovation or replacement will be required) at the option of the manufacturer, and shall include all necessary materials, labor, transportation costs, etc. to complete said repairs.
  - f. The installed synthetic turf system's drainage capability shall allow water flow through the system at a rate of not less than ten (10) inches per hour upon

- completion of the installation, and not drop below eight (8) inches per hour for the duration of the warranty period.
- g. A copy of this warranty shall be provided to the Owner.
3. The Synthetic Turf Contractor may be required upon the request of the owner to provide a list of three clients that they have completed work for after the sale warranty.
- D. All designs, game markings, and layouts shall conform to all currently applicable National Federation State High School Association or KHSAA rules and regulations, or league specific requirements, depending on what applies.
- E. All components and their installation method shall be designed and manufactured for use on outdoor athletic fields. The materials as hereinafter specified, shall withstand full climatic exposure in the location of the field, be resistant to insect infestation, rot, fungus and mildew; it shall also withstand ultra-violet rays and extreme heat, it shall allow the free flow of water horizontally to perimeter areas and vertically to the gravel blanket and into the field drainage system below the surface.
- F. The turf seams of all system components shall provide a permanent, tight, secure, and hazard free athletic playing surface. All inlaid markings (game lines, logos, etc.) shall remain in place throughout the duration of the full, 8 year warranty period.

## **PART 2 - PRODUCTS**

### **2.01 ARTIFICIAL TURF MATERIALS**

- A. Infill Type Competition Game Field Turf System - Dual Fiber Monofilament and Slit Film Synthetic Grass:
1. Face Pile Weight:
    - a. Softball Outfield Areas: 52 oz/sy minimum
  2. Face Yarn Type: polyethylene parallel-long slit fiber and monofilament fiber manufactured in the United States or Europe. No Chinese yarns or yarns with lead are allowed.
  3. Yarn Size/Ends:
    - a. 7,500 - 10,000 denier (8 ends/1250 denier per end) minimum
  4. Yarn Thickness: 100 microns (min) slit film, 300 microns (min) mono
  5. Pile Height (Finished):
    - a. Softball Outfield Areas: 2 inches (+/- 1/8")
  6. Construction: Broadloom tufted
  7. Tufting Gauge: 3/8"
  8. Tuft Bind: 10 lbs (minimum)
  9. Primary Backing: dimensionally stable 1-part (3 components) polypropylene, polyester and fiber backing, 8 oz/sy minimum, perforated for drainage
  10. Secondary Backing: 20 oz/sy (minimum) urethane, full coverage of primary backing
  11. Total Product Weight: 80 oz/sy (+/- 2 oz)
  12. Finished Roll Width: 15 feet
  13. Finished Roll Length: Up to 220 feet
  14. Perforation (Outdoors): 3/16" holes on staggered 4" (approximate) centers
  15. Permeability: 20" +/- per hour.
  16. Average Abrasive Index (ASTM F1015): Less than 30.
- B. Non-Infill Type Turf System - Dual Fiber Monofilament Synthetic Grass:
1. Face Pile Weight:
    - a. 60 oz/sy minimum
  2. Face Yarn Type: polyethylene monofilament fiber with texturized polypropylene thatch manufactured in the United States or Europe. No Chinese yarns or yarns with lead are allowed.
  3. Yarn Size/Ends:
    - a. Polyethylene Turf Fibers: 10,800/8 (Denier/Ends)
    - b. Texturized Polypropylene (Thatch): 4,600/8 (Denier/Ends)

4. Yarn Thickness: 300 microns (min) mono
  5. Pile Height (Finished): 1" (+/- 1/8")
  6. Construction: Broadloom tufted
  7. Tufting Gauge: 3/16" to 1/5"
  8. Tuft Bind: 10 lbs (minimum)
  9. Primary Backing: dimensionally stable 1-part (3 components) polypropylene, polyester and fiber backing, 7 oz/sy minimum, perforated for drainage.
  10. Secondary Backing: 20 oz/sy (minimum) urethane, full coverage of primary backing.
  11. Integral pad: 5mm (minimum) Perforated
  12. Total Product Weight without Pad: 87 oz/sy (+/- 2 oz)
  13. Finished Roll Width: 15 feet
  14. Finished Roll Length: Up to 220 feet
  15. Perforation (Outdoors): 3/16" holes on staggered 4" (approximate) centers
  16. Permeability: 20" +/- per hour.
  17. Average Abrasive Index (ASTM F1015): Less than 30.
- C. Field Colors:
1. Softball Field Areas:
    - a. Warning Track: One color of turf to be chosen from manufacturer's full range of colors.
    - b. Infield: One color of turf to be chosen from manufacturer's full range of colors.
  2. Field markings: White
  3. Striping:
    - a. Softball: White
  4. Logos: The University will paint all logos/graphics required for the turf areas.
- D. Resilient Infill Composition:
1. A resilient infill system, consisting of a specially formulated mixture of SBR crumb rubber and rounded or non-angular silica sand engineered to provide the look, feel, footing, and shock absorption of a natural grass field in ideal conditions.
    - a. SBR Rubber. Granules shall contain minimal dust or contaminants and shall be derived from the ambient processing form of recycled passenger car tires (truck or equipment tires are not permitted). Color shall be substantially black.
      - 1) The clean, uniformly sized particles shall be consistent in shape and particle size distribution.
      - 2) The particles shall resist abrasion in high traffic and excessive wear applications and provide stability to synthetic sports turf applications.
      - 3) The particles shall be processed and sized under rigid specifications and manufacturers' statistical and quality control assurance program.
      - 4) Particles shall be structurally pure and consistently uniform in size distribution for predictable performance.
      - 5) The particles cannot be from another field or have been used for any other purpose, and must be "first use" from the tire recycling facility.
    - b. Sand Particulate. The sand provided as a component of the infill mixture shall be rounded or non-angular so as to minimize abrasion to the athlete and synthetic grass fibers.

## 2.02 VERTICAL DRAINAGE BASE MATERIALS

- A. Excavation: Existing warning track and infield shall be excavated to the depth required to establish the finished elevations designed by the architect and as shown on the excavation plan. The subgrade shall be shaped to achieve a minimum of 0.5% (one-half of one percent) slope. The sub grade shall also be compacted and proof rolled to a minimum of a 95% Proctor within 2% of optimum moisture.
- B. Geotextile Filter Fabric: Water pervious type, black non-woven, needle punched, polypropylene, 6oz minimum weight.

C. Perforated Drainage Pipe Network: Minimum drainage pipe size shall be 4" diameter and minimum collector pipe size shall be 8" diameter unless indicated larger on the on the drawings. Refer to drawings for location and configuration of drainage pipes and collector pipes. Refer to Section 334100 Subdrainage.

D. Stone Base Courses:

1. The free-draining base aggregate base layer shall consist of a consistent 4.5-inch (minimum) depth of open graded material. Base drainage aggregate used must achieve a minimum 95% standard Proctor within 2% optimum moisture. The open graded aggregate material shall conform to the following criteria:

a. Base Aggregate:

Grading Requirements for Base Aggregate - Open Graded Stone, Washed

Sieve Size	Percent Passing
2"	100
3/4"	92
3/8"	58
No. 4	25
No. 16	9.2

E. Choker Stone Course:

1. The choker material (stone dust) shall be a 1.5-inch (minimum) layer of porous, free draining material, number 1 stone sand or similar material, that will provide a minimum 95% Proctor within 2% of optimum moisture.

a. Choker Material:

Grading Requirements for Choker Material - Porous Stone Sand

Size	Sieve	Percent Passing
	3/8"	100
	No. 4	96.8
	No. 8	72
	No. 16	45
	No. 30	25
	No. 50	13
	No. 100	5
	No. 200	2

F. Other Stone: The Contractor can submit an alternate stone gradation for the Base Stone and Choker Stone for review by the Architect if the Synthetic Turf Manufacturers recommended gradation requirements differ from that identified above as long as the full system warranty will apply.

**2.03 OTHER MATERIALS**

A. Nailer boards are to be dimensional lumber made of recycled plastic (no wood fiber allowed) and suitable for direct bury. Acceptable materials include Markstaar Recycled Plastic Lumber ([www.markstaar.com](http://www.markstaar.com)), and Menards Dimensional Plastic Lumber ([www.menards.com](http://www.menards.com)).

B. Adhesives for bonding tufted synthetic turf shall be moisture cured urethane based and designed specifically for the installation of synthetic turf systems. Seam tape is to be used for all glued or welded seams.

## **2.04 NEW GROOMING EQUIPMENT**

- A. Provide two (2) Stihl or Shindiawa power groomers.
- B. Provide four (4) hand operated synthetic turf rakes, 18" width with aluminum or fiberglass handles.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Ensure that all work is coordinated with other trades.
- B. Verify that the subgrade is dry and ready to support the construction loads, and that all gradients and elevations of the subgrade are correct.
- C. The subgrade is to be surveyed by a Licensed Land Surveyor to ensure that it is within a tolerance of 0.5-inches total (+/- 1/4") within a 25-foot grid. The surveyor is to provide a drawing of the actual survey locations and elevations.

### **3.02 JOB SITE CONDITIONS**

- A. Synthetic Turf installation (or any of it's components) shall not occur if ambient air temperature is below 32 degrees F., materials are below 32 degrees F, rain is falling or pending and/or conditions exist or are pending, that will be unsuitable to the installation.
- B. Synthetic Turf Installation shall not occur if excessive rainy or wet conditions have occurred, which would adversely affect the application and cure of any adhesives.

### **3.03 PRE-INSTALLATION CONFERENCES**

- A. Subgrade Pre-Installation Conference
  - 1. Occurs after subgrade is prepared and surveyed.
  - 2. The Architect and Owner will review the subgrade and survey.
  - 3. Construction procedures will be reviewed with the Contractor of the perimeter curb, subdrainage, geotextile fabric, and stone base.
- B. Artificial Turf Pre-Installation Conference.
  - 1. Occurs after stone choker course is installed and surveyed.
  - 2. The Architect and Owner will review the choker stone course and survey.
  - 3. Construction procedures will be reviewed with the Contractor of the artificial turf and infill material.

### **3.04 INSTALLATION**

- A. The Synthetic Turf Contractor and Installer shall strictly adhere to the installation procedures outlined under this section. Any variance from these requirements must be accepted in writing, by the manufacturer's on-site representative, and submitted to the Architect/Owner, verifying that the changes do not in any way affect the warranty.

### **3.05 PERIMETER ATTACHMENT**

- A. Recycled polyethelene turf nailer board: The synthetic turf perimeter fastening structure shall be installed before the drainage aggregate.
  - 1. Install a 2" x 8" nailer board so that the top of the turf infill will be flush with the bottom of the turf backing to meet the required elevation (or as required by the turf manufacturer). See synthetic turf edge attachment detail on the drawings.

### **3.06 VERTICALLY DRAINING BASE**

- A. Trenching: All piping shall be as specified and connected by manufacturer's couplers, plugs etc.



1. The base grade shall be shaped to mirror the finished grade, or be steeper and have additional drainage stone installed, and approved by the Architect and/or Owner's Representative. The Contractor shall begin layout and trenching for the drainage network as indicated on the drainage plan and all details that apply. Trenching progress shall work upward in elevation to allow for immediate discharge of water from the entire field in the event of a rainfall.
  2. No trenches, with or without pipe, shall be permitted, to remain unfilled overnight and/or while crews are not progressively working on site.
  3. All perimeter trenches must be dug in accordance with the field drainage plan details.
  4. Traffic plates are to be used for crossing over any trenches that have pipe installed but have not had the stone drainage blanket installed.
- B. Install geotextile fabric over excavated, graded and prepared sub-grade. Provide a 12" minimum overlap at all long seams, shingled in the direction of water flow, and 18" minimum overlap at roll ends. Fabric shall first be installed in the drainage trenches prior to installation of perimeter collector lines. After backfilling of all trenches is complete, the entire field shall be covered with fabric prior to the base aggregate application.
- C. Drainage Pipe Installation and Backfilling
1. Collector lines shall be connected to discharge outlet at the onset of operations.
  2. Collector lines shall be installed before lateral lines and shall begin with the deepest elevations.
  3. After all collector and lateral lines have been installed, the Contractor shall repair any sub grade undulations prior to installing geotextile fabric.
- D. Base Drainage Aggregate: The installation of the base drainage aggregate shall only begin after the drainage pipe installation has been inspected and approved by Owner's Representative. Installation of the Free-Draining Base Aggregate shall follow procedures that protect the base grade soils and drainage pipe. The drainage pipe network and its existing elevations shall not be disrupted through ground pressures from trucks, dozers or by any other means.
1. The base grade subsoil shall be dry before undertaking the placement of base aggregate.
  2. Delivery trucks shall enter the field only from the designated entrance point. Base course stone shall be dumped closest to the entrance first and continuously worked towards the furthest point of the field. Extreme care must be taken not to disturb sub grade or drainage network.
  3. Low earth pressure track-type dozers shall push out the stone from behind the pile onto and toward the field center. Dozers shall only traffic the aggregate they are spreading.
  4. Bulldozer blades shall be equipped with a laser-guided hydraulic system. Care shall be taken not to disturb or contact the base grade soils with the dozer blades or tracks. All equipment trafficking over the drainage aggregate shall insure there is a minimum depth of 4" of aggregate between the geotextile fabric and the dozer track ground contact position.
  5. When the aggregate spreading is completed, the surface shall be further firmed by a 5-ton roller. Static vibration shall not be part of this process.
  6. The stone shall be left firm, but not over-compacted as to protect the porosity and drainage capabilities of the aggregate profile.
  7. After the drainage stone has been uniformly spread throughout the surface, the surface shall receive a final laser finished grade. This process shall be accomplished using a turf-type tractor, or lightweight grader, equipped with high flotation tires and a hydraulically controlled laser blade capable of the required tolerance.
  8. The free-draining base course must be installed to a depth of 4.5 inches and shall be independently tested for an overall compaction rate of 95% of Proctor at a moisture content within 2% of optimum in accordance with ASTM D1557.
- E. Choker Levels: The base drainage stone final elevations shall mirror the proposed choker layer final grade material. Care shall be taken not to allow the coarser aggregate to surface into the profile or finished grade of the choker layer.

1. The choker layer shall be applied using high flotation grading equipment. The choker material shall be evenly spread throughout the proposed field surface to the final pre-pad or pre-turf elevations.
  2. After the choker material has been uniformly spread throughout the surface by the described method, the surface shall receive a final laser finish grade. This process shall be accomplished using a turf-type tractor, or lightweight grader, equipped with high flotation tires and a hydraulically controlled laser blade capable of meeting the required tolerance.
  3. Care shall be taken throughout the installation not to force the choker material into the porosity of the base aggregate below.
  4. Final choker layer of stone must be laser graded to a tolerance of +/- ¼" from the required elevation based on a 25-foot grid with a maximum deviation of no more than ¼". The laser grading equipment is to be turf tired with automatic laser guiding. The Contractor is to have a licensed land surveyor perform a topographical survey of the finished choker surface on a 25-foot grid over the full synthetic surface area. The surveyor is to provide a stamped and signed certification drawing to the Architect to ensure that the above requirements are met."
  5. Final layer of stone must be installed at a depth of 1.5 inches. Finished aggregate base must be proof rolled by means of 2 to 5 ton roller. The finished aggregate base must achieve an overall compaction rate of 95% Proctor at a moisture content within 2% of optimum in accordance with ASTM D1557. It shall also be flush with top of the turf nailer board.
- F. Base Acceptance: The Architect and/or Owner's Representative must jointly approve the base before turf installation can begin.

### 3.07 SYNTHETIC TURF AND INFILL

- A. Synthetic Turf and Infill Materials
1. After a final inspection of the drainage base by the Contractor and the Owner's Representative, the synthetic turf installation shall begin.
  2. The rolls of turf shall be rolled out a minimum of one hour prior to starting seaming procedures and allowed to relax/expand.
    - a. All visible wrinkles shall be stretched out before seaming.
    - b. Seams shall be flat, tight and permanent with no separation or fraying.
    - c. Synthetic turf yarn fabric that is trapped between seams shall be freed from the seams by hand or other approved method to an upright position prior to the commencement of brushing and top dressing procedures.
    - d. All synthetic turf seams shall be assembled as follows: The full width rolls shall be laid out across the field. Utilizing standard state of the art gluing procedures, each roll shall be attached to the next.
  3. Tufted and Inlaid Lines
    - a. Layout and descriptions of tufted and inlaid lines shall be as indicated on final shop drawings.
    - b. Inlaid lines and field markings shall be cut in using urethane adhesive seaming methods recommended by the Synthetic Turf Contractor.
- B. Infill Materials: After all seaming is completed and inlaid lines, logos and lettering have been installed and the adhesive cured; the infill materials shall be spread evenly, using a drop spreader or top dresser.
1. For Competition Field Turf Areas, a mixture of crumb rubber and sand shall be applied in a uniform rate of 6lbs/s.f. and to a depth resulting in no more than 1/2-inch of turf fiber being exposed above the top of the infill. The crumb rubber and sand shall be applied at a uniform rate in multiple applications until the specified infill depth is achieved. Infill ratios (by weight) shall be as follows:
    - a. Warning track: 50 percent sand (maximum), 50 percent rubber (minimum)
  2. Infill material shall be brushed between infill applications with a motorized rotary broom and pull-type groomer brush simultaneously.

3. After the infill has been installed and the turf groomed, the turf is to be watered at a rate equivalent to 1-inch of rain.
4. After the infill has been completed and the turf watered for settlement, the infield depth is to be checked to ensure that the infill depth is at least 75% of the pile height for each turf type. If infill is shown to be low, additional infill is to be installed per the required ratio until the required depth is reached.
5. Upon verification of the infill depths, the softball coaches are to perform an evaluation of the warning track. If additional infill material is required to adjust the bounce, roll or speed of the turf system, those materials are to be supplied and installed.

### **3.08 PERIMETER ATTACHMENT**

- A. After final trimming of the turf, the turf shall be screwed into the nailer board system as per the turf manufacturers recommendations, or as follows:
  1. Where concrete slabs or vertical walls are present, install a 2" x 4" nailer board to the slab/wall so that the top of the turf infill will be flush with the top of the adjacent grade or at the designed elevation, by means of concrete screws, such as Tapcon, set every 12 inches. This shall be the responsibility of the Synthetic Turf Contractor. See synthetic turf edge attachment detail on the drawings.
  2. Where no concrete curbs, slabs or walls are present, install 2" x 8" nailer board in the subgrade with the appropriate anchors that will keep the nailer board in a stable, vertical position and prevent movement of the nailer board due to contraction/expansion of the turf or heave of the subgrade. Contractor shall attach a flexible rubber infill retainer to the nailer board. The top of the infill retainer shall be flush with the top of the infill for the turf. See synthetic turf edge attachment detail on the drawings.
  3. Attached edge of turf to nailer boards using 1" (minimum) length, stainless or epoxy coated screws as recommended by the manufacturer. Install screws on 12" centers along runs, and at 6" centers at all corners for a distance of 30 inches.

### **3.09 TURF CLEANING**

- A. Upon completion of the turf installation and prior to testing and puch by the designer, the following are to be performed by the turf installer:
  1. All inlaid areas are to be inspected for excess adhesive and trapped fibers, and all excess adhesive removed and trapped fibers released.
  2. The entire turf area is to be checked for installation pins/spikes using a metal detector to ensure that all pins/spikes have been removed.
  3. All loose fibers are to be removed from the field and the field groomed.

### **3.10 TESTING**

- A. Infiltration Testing
  1. The Owners independent testing laboratory will perform a minimum of four (4) field infiltration tests with at least one located in each quadrant of the field both during and after construction as follows:
    - a. Test permeability of the stone choker and drainage blanket upon completion of the final grading of the choker course and immediately before installation of the turf. The testing to be performed is ASTM F2898-11, Standard Test Method for Permeability of Synthetic Turf Sports Field Base Stone and Surface System by Non-confined Area Flood Test Method. Minimum water permeability rate must exceed twenty (20) inches per hour.
    - b. Confirm the permeability of the infill and turf per ASTM D3385, Standard Test Method for Infiltration Rate of Soils in Field using the double-ring infiltrometer. Minimum water permeability rate must exceed twenty (20) inches per hour.

### **3.11 CLOSEOUT**

- A. The Synthetic Turf Contractor must verify that a qualified representative has inspected the installation and that the finished field surface conforms to the manufacturer's requirements.
- B. The Synthetic Turf Contractor must provide the Owner with the maintenance equipment as outlined in this specification section.
- C. The Synthetic Turf Contractor must submit three (3) copies of its maintenance manual to the Owner.
- D. **Demonstration and Owner Training Session**
  - 1. Synthetic Turf Contractor must train Owner's designated field personnel in proper grooming and care procedures. This includes training field personnel how to properly use grooming equipment as well as cleaning and making minor repairs if acceptable with the warranty. All training is to be video taped for later use.
  - 2. Synthetic Turf Contractor shall include training for infill additions, gum removal, seed removal, and normal trash/sweeper equipment operation.
  - 3. Synthetic Turf Contractor shall provide to the Owner in written format a sample of a typical maintenance log to be kept by the Owner.
  - 4. All testing and training shall be completed by the contractor with the Owner prior to substantial completion of the project.
- E. **Extra materials:**
  - 1. Provide to the Owner one (1) super sack each of rubber granules and sand.
  - 2. All salvageable pieces of turf that are or wider (up to one full roll length of each color used) should be left with the Owner.

### **3.12 CLEAN UP**

- A. Contractor shall provide the labor, supplies and equipment as necessary for final cleaning of surfaces and installed items.
- B. During the contract and at intervals as directed by the Architect and as synthetic turf installation is completed, clear the site of all extraneous materials, rubbish, or debris and leave the site in a clean, safe, well draining, neat condition.
- C. Surfaces, recesses, enclosures, etc. shall be cleaned as necessary to leave the work area in a clean, immaculate condition ready for immediate occupancy and use by the Owner.

**END OF SECTION**

**SECTION 328423  
UNDERGROUND SPRINKLERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pipe and fittings, sprinkler heads, and accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 312316.13 - Trenching: Excavating and backfilling for irrigation piping.

**1.03 REFERENCE STANDARDS**

- A. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2015.
- B. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.

**1.04 SUBMITTALS**

- A. Product Data: Provide component product and performance data.
- B. Shop Drawings: Indicate piping layout to water source at existing valve boxes, location and coverage of sprinkler heads, components, site structures, and schedule of fittings to be used.
- C. Record Documents: Record actual locations of all concealed components piping system.
- D. Maintenance Materials: Provide the following for Owner's use in maintenance of project.
  - 1. Extra Sprinkler Heads: Two of each type and size.

**PART 2 PRODUCTS**

**2.01 IRRIGATION SYSTEM**

- A. Manufacturers:
  - 1. Rain Bird Sales, Inc; Heads to match existing: [www.rainbird.com/#sle](http://www.rainbird.com/#sle).

**2.02 PIPE MATERIALS**

- A. PVC Pipe: ASTM D2241; 200 psi pressure rated upstream from controls, 160 psi downstream; solvent welded sockets.
- B. Fittings: Type and style of connection to match pipe.
- C. Pipe Risers at Valves: 160 psi PVC pipe.
- D. Solvent Cement: ASTM D2564 for PVC pipe and fittings.

**2.03 OUTLETS**

- A. Manufacturers:
  - 1. Match existing..
- B. Rotary Type Sprinkler Head: Pop-up type with screens; fully adjustable for flow and pressure; size to match existing; with letter or symbol designating degree of arc and arrow indicating center of spray pattern.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify location of existing utilities.

- B. Verify that required utilities are available, in proper location, and ready for use.

### **3.02 PREPARATION**

- A. Piping layout to match existing.
- B. Layout and stake locations of system components.
- C. Review layout requirements with other affected work. Coordinate locations of sleeves to accommodate system where required.

### **3.03 TRENCHING**

- A. Trench and backfill in accordance with Section 312316.13.
- B. Trench to accommodate grade changes and slope to drains.
- C. Maintain trenches free of debris, material, or obstructions that may damage pipe.

### **3.04 INSTALLATION**

- A. Install pipe, valves, and outlets in accordance with manufacturer's instructions.
- B. Connect to utilities.
- C. Set outlets at finish grade elevations.
- D. Provide for thermal movement of components in system.
- E. Use threaded nipples for risers to each outlet.
- F. Install control wiring to match existing multi-strand.
- G. After piping is installed, but before outlets are installed and backfilling commences, open valves and flush system with full head of water.

### **3.05 FIELD QUALITY CONTROL**

- A. Prior to backfilling, test system for leakage at main piping to maintain 100 psi pressure for one hour.
- B. System is acceptable if no leakage or loss of pressure occurs and system self drains during test period.

### **3.06 BACKFILLING**

- A. Provide 3 inch sand cover over piping.
- B. Backfill trench and compact to specified subgrade elevation. Protect piping from displacement.

### **3.07 SYSTEM STARTUP**

- A. Prepare and start system in accordance with manufacturer's instructions.
- B. Adjust control system to achieve time cycles required.
- C. Adjust head types for full, overlapping water coverage as required.

### **3.08 CLOSEOUT ACTIVITIES**

- A. Instruct Owner's personnel in operation and maintenance of system, including adjusting of sprinkler heads. Use operation and maintenance data as basis for demonstration.

### **3.09 MAINTENANCE**

- A. Provide one complete spring start-up and a fall shutdown by installer, at no extra cost to Owner.

### **END OF SECTION**



**SECTION 329117**  
**ATHLETIC FIELD NATURAL GRASS ROOT ZONE**

**PART 1 GENERAL**

**1.01 Section Includes**

- A. Materials and installation of sand cap root zone system.

**1.02 Related Requirements**

- A. Section 311000 - Site Clearing.
- B. Section 312217 - Athletic Field Natural Grass Subgrade
- C. Section 329227 - Athletic Field Sod Installation
- D. Section 334100 - Subdrainage

**1.03 Definitions**

- A. Sports Field Contractor: Contractor that specializes in athletic field construction and meeting the requirements in the Quality Assurance section below.

**1.04 Reference Standards**

- A. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine And Coarse Aggregates; 2014
- B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)); 2012
- C. ASTM F1632 Method B
- D. ASTM F1647 Method A

**1.05 Submittals**

- A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.
- B. Project Schedule: Critical path schedule showing start and completion of each phase of work being performed by the Sports Field Contractor.
- C. Submit the following within 48 hours of bid opening:
  - 1. List of most recent installation/reference for all projects of similar scope to this project completed in the last ten (10) years (see requirements in Quality Assurance below).
  - 2. Resume and current American Sports Builder Association (ASBA) Certification of proposed Certified Field Builder (CFB).
- D. Conformance survey of finished root zone elevations (see Field Quality Control below).
- E. Materials Sources: Submit name of imported materials source.
- F. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- G. The Sports Field Contractor shall submit to Owner a one-gallon sample of the proposed USGA sand to be used for the root zone. This sample shall be a composite sample taken from the material stockpile allocated for this work by the supplier. A minimum of eight (8) sampling locations shall be randomly selected from the stockpile, varying from the top, to bottom, and all around the pile. At least half of the samples should be taken from the lower third of the stockpile, and none should include material from the outer six (6) inches of the pile where fines have been washed out. The sample is to be labeled to clearly identify which stockpile the sample was taken.



- H. The Sports Field Contractor shall submit samples of the proposed USGA sand and of the subdrainage pea gravel stone to Turf & Soil Diagnostics, 613 East 1st Street, Linwood, KS, 66052. Testing should include gradation/particle size per USGA Root Zone Materials (see below), Acid Reaction, Uniformity Coefficient, D15, D50, and D85 for compatibility and bridging ability. Proposed sand sample is to be obtained at the same time as the sample provided to the Owner as outlined above. Existing field sand is to be a composite sample obtained from a minimum of eight (8) locations across the field and samples must be from below the existing organic zone and from clean sand.

#### 1.06 Quality Assurance

- A. All material approvals must be obtained prior to delivery of materials to the site.
- B. The Sports Field Contractor shall be responsible for all work associated with this specification section, and meet the following requirements:
1. Be an active member of the American Sports Builder Association (ASBA) with a minimum of one (1) Certified Field Builder (CFB) on staff who will be on site and responsible for all work performed within this section.
  2. Have experience in successfully constructing and renovation of sand based or sand capped athletic fields under the current company name and ownership.
  3. Have successfully completed a minimum of five (5) NCAA Division 1, NFL, MLS or MLB sand based or sand capped natural grass fields in the past ten (10) years.
  4. All grading equipment shall be high-floatation, turf tire or low ground pressure agricultural equipment. Fully automatic laser controlled grading box or blade should be used to achieve the specified tolerance from the required elevations.

### PART 2 PRODUCTS

#### 2.01 Materials

- A. USGA Root Zone Materials
- |                      |                                 |
|----------------------|---------------------------------|
| 1. Fine Gravel:      | 2.0 to 3.4mm particle size      |
| 2. Very Coarse Sand: | 1.0 to 2.0mm particle size      |
| 3. Coarse Sand:      | 0.5 to 1.0mm particle size      |
| 4. Medium Sand:      | 0.25 to 0.50mm particle size    |
| 5. Fine Sand:        | 0.15 to 0.25mm particle size    |
| 6. Very Fine Sand:   | 0.05 to 0.15mm particle size    |
| 7. Silt:             | 0.002 to 0.05mm particle size   |
| 8. Clay:             | less than 0.002mm particle size |
- B. USGA Root Zone Mix:
1. Fine Gravel and Very Coarse Sand: Maximum of 10% by weight with maximum of 2% Fine Gravel.
  2. Coarse and Medium Sand: Minimum of 60% by weight
  3. Fine Sand: Maximum of 20% by weight
  4. Very Fine Sand: Maximum of 5% by weight
  5. Silt: Maximum of 5% by weight
  6. Clay: Maximum of 3% by weight
  7. Total Fines (very fine sand + silt + clay): Maximum of 10%
- C. USGA Root Zone Properties:
1. Capillary porosity (40cm tension): 15% to 25%
  2. Air filled porosity (40cm tension): 15% to 30%
  3. Total porosity: 36% to 50%
  4. Saturated conductivity: 16 to 24 inches/hour
- D. Approved Suppliers:
1. Nugent Sand Company, 1833 River Road, Louisville, KY 40206. Phone 502-645-3187.

## **PART 3 EXECUTION**

### **3.01 Examination**

- A. Verify grading and intended elevations are as indicated on drawings and conformance survey has been completed and approved.
- B. Sports Field Contractor is to locate and mark all existing irrigation heads, valve boxes and other existing items to remain, and protect them from damage. Any damage to existing items is to be repaired immediately.

### **3.02 Preparation**

- A. Protect site features to remain, including bench marks, survey control points, existing structures, fences, and sidewalks.
- B. Confirm that root zone material can and will be delivered in washed, clean truck beds with full bed covers.
- C. Stockpile material in a location approved by the Owner, and protected from both air and water born contamination. Stockpile area is to be paved and cleaned of all debris including sand/silt/clay. If a paved area is not available, separation fabric is to be installed between the stockpile and the ground surface.

### **3.03 Root Zone Material Placement**

- A. All deliveries of root zone material are to be inspected for contamination. If any material appears to be contaminated or differs from the approved root zone mix, it shall either be rejected or stockpiled separately from the main stockpile, and a composite sample taken and sent to the approved testing agency for analysis. The material in question is not to be installed until the testing shows that it meets the contract requirements. Any material that does not meet the contract requirements is to be removed from the site by the Contractor.
- B. Root zone material is to be dumped and bladed into place using low ground pressure equipment. No trucks or non-low ground pressure equipment is allowed on the sand base area. Care is to be taken to prevent damage to the subdrainage system (stone, pipe and fabric) and irrigation system, and any damage done is to be remediated immediately and documented with photos and locations of damage and repair.
- C. Root zone material is to be installed in maximum five (6) inch lifts.

### **3.04 Finish Grading**

- A. Maintain profiles and contour of design elevations for a crowned slope of 0.75 percent.
- B. Prior to finish grading, root zone material is to be thoroughly watered until saturation for initial densification of the material.
- C. After initial densification, the finished surface is to be laser graded to meet the required elevation tolerances.
- D. Upon completion of the laser grading, the root zone material is to be thoroughly watered until saturation again, and any resulting low areas are to be filled to the design elevation and planarity. This process is to be done each time additional material is added to the surface after laser grading until the surface is smooth and firm, but does not exceed the bulk density determined by laboratory testing.
- E. Any over-densification of the root zone material beyond the laboratory determined bulk density is to be remediated by scarifying the material to a depth of six (6) inches and re-grading. If scarification and re-grading are required, the above laser grading and water densification process is to be repeated.

- F. Upon completion of the finish laser grading, a conformance survey of the root zone material is to be performed by the Contractor and provided to the Owner and Architect for review and approval. Elevations are to be taken on a minimum 25-foot grid.

**3.05 Tolerances**

- A. Root zone elevation: 0.25 inches from design elevation
- B. Root zone planarity: 0.25 inches over 25-foot grid

**3.06 Cleaning**

- A. Remove unused materials from the site.

**3.07 Protection**

- A. Protect from stormwater runoff and subsequent construction operations.
- B. Do not permit any traffic until the sports turf installation begins.

**END OF SECTION**

**SECTION 329227  
ATHLETIC FIELD SOD INSTALLATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Sod installation.

**1.02 RELATED REQUIREMENTS**

- A. Section 329227 - Athletic Field Natural Grass Root Zone

**1.03 REFERENCE STANDARDS**

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

**1.04 DEFINITIONS**

- A. Sports Field Contractor: Contractor that specializes in athletic field construction and meeting the requirements in the Quality Assurance section below.
- B. 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.

**1.05 SUBMITTALS**

- A. See Division 1 Sections for submittal procedures.
- B. Project Schedule: Critical path schedule showing start and completion of each phase of work being performed by the Sports Field Contractor.
- C. Submit the following within 48 hours of bid opening:
  - 1. List of most recent installation/reference for all projects of similar scope to this project completed in the last ten (10) years (see requirements in Quality Assurance below).
  - 2. Resume and current American Sports Builder Association (ASBA) Certification of proposed Certified Field Builder (CFB).

**1.06 QUALITY ASSURANCE**

- A. All material approvals must be obtained prior to delivery of materials to the site.
- B. The Sports Field Contractor shall be responsible for all work associated with this specification section, and meet the following requirements:
  - 1. Be an active member of the American Sports Builder Association (ASBA) with a minimum of one (1) Certified Field Builder (CFB) on staff who will be on site and responsible for all work performed within this section.
  - 2. Have experience in constructing and renovation of sand based or sand capped athletic fields under the current company name and ownership.
  - 3. Have successfully completed a minimum of five (5) NCAA Division 1, NFL, MLS or MLB sand based or sand capped natural grass fields in the past five (5) years.
  - 4. All sod installation equipment shall be high-floatation, turf tire or low ground pressure agricultural equipment.
- C. The Sports Field Contractor shall be responsible for all aspects of the sod installation including coordination with the sod farm, until the sod installation has been completed and accepted by the Owner.
- D. The Sport Field Contractor shall be responsible for remediating any settlement of the root zone material.

### **1.07 REGULATORY REQUIREMENTS**

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

### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver sod in rolls. Protect exposed roots from dehydration.
- B. Sod is to be installed within 24-hours of cutting. Do not deliver more sod than can be installed in the 24-hour cutting restriction. Sod not installed within 24-hours of cutting will be rejected by the Owner and the Sports Field Contractor will be responsible for all costs in replacing the rejected sod.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Sod: Sod is to be purchased and delivered under a separate contract by the Owner. Sod will be 42-inch, big-roll Bluegrass in lengths between 80- and 100-feet with a 3/8-inch cut.
- B. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that the root zone surface is firm and planar and ready to receive the sod.
- B. Verify that the irrigation system is fully functional and has full coverage of the sod area.

### **3.02 PREPARATION**

- A. Owner will install root zone amendments for pre-sod installation.

### **3.03 LAYING SOD**

- A. Moisten prepared surface immediately prior to laying sod.
- B. Minimize disturbance of the root zone material and repair any disturbance that occurs during sod installation activities. Maintain the planarity of the root zone surface throughout installation.
- C. Lay sod within 24 hours after harvesting to prevent deterioration.
- D. 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. Remove netting as the sod is being unrolled.
- E. Ensure the edges of all rolls are in full contact with the root zone material by tamping the edges during installation.
- F. Lay sod smooth. Align with adjoining grass areas. Top of sod surface to meet and match adjoining warning track and clay infield.
- G. Water sodded areas immediately after installation. Saturate sod to 4 inches of root zone.
- H. Fill any gaps in sod with additional root zone material and water by hand immediately after installation.
- I. Any sod repairs/replacement or patching is to be done with pieces no smaller than 36-inches in length and full sod roll width. Repairs or patching is to be done prior to rolling the sod.
- J. Roll sodded areas to ensure good bond between sod and root zone material and to remove minor depressions and irregularities. Rolling is to be done in two, opposite directions using a 3-ton or larger smooth drum roller to ensure sod-to-root zone contact and an even, planar surface.

- K. Irrigate the installed sod immediately after rolling to a root zone depth of two (2) inches.

### **3.04 ACCEPTANCE**

- A. Acceptance of the sod by the Owner will be done in two stages per below:
1. Initial Acceptance - occurs upon completion of the sod installation including any repairs/patching and rolling. At this time the Owner will take over the irrigation, fertilization and maintenance.
  2. Final Acceptance - should occur between three (3) and four (4) weeks after initial acceptance and when the below items are achieved:
    - a. A root depth of three (3) inches into the root zone material has been established and verified through eleven (11) core samples taken across the field by the Owner.
    - b. The entire sod area exhibits a dense, green and consistent color and texture without any dead areas or weeds.
    - c. The sod and root zone provide a planar surface without bumps or depressions and is considered playable for NCAA Division 1 soccer as determined by the Owner.

### **3.05 MAINTENANCE**

- A. Protect sodded areas with warning signs and temporary fencing until final acceptance by the Owner has been obtained. Keep all traffic beyond that needed for Owner maintenance off of the field until final acceptance has been obtained..

**END OF SECTION**

**SECTION 334100  
SUBDRAINAGE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Sand cap field subdrainage system.
- B. Filter aggregate and fabric and bedding.

**1.02 RELATED REQUIREMENTS**

- A. Section 312316 - Excavation: Excavating for subdrainage system piping and surrounding filter aggregate.
- B. Section 312316.13 - Trenching: Excavating and backfilling for site subdrainage systems.
- C. Section 312323 - Fill: Backfilling over filter aggregate, up to subgrade elevation.

**1.03 REFERENCE STANDARDS**

- A. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.
- B. AASHTO M 252M AND M 294M - Corrugated PE Drainage Pipe and Fittings.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate dimensions, layout of piping, high and low points of pipe inverts, gradient of slope between corners and intersections, and connections to the storm water system.
- C. Product Data: Provide data on pipe drainage products, pipe accessories, and filter fabric.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Project Record Documents: Record location of pipe runs, connections, cleanouts and principal invert elevations.

**PART 2 PRODUCTS**

**2.01 REGULATORY REQUIREMENTS**

- A. The Sports Field Contractor shall submit samples of the proposed USGA Drainage Pea Gravel and Root Zone Sand to the Testing Agency - Turf & Soil Diagnostics, 613 East 1st Street, Linwood, KS, 66052.

**2.02 PIPE MATERIALS**

- A. Dual Walled Corrugated Plastic Pipe: Rigid type; 4 inch minimum diameter or as shown on the drawings, 10-foot or 20-foot lengths, with required fittings.
  - 1. Refer to Specification Section 334101 for approved manufacturer's.
- B. Use perforated pipe at subdrainage system; unperforated through sleeved walls.

**2.03 AGGREGATE AND BEDDING**

- A. Under Synthetic Turf Areas - Filter Aggregate and Bedding Material: Fill Type [Pipe Bedding] as specified in Section 312316.13.
- B. Under Sand Cap Sod Areas - Filter Aggregate and Bedding Material:
  - 1. A. USGA Pea Gravel: USGA approved pea gravel, washed, rounded material per the following:

- a. Gravel drainage material shall consist of washed crushed stone. Gravel components shall not exceed 12% loss of materials as determined b/a Sulfate Soundness Test (ASTM C38) and the loss shall not exceed 40 as determined by the L.A. Abrasion Test (ASTM C131). The stone material shall be used for the trench fill around and above the lateral drainpipes.
- b. The gravel shall have a mean diameter of 4.0 to 8.0 millimeters.
- c. Gravel Drainage Material will be evaluated using the 2004 USGA Testing Protocol as a guideline.
- d. Contractor is to have the Gravel Drainage Material and the Root Zone Sand tested for acceptable bridging. Upon testing of the Gravel Drainage Materials, the test results will establish the specifications for approval or rejection of all subsequent submittals during construction of the Playing Field Subdrainage System.
- e. A one (1) gallon sample of each 400-ton lot of gravel shall be tested. Upon approval of each lot of materials, the gravel shall be released for placement on the Playing Field site and allowed to be incorporated into the under-drainage system construction.
- f. The Sports Field Contractor shall bear costs for the testing of the Gravel Drainage Material.
- g. This material must physically bridge with the Root Zone Mix used for the Natural Grass Practice Soccer Field and meet permeability requirements to allow movement of water through the fill. See below.
  - 1) USGA Pea Gravel: Criteria defining any stone product to be used for bedding of pipe and that interface with a root zone material such as sand. Acceptance, or selection of gravel, shall be done concurrently with sand or root zone selection.
    - (a) 1/2 inch (12.5 mm) - 100% passing
    - (b) 10 mesh (2.0 mm) - <10% passing
    - (c) 18 mesh (1.0 mm) - <5% passing
  - 2) Gravel aggregate shall be clean and dust free. The Parent material shall be stable chemically and physically. Aggregate stability testing shall be determined with sulfate soundness test, ASTM C-88, and / or an LA Abrasion Test ASTM C-131. Sulfate Soundness <12% Loss. LA Abrasion <40%.
  - 3) Gravel size criteria shall meet the following criteria for bridging and permeability with the root zone and / sand submittal.:
    - (a) Bridging - D15 Drainage Gravel < 8 x D85 Sand Root Zone
    - (b) Permeability - D15 Drainage Gravel > 5 x D15 Sand Root Zone
    - (c) Uniformity Coefficient - D90 (gravel) / D15 (gravel) is less than or equal to 3.0.

## 2.04 ACCESSORIES

- A. Filter Fabric: Water pervious type, black non-woven, polypropylene, 6oz minimum weight.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

### 3.02 PREPARATION

- A. Hand trim excavations to required elevations. Correct over-excavation with pipe bedding.
- B. Remove large stones or other hard matter that could damage drainage piping or impede consistent backfilling or compaction.



- C. Drainage Gravel:
1. The Sports Field Contractor shall schedule delivery of approved lots of both the fill/course and USGA pea gravel. Confirm that delivery will be made in washed and covered trucks to eliminate contamination during transportation. Stockpiling of the material on site is to be coordinated with the Owner and Construction Manager. The material shall be placed in an area free from contamination avoiding such areas as low wet areas and or refuse and debris areas.
  2. Each load of gravel delivered to the site shall be visually inspected for any contamination. If any of the gravel appears to be contaminated, or visually different from previously delivered material, a sample shall be sent to the Testing Agent. If the sample fails to meet the specification requirements, the Owner will reject the balance of that load. The rejected material shall be removed off the Practice Field Site and off the University's property by The Sports Field Contractor/Gravel Supplier immediately and disposed of at no cost to the Owner. Owner will pay for any test that come back as approved, with the Sports Field Contractor paying the cost for any failed test.

### **3.03 INSTALLATION**

- A. Install and join pipe and pipe fittings in accordance with pipe manufacturer's instructions.
- B. Place filter fabric on clean cut subsoil or top of footing if adjacent to a wall.
- C. Place drainage pipe on filter fabric.
- D. Lay pipe to slope gradients noted on drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- E. Place aggregate in maximum 4 inch lifts, consolidating each lift.
- F. Refer to Section 312323 for compaction requirements. Do not displace or damage pipe when compacting.
- G. Connect to storm sewer system with unperforated pipe.
- H. Install magnetic, detectable warning tape immediately over the Drainage Gravel and under the Root Zone Sand in all pipe locations.

### **3.04 FIELD QUALITY CONTROL**

- A. See Division 1 Sections for general requirements for testing and inspections.
- B. Request inspection prior to and immediately after placing aggregate cover over pipe.

### **3.05 PROTECTION**

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operation begins.

**END OF SECTION**

**SECTION 334101  
SITE STORM DRAINAGE PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Storm drainage piping, fittings, and accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.
- B. Section 334416 - Trench Drains
- C. Section 334913 - Storm Drainage Manholes

**1.03 REFERENCE STANDARDS**

- A. AASHTO M 252M AND M 294M - Standard Specification for Corrugated Polyethylene (PE) Drainage Pipe.
- B. ASTM F 447 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- C. ASTM D 3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating pipe, pipe accessories, and fittings.
- C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Project Record Documents:
  - 1. Record location of pipe runs, connections, and invert elevations.

**PART 2 PRODUCTS**

**2.01 SEWER PIPE MATERIALS**

- A. Corrugated PE Drainage Pipe and Fittings: Type S, dual wall with smooth waterway for coupling joints and PE sleeve with gasket material that mates with pipe and fittings to make them watertight. Approved manufacturers are:
  - 1. Advanced Drainage Systems, Inc., N-12 Pipe ([www.ads-pipe.com](http://www.ads-pipe.com))
  - 2. Timewell, Dual Wall Pipe ([www.timewelltile.com](http://www.timewelltile.com))
  - 3. Baughman Tile Company, Dual Wall Pipe ([www.baughmantile.com](http://www.baughmantile.com))
  - 4. Hancor, Blue Seal Pipe ([www.hancor.com](http://www.hancor.com))
  - 5. Prinsco, Goldflow WT ([www.prinsco.com](http://www.prinsco.com))
  - 6. J.M. Eagle- product Eagle Corr Dual Wall Watertight Pipe. ([www.jmeagled.com](http://www.jmeagled.com))
  - 7. Substitutions: As submitted for review and approved by architect by addendum during the bidding process.

**2.02 PIPE ACCESSORIES**

- A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required wye, bends, elbows, cleanouts, reducers, traps and other configurations required.
- B. Trace Tape: Magnetic detectable conductor, clear plastic covering, imprinted with "Storm Sewer Service " in large letters.

### **2.03 BEDDING AND COVER MATERIALS**

- A. Bedding: As specified in Section 312316.13 and Section 334100.
- B. Cover: As specified in Section 312316.13 and Section 334100.

### **PART 3 EXECUTION**

#### **3.01 TRENCHING**

- A. See Section 312316.13 for additional requirements.
- B. Hand trim excavation for accurate placement of pipe to elevations indicated.

#### **3.02 INSTALLATION - PIPE**

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
- B. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- C. Connect to building storm drainage system, foundation drainage system, and utility/municipal sewer system.
- D. Install continuous trace wire 6 to 12 inches below finish grade, above pipe line; coordinate with Section 312316.13.

#### **3.03 FIELD QUALITY CONTROL**

- A. See Division 1 Sections for general requirements for testing and inspections.
- B. Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
- C. Piping that is crushed, cracked, broken or otherwise damaged will require repair or replacement as determined by the Architect.

#### **3.04 PROTECTION**

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

**END OF SECTION**

**SECTION 334416  
TRENCH DRAINS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Monolithic FRP trench drains, anchorage, and accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 015713 - Temporary Erosion and Sediment Controls for temporary inlet protection
- B. Section 321613 - Concret Curbs and Gutters for trench drain concrete.

**1.03 REFERENCE STANDARDS**

- A. ASTM D 3753 - Standard Specification for Glass-Fiber-Reinforced Polyester Structures; 2005.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate structure identification designations, locations, elevations, piping sizes and elevations of penetrations.
- C. Product Data: Provide structure data including configuration, grates, frames and other components .

**1.05 QUALITY ASSURANCE**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

**1.06 FIELD CONDITIONS**

- A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530.1/ASCE 6/TMS 602 or applicable building code, whichever is more stringent.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Stainless Steel: Type 304 or 316
- B. Approved Manufacturers:
  - 1. Aco-Drain
  - 2. Other equals as approved by addendum prior to bidding.

**2.02 TRENCH DRAIN COMPONENTS**

- A. Pedestrian Grates: Stainless Steel with tamper resistant fasteners; heel safe; 4 inch wide grate area; medium duty.
- B. Trench Channel: pre-molded polyester or Fiber-reinforced resin with traffic duty H-20 load rating.

**2.03 CONFIGURATION**

- A. Clear Inside Dimensions: As indicated.
- B. Design Depth: As indicated.
- C. Pipe Penetrations: Provide openings as required.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify items provided by other sections of Work are properly sized and located.
- B. Verify that built-in items are in proper location, and ready for roughing into Work.
- C. Verify excavation for structure is correct.

#### **3.02 PREPARATION**

- A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

#### **3.03 INSTALLATION**

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Form and place cast-in-place concrete anchors as required by system manufacturer.
- C. Establish elevations and pipe inverts for inlets and outlets as indicated.
- D. Anchor pre-manufactured channel sections to prevent floating during concrete installation.
- E. Coordinate with other sections of work to provide correct size, shape, and location.

#### **3.04 FIELD QUALITY CONTROL**

- A. Structures that are cracked, broken or otherwise damaged will require repair or replacement as determined by the Architect.
- B. The contractor is to provide someone to remove and replace all grates or covers on storm water structures for any punch list visits that involve the storm water system.

**END OF SECTION**

**SECTION 334913  
STORM DRAINAGE MANHOLES, FRAMES AND COVERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Modular precast concrete manhole sections with tongue-and-groove joints covers, anchorage, and accessories.
- B. Monolithic FRP manholes with transition to lid frame, covers, anchorage, and accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 015713 - Temporary Erosion and Sediment Controls for temporary inlet protection

**1.03 REFERENCE STANDARDS**

- A. ASTM A 48/A 48M - Standard Specification for Gray Iron Castings; 2003.
- B. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2002.
- C. ASTM D 3753 - Standard Specification for Glass-Fiber-Reinforced Polyester Manholes and Wetwells; 2005.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate manhole locations, elevations, piping sizes and elevations of penetrations.
- C. Product Data: Provide manhole covers, component construction, features, configuration, and dimensions.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

**1.06 FIELD CONDITIONS**

- A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530.1/ASCE 6/TMS 602 or applicable building code, whichever is more stringent.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Manhole Sections: ASTM D 3753, glass-fiber reinforced polyester .

**2.02 COMPONENTS**

- A. Lid and Frame: ASTM A 48/A 48M, Class 30B Cast iron construction, machined flat bearing surface, removable lid, scheduled lid design; live load rating of H-20; lid molded with identifying name ;.

**2.03 CONFIGURATION**

- A. Shape: Cylindrical.
- B. Clear Inside Dimensions: As required for shown pipe sizes and configurations. Structure diameter is to remain consistent from the bottom section to the cone or top slab that supports the casting.
- C. Design Depth: As indicated.
- D. Clear Lid Opening: As indicated.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify items provided by other sections of Work are properly sized and located.
- B. Verify that built-in items are in proper location, and ready for roughing into Work.
- C. Verify excavation for manholes is correct.

#### **3.02 PREPARATION**

- A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

#### **3.03 MANHOLES**

- A. Place concrete base pad, trowel top surface level.
- B. Cut and fit for pipe.
- C. Seal section and top joints with Conseal Sealant or approved equivalent.
- D. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.
- E. Set cover frames and covers level without tipping, to correct elevations.
- F. Coordinate with other sections of work to provide correct size, shape, and location.
- G. Seal pipes to structure.

#### **3.04 FIELD QUALITY CONTROL**

- A. See Division 1 Sections for general requirements for testing and inspections.
- B. Structures that are cracked, broken or otherwise damaged will require repair or replacement as determined by the Architect.
- C. The Contractor shall provide someone to remove and replace all grates for any punch list visits that involve the storm water system. Contractor shall also provide all required equipment needed to meet OSHA confined space requirements associated with inspecting the drainage structure.

**END OF SECTION**