Chapter I
Section 31 22 17
Sub-Base: Natural Grass and Synthetic Turf Fields

PART 1: GENERAL

1.01 - RELATED DOCUMENTS

A. Drawings and General Provisions of Contract Documents, including General Conditions, Supplementary General Conditions, Division 1 Specification Sections, apply to the work of this section.
B. A geotechnical report, including soil borings performed at the site, is included in these documents.
C. Within this section, the term "Sports Field Contractor" shall be the entity submitted by the Construction Manager who meets the criteria in Section 1.4 B, Quality Assurance, as shown below. Additionally, the term "Owner", where noted anywhere in this section, shall include the Sports Field Manager, or his appointed representative, and the Architect.

1.02 - RELATED SELECTIONS

A. 312319 - Dewatering
B. 329117 – Root Zone Soil Preparation Natural Grass Fields
C. 329227 – Sod Installation Natural Grass Fields
D. 334617 – Sub-drainage for Natural Grass

1.03 - SUMMARY

A. The work covered by this specification shall include the furnishing of all labor, materials, and equipment necessary to prepare the sub-base for the Natural Grass Field. It shall also include all incidental earthwork operations, which are specifically required for the installation and establishment of sub drainage systems, irrigation system, 4-inch USGA gravel layer, the 8-inch root zone profile, crushed stone drainage medium and the natural grass for the Field System.
B. The Earthwork Contractor shall establish a sub-base, in accordance with the Site Grading Plans and Details. Rough grade to elevations within +/- 0.50" (1/2") tolerance with 1/2" maximum deviation from design elevation, within a 25 foot by 25-foot grid, and when measured in any direction, with relation to the sub-base design elevations. The Construction Manager will then turn over to the Sports Field Contractor for completion of the Sub-Base.
C. The sub-base elevations, **when completed by the Sports Field Contractor**, shall be within +/- 0.25-inch tolerance with ¼" maximum deviation from design elevation, measured in any direction, with relation to the sub-base design elevations as per the Site Grading and Detail plan sheets. Sub-base elevations vary depending on finished grade surfacing. It shall be graded to the same contour as the final field surface as indicated by the Site Grading and Detail design finish grade elevations.
D. Written verification, as well as a conformance survey, showing the confirmed finished sub-base elevations based on 25 foot on center grid, (25 feet by 25 feet) shall be prepared by an independent, State of South Dakota Licensed Land Surveyor, and submitted by the Sports

Field Contractor to the Architect and Owner. No work on the sub-surface subdrainage system shall begin until written approval, and acceptance, of the completed sub-base is issued by the Owner.

E. In addition to written verification and conformance survey, the Sports Field Contractor shall obtain approval of the testing and proof rolling of the sub-base by the Special Inspector.
F. The work covered by this specification also includes all applicable federal, state, and local taxes at the time of construction.
G. No deviations from these specifications, the accompanying drawings, or the contract agreement is authorized or shall be made without prior written authorization signed by the Owner.

1.04 - QUALITY ASSURANCE

A. General: Unless otherwise specified herein, requirements for supervision, inspection, samples other similar requirements shall be the responsibility of The Sports Field Contractor. Approvals shall be obtained before delivery of any material or any equipment to the project site.
B. Contractor Qualifications: The "Sports Field Contractor" shall complete all work associated with this section and be the entity submitted by the Construction Manager with their initial bid package meeting the following requirements:
   A. The Sports Field contractor must have been actively engaged in the construction of sand-based fields and renovations for a minimum of (5) Five years and under the current company name.
   B. The Sports Field Contractor must submit proof of (5) Five or more regulation NCAA Division 1, NFL or MLB sports field installations of sand-based construction that have been in use for a minimum of (3) Three years.
   C. The Sports Field Contractor must be a member of the American Sports Builder Association and have a Certified Field Builder form the American Sports Builder Association on staff and on site during all field construction activities.
   D. All grades must be established, and laser graded by laser equipment consisting of an agricultural type tractor, equipped with flotation type tires, and pulling a 5' to 7' laser guided scraper that is fully automated, hydraulically actuated and capable of grading to within .25 (1/4") of desired elevations. Inspection of the Site: The Sports Field Contractor shall acquaint itself with all site conditions, including underground utilities before construction is to begin. The Sports Field Contractor shall coordinate placement of underground materials with previously installed underground materials in the vicinity. The Sports Field Contractor is responsible to verify that the rough subgrade provided by the Earthwork Contractor is within tolerance and is acceptable before beginning their work.
C. The Sports Field Contractor shall employ a qualified, independent geotechnical engineering testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified recommendations for fill and new work. Required field and laboratory testing, including proof-rolling, will be done by the Special Inspector.
D. The Sports Field Contractor shall keep on site, from start and during its progress, a competent superintendent, and any necessary assistants, all satisfactory to the Owner.
E. The Superintendent shall represent The Sports Field Contractor and all directions given him/her shall be as binding as if given directly to The Sports Field Contractor's project manager.
F. The Owner shall have full authority to approve or reject work performed by The Sports Field Contractor and have full authority to make minor field changes that are deemed necessary as long as the changes do not incur additional costs to The Sports Field Contractor.

G. The Sports Field Contractor shall comply will all applicable local, state, and federal rules regulations and ordinances concerning sloping of excavation, trenching, and safety of workers, including the latest version of OSHA requirements.
H. The Sports Field Contractor shall carefully preserve and maintain existing benchmarks, vertical/horizontal control, monuments, property line pipes and pins, and other reference points. If disturbed or destroyed, The Sports Field Contractor shall restore or replace them at no additional cost to the Owner.
I. The Sports Field Contractor shall barricade all open excavations occurring as part of this work and post with warning lights; operate warning lights as recommended by authorities having jurisdiction; protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by the Practice Field Earthwork operations.

1.05 - SUBMITTALS

A. Submit a Project Schedule within 10 days after issuance of the Notice to Proceed that's lists the individual work phases of the Natural Grass Practice Fields Systems with the start date, the finish date, and the length of time to complete each phase of the Natural Grass Practice Fields Systems construction.
B. Provide a list, including contact information, for a minimum of five (5) NCAA Division 1, NFL or MLB sports field installations of sand-based construction that have been in use for a minimum of three (3) years.
C. Written verification, as well as a conformance survey, showing the confirmed finished sub-base elevations based on 25 foot on center grid, (25 feet by 25 feet) prepared by an independent, Licensed Land Surveyor.
D. Written confirmation of suitable sub-base, from the Special Inspector, after review of required testing results and proof-rolling of sub-base; both from results after any cut and fill, and just prior to finish grade.
E. Provide contact information for assigned superintendent for this section of work.
F. Include a detailed list of all equipment to be used for this section of the project. The list should include both equipment owned by the Sports Field Contractor and all pieces that must be rented.

1.06 - PERMITS AND INSPECTIONS

A. It will be the responsibility of the Construction Manager, and or Sports Field Contractor, to obtain all local permits customarily required for the type of work involved. The Sports Field Contractor shall also comply with local codes governing this type of work.
B. All local, municipal, and state laws and rules and regulations governing or relating to any portion of this work are hereby incorporated into and made part of these specifications and their provisions shall be carried out by The Sports Field Contractor.

PART 2: PRODUCTS

2.01 – MATERIALS

A. General: Provide approved borrow soil materials from off-site when sufficient approved soil Materials are not available from excavations.

B. Satisfactory Soil Materials: ASTM D 2487 soil classification groups CL; free of rock or Gravel larger than 1 inches in any dimension, debris, waste, frozen materials, vegetation, and any other deleterious matter. No more than 20% of the soil material maybe rock or gravel meeting the above size restriction.
C. Unsatisfactory Soil Material: ASTM D 2487 soil classification groups; GC, SC, ML, MH, CH, OL, OH, and PT. Soils of the GC, SC, CL, or CH groups may be utilized as satisfactory soil material upon written authorization of the Owner. Soils that are above optimum moisture are not considered unsatisfactory since they can be dried and used.
D. Backfill and Fill Material: Satisfactory soil materials.
    a. Material to be used for fill (if needed for the sub-base establishment by The Sports Field Contractor) shall be approved by the Owner. See Part 2 - Soil Material above. All roots, organic matter, trash, debris, and other unsuitable materials, which may find their way into otherwise acceptable fill material; shall be removed during the dumping and spreading operation by The Sports Field Contractor.

PART 3: EXECUTION

3.01 - EXAMINATION

A. Site Visit: Visit and inspect site and take into consideration known and reasonably inferable conditions affecting work, prior to bidding. Failure to visit the site will not relieve the Contractor of furnishing materials or performing work required.
B. Examine areas, and conditions under which the work of this section will be performed and shall not proceed with the work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of all areas and all conditions of the Practice Field areas.
C. Locate existing underground utilities in areas of the Natural Grass Fields work. Provide protection during the Natural Grass Fields earthwork operations. Repair any utilities damaged by The Sports Field Contractor earthwork operations to the satisfaction of the Owner or appropriate utility company.
D. Provide all necessary measures to protect workmen and passerby. Barricade open excavations occurring as part of the work, as required by municipal or other authorities having jurisdiction at The Sports Field Contractor's expense.
E. Protect adjacent construction throughout the entire Natural Grass Field construction operation. Protect newly graded areas (through The Sports Field Contractor's best abilities and capabilities) from destruction by weather or runoff. Protect structures, utilities, pavements, and other improvements from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by The Sports Field Contractor earthwork operations on the Practice Field.
F. Conform to elevations and grades shown within a tolerance of +/- 0.25" in 25 feet x 25 feet, when measured in any direction.
G. Notify the Owner immediately upon finding evidence of previous structures or filled materials, which penetrate, below designated excavation levels, or other conditions which are not shown, or which cannot be reasonably assumed from existing surveys and geo-technical reports. Secure the Owner's instructions before proceeding with further work in such areas.
H. As indicated by the drawings, the completed sub-base is to be compacted to 95% proctor. All unsuitable materials shall be removed and replaced with acceptable material approved by the Owner to insure against future settlement and for proper compaction by the Sports

Field Contractor. The finished sub-base shall be completely free of debris and all loose non-compactable materials.

I. Install the finish grade with fully automated, hydraulically actuated laser guided equipment. Acceptable grading tolerances will not be exceeded.

J. Transport acceptable excess excavated material off the Natural Grass and Synthetic Turf Fields Systems site and dispose of at The Sports Field Contractor's expense. Remove all trash and debris, all waste materials, including materials not allowed for fill, backfill, or site grading as specified within, and dispose of it off the Owner's property at The Sports Field Contractor's expense.

3.02 - PREPARATION

A. Field engineering for benchmarks, monuments, reference points and layout of the work shall be verified prior to commencing work. A benchmark has been provided by the CM and/or surveyor. A copy of the survey plan is included within the Drawings set.

B. Protection:
   a. Maintain soil under foundations and pavements at optimum moisture content.
   b. Provide and maintain slopes, crowns, and ditches in excavation to insure satisfactory surface drainage always. Provide temporary drainage facilities to prevent water from draining into excavations. When completed, restore temporary ditches or cuts to original finish grade as indicated.
   c. Bailing or Pumping: Always keep excavations free from water. Take measures and furnish equipment and labor necessary to control water flow, drainage and accumulation of water as required to permit completion of work under this section. Discharge water into the existing storm drainage system and sub drainage piping system as approved by Owner. See Section 312319 for additional information.

3.03 - EXCAVATION

A. Area excavations: Excavate site as required to accommodate new work as indicated on drawings.
   a. Sub-bases: If debris, soft spots or loose or excessively moist areas are found at the bottom of any excavation, immediately report condition to Owner who will determine the corrective work if necessary.
   b. Unsuitable Sub-base Material: If unsuitable bearing materials are encountered at the required sub-base elevations, carry excavations deeper and replace the excavated material as directed by the Owner with suitable material from an offsite stockpile. Sub-base certification: When excavation has reached required sub-base elevations, and is laser graded, Sports Field Contractor will certify grades provided by a registered State of South Dakota professional engineer to within +/- 0.25" with field engineers 25' X 25' grid report. Submit electronic copies of survey in PDF format, as well as six (6) paper copies of survey for review and approval. Notify the Owner, who will inspect conditions and will review field engineer's grade survey certifications for sign off.

B. Stability of Excavation
   a. Sides of excavation basin to comply with all codes and ordinances having jurisdiction. Shore and brace side walls for stability of material excavated.
   b. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

c. Comply with local codes, ordinances, and requirements of the authorities having jurisdiction to maintain stable excavations.

C. De-watering:
   a. Prevent surface water from flowing into excavations and from flooding project site and surrounding areas.
   b. Do not use footing or foundation or utility trench excavations as temporary drainage ditches. See Section 312319 for additional information.

D. Cold Weather Protection:
   a. If work must continue to meet schedule, protect excavated bottoms against freezing when atmospheric temperature is less than 35¤F.

E. Moisture Control:
   a. Uniformly moisten or aerate sub-base and each subsequent fill or backfill layer before compaction to within 2% optimum moisture content.
   b. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
   c. Remove and replace or scarify an air-dry satisfactory soil material that is too wet to compact to specified density.
   d. Stockpile or spread and dry removed, wet, satisfactory soil material

3.04 - FILL

A. Fill Material shall be spread in uniform horizontal layers not exceeding 6-inches, in un-compacted thickness. All fill must be placed in horizontal layers. Sloping fill planes will not be permitted. Fill material shall be distributed over the full width of the embankment, and in no case will deep ruts be allowed to form.

B. The Standard Proctor method of moisture-density relationship test, ASTM 698 or AASHTO T-99, shall be used to determine the maximum laboratory dry density and the optimum moisture content of the material which is to be used to fill, if necessary for the sub grade establishment.

C. Each layer of fill material shall be compacted until its density is not less than 95% of the maximum laboratory dry density for the same material. The moisture content of compacted cohesive materials shall not vary by more than two percentage points from the optimum moisture content for the same material, providing excessive yielding is not produced within this range of moisture contents.

D. When sub-base, or existing ground surface to receive fill, has a density less than that required for fill, break up ground surface to depth required, pulverize, moisture - condition or aerate and re-compact to required density.

E. At the close of each day's work or where is to be interrupted for a period, the surface of the site shall be shaped to drain freely and sealed. If after a prolonged rainfall, the surface of the area to be filled or cut is too wet to work properly, the unsuitable material shall be removed to expose workable soil. The wet material removed may be dried and reused. Construction traffic shall be controlled to prevent rutting of graded areas to avoid excessive compaction on any one section.

3.05 - COMPACTION

A. Compaction Requirements: Compact each layer to a minimum of the following Standard Proctor Densities by ASTM D698.
   a. Subbase or subgrade - 95%

b. Bottom of excavated trenched for drainpipe - 95%
c. Natural Grass Practice Fields: compact the top 6-inches below sub-base, and each layer of backfill or fill material, at 95% maximum dry density.

B. The Special Inspector shall be responsible for compaction testing of the sub-base soils beneath practice field areas. Notify the Special Inspector 48 hours in advance of anticipated compaction testing. Approval, in writing, shall occur prior to the installation of the sub drainage piping system for the field. Compaction tests shall occur for every 10,000 square feet of surface area of the field and shall be provided immediately to the Owner and Architect for review and comment. Provide Owner and Architect with all test results.

3.06 - PROOF-ROLLING

A. Proof-roll the Natural Grass Fields area's exposed sub-base with a fully loaded dump truck to check for pockets of soft materials. Proof rolling shall consist of several complete passes, with the passes being perpendicular directions and sufficient to cover the entire area to the satisfaction of the geotechnical engineer. Remove any areas that deflect, rut, or pump excessively during proof rolling, or that fail to consolidate after successive passes. Replace with suitable soils and re-compact. Maintain sub-base until the succeeding operation has been accomplished.
B. Should Owner determine that unforeseen, unsatisfactory soil is present, continue excavation and replace with compacted backfilled our fill material as directed.
C. Unforeseen additional excavation and replacement material will be paid according to the contract provisions for changes in work.
D. Reconstruct sub-bases damaged by freezing temperature, frost, rain, accumulated water, or construction activities, as directed by the Owner at the Contractors expense.

3.07 - FINISH GRADING

A. General: Cut and fill all areas to elevations and tolerances specified. Leave graded surface clean, free from rubbish and large clods and laser graded.
B. Sub-base under natural grass field area: Finish grade to sub-base elevations indicated on the Drawings. Tolerance: +/- 0.25" (25' X 25' grid survey required for certification).

3.08 - FIELD QUALITY CONTROL

A. Testing Agency Services: Allow Special Inspector to inspect and test each sub-base and each fill or backfill layer. Do not proceed until test results for previously completing work verify compliance with requirements. All testing done by the Special Inspector is to be scheduled and coordinated by the Sports Field Contractor at least 48-hours prior to when the testing is done.
B. Sub-base: At sub-bases, perform at least one test of each soil stratum to verify design-bearing capabilities. Subsequent verification and approval of other subgrades maybe based on a visual comparison of each sub-base with related tested strata when acceptable to the Owner.
C. Natural Grass Field Areas: At sub-base, and at each compared fill and backfill layer, perform at least one field in-place density test for every 10,000 square feet or less of field area, but no fewer than three test per layer and per day of fill/backfill placement.
D. Before commencing earthwork, meet with representatives of the governing authorities, Owner, geotechnical engineer, independent testing agencies, and other concerned entities. Review earthwork procedures and responsibilities, including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to conveying conference. Record discussions and agreements and furnish a copy to each participant.

3.09 - MAINTENANCE

A. Protection of graded areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
B. Reconditioning compacted areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, re-shape and compact to required density prior to further construction.
C. Settling: Where settling is measurable or observable at backfilled or filled areas during general project warranty period, remove surface (pavement, lawn, or other finish), add appropriate backfill material, compact and replace surface treatment. Restore appearance, quality, and condition of surface to match adjacent work and eliminate evidence of restoration to greatest extent possible.

3.10 - ACCEPTANCE

A. Completion of the work shall mean full and exact compliance and conformity with the provisions expressed in the Practice Field drawings and specifications.
B. The Owner shall solely determine the acceptability of all material and workmanship, and compliance with the Field specifications, grades, and standards.
C. The Owner shall have the right, at any stage of the work, to reject all work and materials which, in his opinion, does not meet the requirements of the Field plans and specifications. Rejected material shall be immediately removed from the site and acceptable material substituted in its place by The Sports Field Contractor.
D. The Sports Field Contractor shall be responsible, during construction and until final acceptance, of the Sub-Base for the maintenance of all grading completed under the Practice field construction operations.
E. The Sports Field Contractor, until final acceptance of the Sub-Base, shall use any methods necessary, and approved by Owner, to maintain the work covered by this section so that the Natural Grass Practice Fields Systems work will not contribute to excessive soil erosion.

END OF SECTION

Chapter II
Section 33 46 17
Sub-Surface Drainage

PART 1: GENERAL

1.01 - RELATED DOCUMENTS

A. Drawings and General Provisions of Contract Documents, including General Conditions, Supplementary General Conditions, Division 1 Specification Sections, apply to the work of this section.
B. Within this section, the term "Sports Field Contractor" shall be the entity submitted by the Construction Manager who meets the criteria in the Quality Assurance section shown below. Additionally, the term "Owner", where noted anywhere in this section, shall include his/her appointed representative, and the Architect.

1.02 -RELATED SECTIONS

A. 312217 – Sub-Base
B. 312319 – Dewatering
C. 352653 – Root Zone Soil Preparation
D. 334617 – Sod Installation

1.03 - SCOPE

A. Furnish all labor, material, supervision, and equipment necessary to install sub drainage as indicated on the drawings and as specified herein. Also, any incidental work not shown or specified that can reasonably be determined to be part of the work and necessary to providing a complete and functional drainage system.
B. Sub Drainage internal drains include but are not limited to:
1. Trenching for installation of sub drainage system.
2. Trench bottoms compacted to 95% proctor.
3. Geotextile filter fabric trench lining and separation between stone/gravel and soil.
4. All piping, fittings, collectors, connections etc.
5. Drainage Stone aggregate up to top of drainage trench.
6. USGA Pea Gravel (blanket) over sub-grade and Drainage Stone filled trenches.
7. Installation of metallic utility marking tape on top of USGA Pea Gravel Blanket layer over all pipe locations.
8. Connection to "Site Contractors" Storm Water Outlet/Manhole.

C. The work covered by this specification also includes all applicable federal, state, and local taxes at the time of construction.
D. No deviation from these specifications, the accompanying drawings or the contract agreement is authorized or shall be made without prior written authorization signed by the Owner or his duly appointed representative.

1.04 - QUALITY ASSURANCE

A. General: Unless otherwise specified herein, requirements for supervision, inspection, samples, testing, and other similar requirements shall be at the responsibility of The Sports Field Contractor. Approvals, except for field tests, shall be obtained before delivery of any material or any equipment to the project site.

B. Contractor Qualifications: The "Sports Field Contractor" shall complete all work associated with this section and be the entity submitted by the Construction Manager with their initial bid package meeting the following requirements:

1. The Sports Field Contractor must have been actively engaged in the construction of sand-based fields and renovations for a minimum of five (5) consecutive years, and under the current company name.
2. *The Sports Field Contractor must submit proof of five (5) or more regulation NCAA Division 1, NFL, MLS, MLB, or MiLB sports field installations of sand-based construction that have been in use for a minimum of three (3) years.*
3. The Sports Field Contractor must be a member of the American Sports Builder Association and have a Certified Field Builder from the American Sports Builder Association on staff and have proper designation for *natural and artificial*.
4. The Sports Field Contractor shall have the certified sports field builder on-site during each step as provided in this section of work.
5. All grades must be established and laser graded by laser equipment consisting of an agricultural type tractor, equipped with flotation type tires, and pulling a five to seven-foot laser guided scraper that is fully automated, hydraulically actuated and capable of grading to within 1/4" of desired elevations.

C. Inspection of the Site: The Sports Field Contractor shall acquaint itself with all site conditions, including existing underground utilities before construction is to begin. The Sports Field Contractor shall coordinate placement of the sub drainage system with previously installed underground materials in the vicinity and is responsible for minor adjustments in the layout of the work to accommodate existing underground facilities.

D. The Sports Field Contractor shall install the under drains with a laser operated trencher.

E. The Sports Field Contractor shall keep on site, beginning with and until its completion, the certified field builder, and any necessary assistants, all of which are satisfactory to the Owner.

F. The Superintendent shall represent The Sports Field Contractor and all directions given him shall be as binding as if given to The Sports Field Contractors project manager.

G. The Owner shall have full authority to approve or reject work performed by The Sports Field Contractor. Additionally, the Owner shall have full authority to make minor field changes that are deemed necessary if the changes do not incur additional costs to The Sports Field Contractor.

H. In all cases where inspection of the Playing Field Sub Drainage System is required, and/or where the portions of the work specified is to be performed under the direction of the Owner; The Sports Field Contractor shall notify the Owner at least 48 hours prior to the time such observation or direction is required.

I. Any necessary re-excavation or changes to the system needed because of failure of The Sports Field Contractor to have the required inspections shall be performed at The Sports Field Contractor's expense.

J. All work under this section shall be performed on a dry sub-base.

K. Material Testing During Construction: To ensure that the quality of drainage fill materials remains consistent, from point of supply to job site, the following protocol shall be used:

1. Sports Field Contractor shall submit to Owners Testing Agent, a one (1) gallon sample of Drainage Fill and USGA Pea Gravel Fill. These samples shall be taken from the material

stockpile allocated for this work by the supplier. The Owners Testing Agent will evaluate this material using the appropriate protocol. This pre-construction sample shall be used for comparison with all subsequent quality assurance samples submitted for approval during the construction process. Prior to shipment from the supplier, the Sports Field Contractor will provide a one (1) gallon composite sample representing every 400 tons to be shipped to the site for comparison with the pre-construction sample. The results of each subsequent test will be provided to the owner, and upon approval, the representative amount of material may be shipped to the site.

2. The testing agent will conduct the appropriate test (ASTM F1647 Method A Standards) and submit results to the Owner. The Owner will review the results and either accept or deny as the initial lot for delivery. Approval for all additional lots will be based on this initial test results.
3. No work by the Sports Field Contractor shall commence before written approval of the *Natural Grass* Fields sub drainage material list, descriptive material and samples have been delivered to the Owner by The Sports Field Contractor.
4. The initial test of each sample is the responsibility of the Owner. The cost for testing that must be repeated, due to a failing sample or a shortage of supply, shall be the responsibility of the Sports Field Contractor.
5. If a visual analysis of shipped material suggests a change in the material quality, an additional test may be required. If this on-site sample passes, the Owner shall bear the cost of the test, with the Sports Fields Contractor making payments for any failed test.
6. All components that make up the sub drainage system, including the gravel for bedding pipe, USGA gravel blanket and the root zone, must be confirmed as bridging where any two of them meet.

1.05 - PERMITS AND INSPECTIONS

A. It will be the responsibility of the Construction Manager to obtain all local permits customarily required for the type of work involved. The Sports Field Contractor shall also comply with local codes governing this type of work.
B. All local, municipal, and state laws, rules and regulations governing or relating to any portion of this work shall hereby be incorporated into and made part of these specifications and their provisions shall be carried out by The Sports Field Contractor.
C. Anything contained in these specifications shall not be construed to conflict with any of the above rules, regulations, or requirements of the same. However, when these specifications call for described materials, workmanship, or construction of a better quality, higher standard or larger size, the specifications and/or drawings shall take precedence over the requirements of said rules and regulations.

1.06 - SUBMITTALS

A. The Sports Field Contractor shall provide Shop Drawings to the Owner for record keeping purposes. Shop drawings shall have any field changes made to the original drawings recorded.
B. Shop Drawings shall conform to the Owner's requirements as to number and format.
C. An As-Built survey must be completed prior to close out of the project. The Construction Manager will be responsible for conducting the as-built survey. All underground utilities (including storm drainage, irrigation, electrical, etc.) must be surveyed prior to the utilities being covered.
D. If utilities are covered prior to the Project Manager having the utilities surveyed, the Owner reserves the right to require the utilities be uncovered and replaced if not installed as designed.

E. The Sports Field Contractor will provide as a minimum, catalog cuts, product data, and samples along with supporting literature for the following:

1. All drainage pipe material
2. 1 - gallon proposed USGA gravel drainage material for the 4-inch horizontal drainage layer
3. 1 – gallon proposed Drainage Fill for bedding pipe and pipe cover up to bottom of 4-inch drainage layer.
4. Geotextile filter fabric (12” x 12”)

F. Include a detailed list of all equipment to be used for this section of the project. The list should include both equipment owned by the Sports Field Contractor and all pieces that must be rented.

1.07 - MATERIALS TESTING AGENT

A. The Owner will employ a testing laboratory to provide Material Testing for all the Sub Drainage System materials. The Owner shall provide copies of the test results to The Sports Field Contractor for its records.

B. Owner shall handle the cost for pre-construction and quality control testing of materials, prior to materials being delivered to the project site, unless otherwise noted.

C. Owners Testing Agent is as follows:

A.McNitt & SerenSoil Testing
1338 Deerfield Drive
State College, PA 16803
(610) 360-5985

1.08 - RECORD DRAWINGS

A. The Sports Field Contractor shall furnish to the Owner, one (1) set of reproducible records showing all work required under this contract and all changes that were made during actual installation of the sub drainage System. An as-built survey must be completed prior to close out of the project. The Owner will be responsible for conducting the as-built survey. However, the Construction Manager shall contact the Project Manager a minimum of 24 hours’ prior to when surveying services are needed. All underground utilities (including storm drainage, irrigation, electrical, etc.) must be surveyed prior to the utilities being covered.

B. If utilities are covered prior to the Project Manager having the utilities surveyed, the Owner reserves the right to require the utilities be uncovered and replaced if not installed as designed.

C. Immediately upon installation of any piping in locations other than shown on the original drawings or of sizes other than indicated, The Sports Field Contractor shall clearly indicate such changes on the set of bluelines kept with project location. Recording shall be made daily. All records shall be neat and subject to approval of the Owners Representative

D. These drawings shall also serve as work progress sheets. The Sports Field Contractor shall make neat and legible notations thereon daily as the work proceeds, showing the work as actually installed. These drawings shall be kept in a location designated by the Owner.

D. Before the date of the final site inspection and approval the Sub Drainage Construction Phase, The Sports Field Contractor shall deliver the original marked reproducible drawing to the Owner. Recorded drawing information shall be approved by the Owner prior to the issuance of the final Retainage Payment for this section.

F. The Owner must approve the Monthly Progress Payment Request, and record drawing information, before Monthly Progress Payment is made to The Sports Field Contractors.

G. If in the opinion of the Owner, the record drawing information is not being kept properly or recorded promptly, the Sports Field Construction Progress Payment may be held until the proper information has been recorded and submitted to the Owner's Representative.

PART 2- PRODUCTS

2.01 - GENERAL

A. All products shall be as specified on the plans and herein these specifications.
B. Provide only new materials without flaws or defects and of the highest quality of their specified class and kind.
C. Delivery, Storage and Handling: Store pipe neatly and orderly, stacked and blocked to prevent damage. Cracked, checked, spalled, or otherwise damaged pipe shall be removed from site.

1. Use of chain slings shall not be permitted for pipe handling.
2. All piping, fittings and related materials shall always be carefully handled.
3. All pipelines, fittings and drainage structures shall be kept clean and closed during construction.

2.02 - FILL MATERIALS

A. USGA Pea Gravel: USGA approved pea gravel, washed, rounded material per the following:

1. 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 Cl31). The stone material shall be used for the trench fill around and above the lateral drainpipes.
2. The gravel shall have a mean diameter of 4.0 to 8.0 millimeters and a particle size that approximates the following criteria:
3. The Owner's Testing Laboratory shall perform a Sieve Analysis Test on the Gravel Drainage Material.
4. Gravel Drainage Material will be evaluated using the 1993 USGA Testing Protocol as a guideline.
5. 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 Sub Drainage System.
6. 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 sub drainage system construction.
7. The Owner shall bear costs for the testing of the Gravel Drainage Material. All costs for subsequent testing required to gain approval of rejected materials shall be borne by The Sports Field Contractor.
8. This material must physically bridge with the Root Zone Material used for the project and meet permeability requirements to allow movement of water through the fill. See at bottom of chart below.

Aggregate Size U.S. Standard Sieve Mesh (mm)	Allowable Ranges % Passing Individual Sieve
1/2 inch (12.5 mm)	100.00%
10 mesh (2.0 mm)	<10%
18 mesh (1.0 mm)	<5%
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. Acceptance based on the following criteria:	
Test Method	**Criteria**
Sulfate Soundness	<12% Loss
LA Abrasion	<40%
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.	

Drainage Stone: Crushed limestone meeting the below guidelines for crushed stone gradation, washed to remove all dust and fines. Course gravel shown below may be used in collector trenches with round openings and in lateral drain trenches to bed pipe. Material must bridge with USGA pea gravel used for the 4” drainage layer that will rest on top of this course gravel.

Note: The course gravel may be used in collector trenches with round openings and in lateral drain trenches to bed pipe. Material must bridge with USGA pea gravel used for the 4” drainage layer that will rest on top of the course gravel. The following criteria shall be used for the interface between the coarse gravel and the gravel layer on top of laterals or large trenches and pipe.

Size mm (US Sieve)	Allowable Cumulative % Passing
19.0 mm (3/4 inch)	90 - 100
12.5 mm (1/2 inch)	40 - 60
9.5 mm (3/8 inch)	< 30
6.3 mm (1/4 inch)	< 10
4.0 mm (No. 5)	< 5

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. Acceptance based on the following criteria:

Test Method	Criteria
Sulfate Soundness	< 12% loss
LA Abrasion	< 40%
Bridging	D15 Coarse Gravel < 8 x D85 Gravel Blanket
Permeability	D15 Coarse Gravel > 5 x D15 Gravel Blanket

2.03 - LATERAL DRAIN LINES, COLLECTOR LINES & RISER PIPE

A. Lateral drain lines, collector lines and riser pipe will be both perforated and non-perforated (as shown on the Storm Drainage Plans and Details) corrugated polyethylene pipe ASTM F405. The Sports Field Contractor will also provide the drainage pipe complete with bends, reducers, adapters, couplings collars and joint materials.

B. Sub Drainage System will comply with pipe sizes indicated on the Site sub drainage Plan. No substitutions or smaller pipes will be used. Damaged and defective pipe shall be removed from the site immediately.

C. Acceptable Material: Subject to compliance with requirements, provide products from one of the following or approved equal:

1. Lateral Drain Lines, Collector, Riser Pipe.
    a. Advanced Drainage System N-12 Pipe (614) 457-3051 (www.ads-pipe.com)
    b. Hancor, Inc. Blue Seal Pipe (800) 472-9557 (www.hancor.com)
    c. Timewell, Dual Wall (www.timewelltile.com)
    d. Substitutions: As submitted for review and approval by the Architect by addendum during the bidding process.
2. Collector Lines and Riser Pipes.
    a. Advanced Drainage System N-12 Pipe (614) 457-3051 (www.ads-pipe.com)
    b. Hancor, Inc. Blue Seal Pipe (800) 472-9557 (www.hancor.com)
    c. Timewell, Dual Wall (www.timewelltile.com)
    d. Substitutions: As submitted for review and approval by the Architect by addendum during the bidding process.

D. Pipe shall comply with the following requirements:

1. The Lateral Corrugated Polyethylene Pipe will be a high-density polyethylene corrugated pipe, dual wall with an integrally formed smooth waterway. Nominal sizes shall have a full circular cross-section, with an outer corrugated pipe wall and an essentially smooth inner wall (waterway). Corrugations will be either annular or spiral. All sizes shall conform to the AASHTO classification “Type S’. The perforated pipe shall have a minimum inlet area equal to 1.5 square inches per linear foot of pipe. Pipe and fittings shall be made from virgin PB compounds, which conform to the requirements of cell class 324420C, as defined and described in ASTM D335. Pipe sections are to be in 10-foot or 20-foot sections. Rolled pipe (single wall) will not be permitted.
2. Clean out fittings will be fabricated from ASHTO M252 polyethylene pipe and will include threaded P.V.C. caps. P.V.C. caps shall have a 1/2” galvanized bolt threaded through the cap to allow for location later.

2.04 - ACCESSORIES

A. Geotextile filter fabric will be a non-woven filter fabric consisting of long- chain synthetic polymers composed of at least 85% by weight polyolefin, polyesters, or polyamides and exhibiting the following physical properties:

1. Grab Test: 90 lbs. minimum ASTM D4632
2. Puncture Test: 50 lbs. minimum ASTM D4833
3. Burst Test: 215 PSI minimum ASTM 53786
4. Trapezoid Tear Strength: 40 lbs. maximum ASTM D4533
5. Permeability: 0.1 CM/SCC minimum ASTM D4491
6. Apparent Opening Size: # 50 Sieve Size ASTM D4751
7. The Sports Field Contractor shall use Amoco # 4545, Phillips "Supac" or an approved equal for the Geotextile Fabric.

B. Utility Marking Tape: Magnetic detectable conduction, clear plastic covering, imprinted with "Storm Sewer Service" in large letters.

PART 3: EXECUTION

3.01 - EXAMINATION

A. The sub-base preparation shall be complete, and approved by owner, before commencement of work under this section.

B. The Sports Field Contractor shall verify the locations of other utilities that fall within the work area.

3.02 - PREPARATION

A. The Sports Field Contractor shall layout and stake the location of each pipe run and obtain approval of the layout from the CM and Owner prior to excavating for the drainage lines.

3.03 - DELIVERY OF GRAVEL

A. The Sports Field Contractor shall schedule delivery of approved lots of both the Fill 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 Owner and Construction Manager.

B. Fill and USGA pea gravel: Each load of gravel delivered to the site shall be visually inspected by the Owner 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 requirement, the Owner will reject the balance of that load. The rejected material shall be removed off the project site and by the Sports Field Contractor/Gravel Supplier immediately and disposed of at no cost to the Owner. Owner will pay for any tests that come back as approved, with the Sports Field Contractor paying the cost for any failed test.

3.04 - EXCAVATION

A. The Sports Field Contractor will excavate the trench to the required elevations as noted in the plans for the Drainage System Pipe and provide a clear horizontal distance between

the drainpipe and the trench wall on both sides. The Sports Field Contractor will use Spectra-Physics Laser Instruments (or equal) to set and maintain the flow slope and drainage pipe inverts.
B. All activities and work shall be conducted on a dry sub-base. Use great care so no tracks, dents, ruts, or other damage occurs to the sub-base. Any damage to the sub-base that is determined by the Owner to be detrimental to the overall success of the sub-base and its components, will have to be corrected immediately and to the satisfaction of the Owner and at the expense of the Sports Field Contractor.
C. Only perform trenching, drainage pipe installation, and backfilling operations that can be completed in one day. Any exposed trenches that collapse due to rain or other occurrences shall be widened and filled as specified or refilled with sub-grade materials, compacted, and retrenched.
D. Trench width shall not exceed dimensions shown on the plans. Sports Field Contractor shall use great care so as not to disturb the finish grades of the field. Sports Field Contractor shall make provisions to avoid rutting of the field surface and equipment used to install sub drainage system shall have large flotation tires. Under no circumstances will loaded rubber tire vehicles, or equipment with a loading rate more than 5-lbs/in to be allowed on the sub grade prior to, or during excavation, placement of pipelines, or gravel placement. Do not leave any wheel ruts.
E. Compact the bottoms of all trenches to the density described in Backfilling and Compaction included below. Owner has the option of observing the general trenching and compaction operation.
F. Two inches of Drainage Stone will be laid on top of Geotextile Fabric in the bottom of the trench prior to install of drainpipe. (See plans for details)
G. The Sports Field Contractor shall line the Excavated Drainage Trenches with the Geotextile Fabric as shown on the Site Details “Field Cross Section” prior to installing the polyethylene drainpipe and Drainage Stone.
H. Full bearing will be provided for each pipe section throughout its length with the Drainage Stone to true grades, alignment and a continuous (minimum 1.00%) slope in the direction of the flow. Lay pipe to slope gradients as noted on drawings, with the maximum variation from true slope of 1/8 inch in 25 feet with ¼ inch maximum variation along full pipe run.
I. Provide recesses in excavation bottom to receive bells for drainpipe having bell and spigot ends. Lay pipe with bells facing up slope, with spigot end entered fully into the adjacent bell. Seal joint in accordance with codes.
J. All lateral pipes shall be joined by snap coupling with soil tight gaskets on both ends. All joints to be sealed with black vinyl tape for minimized air leakage from joints. End caps to be secured with two (2) stainless steel screws and sealed with black vinyl tape for minimized air leakage.
K. The Sports Field Contractor will comply with pipe sizes indicated on the Proposed Storm Drain Plan. Substitution of smaller pipe will not be permitted (larger sizes may be used subject to acceptance of the Owner’s Representative). The Sports Field Contractor will remove damaged and/or defective pipe from the Project site immediately.
L. The perforated pipe shall be laid in accordance with the pipe manufacturer’s recommendations and as per the Slope Gradients and Invert Elevations as shown on the Drainage Plan. The pipe collars and couplings will be installed as required.
M. The sub drainage pipes must be tested and checked before placing the Drainage Stone to assure free flow. Any obstructions will be removed, and damaged components will be replaced and re- tested.
N. The filter fabric is to be temporarily wrapped around the Drainage Stone and any open pipe ends to protect the Gravel Drainage Material and pipe from sediment whenever a rain even is expected, or the trench is completed but not yet covered with the USGA Pea Gravel. The fabric is to be opened back up for the installation of the subgrade filter fabric cover and placement of

the USGA Pea Gravel to have direct contact between the USGA Pea Gravel and the Drainage Stone.
O. The Drainage Stone will be placed after testing the drainage lines. The Sports Field Contractor will place the gravel around the drainage pipe located in the trench areas until the Drainage Stone is level with the surrounding sub-grade. After filling the trenches, USGA Pea Gravel Material will be placed thus installing the "Drainage Blanket" described below.

3.05 - BACKFILLING AND COMPACTION

A. Backfilling Lateral Trenches: Fill lateral trenches with Drainage Stone in maximum 4- inch lift, consolidating each lift. Do not displace or damage drainage pipe with compacting. The intent is to have a compacted and consolidated trench that will not subside prior to the installation of the root zone mix. Exercise care to prevent disturbance to the sub-grade elevations our compaction.
B. Backfilling Collector Trenches: Fill collector trenches with Drainage Stone material in 6-inch lifts maximum, consolidating each lift. Do not displace or damage drainage pipe when compacting. The intent is to have a compacted, and consolidated, trench that will not subside prior to installation of the root zone mix.
C. Material shall be tamped, vibrated or any other approved process necessary to provide a stable compacted installation.
D. After all collectors and drain lines are installed and completed, the Sports Field Contractor shall repair any ruts, tracks, and undulations on sub-base prior to placement and spreading of root zone.

3.06 – USGA PEA GRAVEL LAYER - DRAINAGE BLANKET

A. While performing this work, the Sports Field Contractor shall avoid damage to any existing structures or features of the project site, or features under construction, such as drainage and irrigation systems. The Sports Field Contractor Shall, at his own expense, repair any such damage.
B. Any filter fabric previously folded over internal drain trenches, should be unfolded, and allowed to rest on the sub-grade as per the construction details. The fabric shall extend 12-inches beyond each edge of the trench. Pin as necessary to hold fabric in place during spreading operations.
C. The Sports Field Contractor will be responsible for removing minor residual debris from the site prior to the beginning of the placement of the Drainage Gravel Layer.
D. A 4-inch layer of the above-specified USGA Pea Gravel Material shall be placed and installed over the entire sub-grade. The Sports Field Contractor shall begin delivery; placement and grading of the 4-inch gravel blanket only after all other field systems have been inspected and approved by Owner. Additionally, and after testing and with Owner's approval for each 400-ton lot of additional gravel. Installation shall follow procedures that protect the sub-grade, trenches, and all the field systems components within and below that layer.

1. Drainage fill and pea-gravel shall be placed at the edge of the field (or another pre-approved location by Owner) and pushed from behind to the center of the field with a low ground pressure Sand Dozer. Under no circumstances will rubber-tired loaded vehicles, or equipment with a loading rate more than 5-lbs/in, be allowed on the sub-grade during the placement and spreading of the USGA pea gravel.
2. The Sports Field Contractor shall spread the pea-gravel over the completed sub-base and drain tile to the depth and finish grades indicated on the drawings. Extreme care must be exercised so that there is no damage caused to both the drainage, sub-base, and irrigation systems by any of the equipment used during the hauling and

spreading operations. The sub-base soil shall be dry before placement and spreading of the gravel can begin.

3. Delivery trucks shall enter the field area from the designed entrance point. Unless otherwise approved by Owner, the gravel shall be dumped closest to the entrance first, and then pushed from behind towards the further most point of the field. Extreme caution must be used throughout the entire process to ensure no damage is done to any of the existing system components.

4. Move the gravel from the stockpile in such a manner that contaminated materials are not tracked onto the field from the equipment tracks or tires. If it is determined by the Owner that contamination is occurring, on-site samples will be taken and tested by the Testing Agent at the expense of The Sports Field Contractor. Any contamination or over compacted conditions will require immediate action by The Sports Field Contractor, to satisfy the intent of these specifications, and with no additional cost to the Owner.

5. ONLY low earth pressure, track-type sand dozers equipped with a laser-guided hydraulic system may be used during distribution. Dozers shall only traffic gravel they are spreading and should push out the gravel from behind the pile onto and toward the field center.

6. Care shall be taken not to disturb or contact the sub-base or trenches with the dozer blades or tracks. All equipment trafficking over the drainage blanket shall insure there is a minimum of 4” depth between the sub-base and the contact point of the dozer tracks.

7. After spreading of the gravel is complete, firm the surface with a 5-ton roller. Static vibration shall not be a part of the process.

8. The gravel shall be left firm, but not over-compacted as to protect the porosity and drainage capabilities of the pea-gravel profile.

9. The pea-gravel must be installed to a consistent depth of 4-inches throughout the entire site.

10. The USGA Pea Gravel Layer, after being spread uniformly throughout the surface, shall receive a final laser finished grade. This process may be accomplished by using laser equipment consisting of an agricultural type tractor, equipped with flotation type tires, and pulling a five to seven-foot laser guided scraper that is fully automated, hydraulically actuated and capable of grading to within 1/4” of desired elevations.

E. The sub-grade must remain smooth and firm during all construction activities. Prevent contamination or mixing of drainage fill and Drainage Stone and any adjacent sub-grade soil.

F. The Owner’s Representative shall approve the completed installation of the USGA Pea Gravel Layer before the Sports Field Contractor may proceed with the installation of the Root Zone Mix.

3.07 - FIELD QUALITY CONTROL

A. Perform testing and observation of trench bottoms to confirm solid substrate prior to installation of filter fabric. Trench bottoms are to be probed every 150 feet to verify stiffness. If adequate stiffness is not achieved, observe, and verify remedial work to remove and replace soft material or additional work to compact soft material.

B. Observe installation and verify overlap of filter fabric for trenches and subgrade cover.

C. Observe installation of sub drainage pipe and verify joint connections and consistent slope prior to the piping being covered.

D. Observe and verify adequate densification work has been done to achieve the required density of the Drainage Stone backfill and the USGA Pea Gravel layer. Also verify that these materials have not been contaminated with other soil materials.
E. Verify these materials have not been contaminated with other soil materials.

3.08 - CLEANING

A. Remove from the project site and legally dispose of unused materials, waste materials, including unsuitable excavated materials, trash and debris generated during the Sub Drainage System Installation.
B. Maintain disposal route clear, clean, and free of debris.

3.09 - ACCEPTANCE

A. Test and demonstrate to the Owner the satisfactory operation of the Drainage System and that it is free of any defects.
B. Complete Drainage System record drawings. The record drawings shall be delivered to the Owner before final acceptance of the work.
C. Completion of the work shall mean full and exact compliance and conformity with the provisions expressed in the drawings and specifications.
D. Sub Drainage System must be approved by the Owner prior to the commencement of the installation of the root zone.

PART 3: EXECUTION

3.01 - ROOT ZONE

A. Verification of sub-base, irrigation system and sub drainage: The Sports Field Contractor shall check and verify that the sub-base, irrigation system and sub drainage has been installed and is functioning correctly. Verify that irrigation heads are installed to below 1/8 of an inch from flush to the surface after grassing. Report, in writing, any concerns or issues prior to starting work contained in this section. Do not begin until any issues are addressed, and you have written approval to proceed.
B. Root Zone: The Root Zone shall be selected and defined by the criteria established under Part 2 – Products and Materials of this section and the Owner's testing agent. The Root Zone will be evaluated using the referenced testing protocol in this specification.
C. The Sports Field Contractor shall provide a root zone sample, which shall be tested for compliance with the specifications. Upon approval of the root zone, the test results will establish the specifications for approval or rejection of all subsequent submittals during construction of the Root Zone.
D. Upon receipt of the written test results showing approval of the first *650* tons of material, The Sports Field Contractor may begin delivery of the approved material.
E. Each additional *650* tons of Root Zone delivered to the project Site must be tested and approved by the Owner prior to shipment to the site.

3.02 - DELIVERY OF ROOT ZONE

A. The Sports Field Contractor shall schedule delivery of approved Root Zone material. Confirm that delivery will be made in washed and covered trucks, and or rail cars, to eliminate contamination during transportation. Stockpiling of the material on site is to be

coordinated with the Owner and General Contractor. The material shall be placed in an area free from contamination avoiding such areas as low wet areas and or refuse and debris areas.

B. **Root Zone**: Each load of Root Zone delivered to the site may be visually inspected by the Owner for any contamination. If samples appear 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 requirement, the balance of the failed root zone will be rejected by the Owner. The rejected material shall be removed off the project site and off the property by The Sports Field Contractor/Root Zone Supplier immediately. The Owner shall not bare any cost for its removal. Should the test results meet the specifications and are within the initial test results, the Owner shall bear the cost for that load.

3.03 - SPREADING ROOT ZONE

A. The Sports Field Contractor shall begin delivery, placement, and grading of the root zone; only after all other field systems have been inspected and approved by Owner. Additionally, only after testing and with Owner's approval, for each *650*-ton lot of additional root zone. Installation shall follow procedures that protect the sub-base and all other field systems.

1. The Sports Field Contractor shall place the Root Zone over the sub-base, sub drainage and finish grades indicated on the drawings. Extreme care must be exercised so there is no damage to the sub-base, Natural Grass Drainage, and Irrigation Systems; by any of the equipment used during the Root Zone hauling, placement and spreading operations.
2. Move the root zone from the stockpile in such a manner that contaminated materials are not tracked onto the field from the equipment tracks or tires. If it is determined by the Owner that contamination is occurring, on-site samples will be taken and tested by the Root Zone Testing Agent at the expense of The Sports Field Contractor. Any contamination or over compacted conditions will require immediate action by The Sports Field Contractor, to satisfy the intent of these specifications, and with no additional cost to the Owner.
3. ONLY low earth pressure, track-type sand dozers equipped with a laser-guided hydraulic system may be used during distribution. Dozers shall only traffic root zone they are spreading, Dozers should push out the Root Zone from behind the pile onto sub-base, and toward the field center.
4. Care shall be taken not to disturb or contact the sub-base with the dozer blades or tracks. All equipment trafficking over the sub-base shall insure there is a minimum of 3" depth of Root Zone between the Root Zone and the contact point of the dozer tracks. The Root Zone may be "pushed" out and onto the surface at the 6-inch depth in one operation.
5. After placement and uniform distribution of the Root Zone, a final fine grading of the surface shall occur. For the fine grading, use of a turf-type tractor with high flotation tires and a hydraulically controlled laser blade may be used.
6. Delivery trucks shall enter the field area from the designed entrance point. Unless otherwise approved by Owner, the Root Zone shall be dumped closest to the entrance first, and then pushed from behind towards the further most point of the field. Extreme caution must be used throughout the entire process to ensure no damage is done to any of the existing system components.
7. After placement and prior to fine grading, the Root Zone shall be "settled using 3 inches of irrigation to promote compaction and settling of the root zone

B. The Sports Field Contractor shall operate the irrigation system until water is shown to be draining through the sub drain collectors. Fill all low spots to finish grade with Root Zone and water

in. This process shall be repeated as required to bring to finish grade specifications and tolerance forming a smooth firm surface. Finish grades and material depths shall be verified utilizing the Spectra-Physics (or equal) laser operated survey instruments at a grid of 25 feet grid. Field compaction shall not exceed bulk density as performed in laboratory testing.

C. Areas where the root zone material is consistently hauled into the sub-grade repeatedly, and that cause any compacted root zone, may require roto-tilling to a depth of 5-inches minimum **(but no deeper than any of the previously installed root zone and no so deep as to disturb the sub-base)**, and to the satisfaction of the Owner.

3.04 - FINISH GRADING

A. The required finish grading work shall be performed by The Sports Field Contractor which will produce the grading requirements shown on the plan. There shall be no damage to either the sub-base, Sub drainage or Irrigation Systems during the Fine Grading Operations.

B. Ensure that irrigation heads are left with the proper depth of minus 1/8 of an inch to flush with surface after grassing.

C. The Sports Field Contractor shall be responsible for removing minor residual debris from the site prior to the beginning of shaping a finished grade that provides positive drainage and is in conformance with the finish grades shown on the grading plan.

D. The Sports Field Contractor shall provide all staking and layout for grade control so that the finished design plan grades will meet specifications.

E. The final grade shall be established using a fully automated Spectra Physics, (or approved equal) hydraulically actuated laser guided equipment. Acceptable grading tolerances will not be exceeded.

F. The Sports Field Contractor shall verify grades established during the final laser site finish grade preparation prior to the beginning of *sod installation* as being true finish contours shown and maintain such areas until the effective date to begin *sodding operations*. It shall be the responsibility of The Sports Field Contractor to maintain a suitable grade for sod, including but not limited to hand grading (to string line) if required, after the Owner has inspected and approved the final finish grade. This will include acceptance based on the conformance survey.

G. The acceptability of finish grade areas shall be solely determined by the Owner and prior to the grassing of the surface. The Owner will, after providing written acceptance of the finish grade and all other field components, be responsible for the grassing of the surface.

H. The Owner will supply and apply pre-plant material (fertilizers, etc.) along with the finish grading operations, and will work with Sports Field Contractor on timing and application so as not to prohibit the finish grade process.

3.05 - ACCEPTANCE

A. Completion of the work shall mean full and exact compliance and conformity with the provisions expressed in the drawings and specifications.

B. The acceptability of all material, workmanship, labor, and compliance with the specifications, grades and standards shall be solely determined by the Owner.

C. The Owner shall have the right, at any stage of the work, to reject all work and materials which, in their opinion does not meet the requirements of the plans and specifications. Rejected material shall be immediately removed from the site and acceptable material in its place by The Sports Field Contractor.

END OF SECTION

Chapter III
Section 38 52 61
Sod Requirements, Installation, Acceptance

PART 1: GENERAL

1.01 - RELATED DOCUMENTS

A. A drawing will be provided showing area for delivery, and unloading, of the sod. It will also show area to be included for installation.
B. *Within this section, the term "Sports Field Contractor", shall include the "Sod Producer & Farm" and or the "installer of the big-roll sod; and both shall be the entity that meets the criteria shown below in section "Quality Assurance". Additionally, the term "Owner" shall include his appointed representative, and the General Contractor (GC).*

1.02 – RELATED SECTIONS

A. Irrigation
B. Root Zone

1.03 - SUMMARY

A. *The intent of this specification is to secure a sod producer and installer to provide and install the sod, as outlined within this document. The field will be built as a 8" Fusion Root Zone. The total square footage for sod and installation will be approximately 97,690 sq. ft. Submittal of the sod and installation should be included with this bid, with the vendor submitting listing the sub, along with information required under **1.05 - SUBMITTALS REQUIRED WITH BID**.*
B. The Sports Field Contractor will coordinate delivery of the sod to the site for installation.
C. Furnish all labor, material, supervision, and equipment necessary to install big roll or split sod as specified herein. Sod installation includes, but is not limited to the following:
    1. The Sod Producer and Farm must be currently licensed and approved to produce and sell *After Midnight Kentucky Bluegrass,* Please provide a copy of the producer's license. Additionally, and if the sod is grown in a state with a certification program, a copy of the state's certification certificate will be required.
    2. The work specified in this section consists of the establishment of a consistent, dense, healthy stand of grass within the area specified on the drawings.
D. The extent of the natural grass field system is indicated on drawing provided.
E. Grade Elevations: Finish grading shall be as specified on the plans and to the finish grades as shown on the grading plan sheet.
F. No deviation from the specifications, any accompanying drawings, or the contract agreement is authorized, or shall be made without prior written authorization, which is signed by the Owner.

1.04 - QUALITY ASSURANCE

A. The Sports Field Contractor (both the sod producer and installer) shall install or oversee the sod harvest and installation as an in-house operation. The on-site supervisor must have been

actively and directly engaged in the installation of big-roll sod for either NCAA Division 1, NFL, or MLB level for the past five (5) consecutive years.

B. The Sports Field Contractor's sod installation crew must perform all work as detailed in the specifications and plans with no exceptions.

C. The owner shall have the right, at any stage of the process listed in this section, to reject all work or material, which in their opinion, does not meet the requirements of the plans and specifications.

D. Contractor qualification: The Sports Field Contractor shall complete all work associated with this section, and be the entity submitted by the Contractor with their initial bid package meeting the following requirements:

1. The Sports Field Contractor must have been actively engaged in the construction of sand-based sports fields (sod installation), under the same company name, for a minimum of the past five (5) consecutive years, with projects at the NCAA Division 1, NFL or MLB level.
2. The Sports Field Contractor must submit proof, along with contact information, of five (5) or more NCAA Division 1, NFL or MLB sports field installations (sod installation and or sod provided for) of sand-based construction; that have been in use for a minimum of three (3) consecutive years.

1.05 - SUBMITTALS REQUIRED WITH BID

A. Submit, along with contact information and project scope, a list of five (5) NCAA Division 1, NFL or MLB projects, consisting of sand-based sports fields, that have been completed and in use for a minimum of three (3) full years, for both the installer and sod provider.

B. Include a detailed list of all equipment to be used for this section of the project. The list should include both equipment owned by the Sports Field Contractor and Sod Provider, along with all pieces that must be rented.

C. Provide the name of the on-site superintendent for this section of the project, along with contact information for that individual. Also, include the contact person, along with email and phone numbers for that person, from the sod provider.

D. Include a most recent soil analysis, including particle size, for which the proposed sod is currently being grown on and will be harvested from.

E. Please provide a copy of the producer's license as issued by Sod Solutions. Additionally, and if the sod is grown in a state with a certification program, a copy of the state's certification certificate will be required.

F. Include schedule/timeline for items listed in this section.

G. Seed label for proposed fescue big-roll sod, that will include placement of a single roll just inside the entire length of the perimeter fence.

PART 2: PRODUCTS

2.01 – SOD AND AMENDMENTS

A. *Amendments: The Sports Field Contractor will apply pre-plant material, and grow-in fertilizer, and other materials as necessary for establishment of the sod. Additionally, and after completion and acceptance of the sodding, the City of Milbanks S.D., will take over the maintenance of the turf, including rolling of the sod, mowing and irrigation.*

2.02 - SOD – 365 SS Kentucky Bluegrass

A. Sod: The Owner, or his representative, may approve the sod as it is being harvested at the sod farm. The big-roll Kentucky Bluegrass sod will be a minimum width of 42 inches and no less than 80 feet long; with a maximum length of 100 feet. The sod shall be delivered with a soil thickness of 3/8". The Owner's preference is to have solid rolls; however split rolls may be provided.

B. The owners' preference for the primary sod area is After Midnight Kentucky Bluegrass (the final decision will be made later, and based on availability, soil test results, etc.). However, if the available quantity of After Midnight Kentucky Bluegrass is not sufficient, or not suitable due to winter kill, a lack of density, tensile strength, etc., or to meet the square footage required to complete the project, another Kentucky Bluegrass variety may be considered as an alternate.

B. The sod shall be a nursery grown, **sand based**, Kentucky Bluegrass, purchased by the Sports Field Contractor and delivered to project location. It must be a machine cut sod, at a uniform thickness excluding top growth and thatch, and matching the depth of cut for the sod removal. The sod farms sand growing medium must be a soil that is compatible with the installed root zone of the base bid and any alternates and should be a free draining material that is tested by the owners' testing lab in particle and soil characteristics. Confirmation of compatibility for both the sod growing medium and the existing root zone, along with acceptance by the owner, will be required. Additionally, all test results are to be made available to the owner for his review and acceptance prior to securing the sod.

D. Sod must be sand grown Kentucky Bluegrass machine cut and taken up in commercial size rolls. The sod shall be sufficiently thick to secure a dense stand of live grass that will maintain suitable conditions for installation. Sod must be live, fresh, and uninjured at the time of planting, and should consist of a sufficient and consistent thickness to withstand all necessary handling. However, if a thicker cut is required to maintain the integrity of the sod for handling, and that thickness would exceed the depth of the soil/sod removed, netting may be used to stabilize the sod until installation. ALL NETTING MUST BE REMOVED BEFORE THE INSTALLATION PROCESS.

E. Harvesting procedures, and the equipment used for harvesting the sod, must produce a uniform cut. The sod should have a consistent thickness of soil across the entire width and length of each section. Edges must be cut at 90° angles requiring the use of sharp blades for the entire harvesting process. Sod should be protected against drying and breaking of rolled strips while at the practice field and prior to installation.

F. All sod rolls are to be free of noxious weeds and other objectionable plant material.

G. Sod may be transported by open truck, only if harvesting begins after 7:00 P.M. local time at the sod farm and delivered to job site before 9:00 A.M. local time the following day. It must be adequately covered to prevent windburn.

H. **If delivery of the sod cannot meet the requirements as stated in "G", the sod shall be delivered in refrigerated trucks. The temperature range should be between 50-55 degrees at the start of loading process at the sod farm and maintained until sod is unloaded at site. Installer shall have a pallet jack and forklift available on site for unloading.**

I. Sod must be installed within **24 hours from harvest**, or it will be rejected and must be removed from site. Any of the delivered sod, which is damaged through any action or inaction of the contractor or subcontract, must be replaced at the contractor's expense.

J. Contractor/installer will be responsible for the coordination and scheduling of the harvesting, timing, spacing and number of trucks per day for the delivered big roll sod. It is the responsibility of the installer to protect the sod until it is installed. The number of trucks that deliver each day shall not exceed the ability of the installer to install the sod within the time requirements. Additionally, the spacing of the trucks shall not allow for no more than 2 trucks to be on site at any one time.

K. Acceptance of the delivered sod will be at the sole discretion of the owner, or owner's representative, with no exceptions.

PART 3: EXECUTION

3.01 - SITE CONDITIONS

A. The Sports Field Contractor is responsible for acquainting themselves with the site, including locations of all utilities, irrigation boxes, value boxes, etc. Avoid conflicts with all existing facilities and maintain any grade stakes set by others unless all parties concerned mutually agree upon the removal.
B. The Sports Field Contractor shall be responsible for complete coordination of the sodding operations, along with any other field operations. Repair of damages to plants, grades, fences, etc. caused during the off loading and installation of the sod are not to be considered as an extra and shall not be charged to the Owner.
C. Finish grade of the root zone will have been completed, certified by a conformance survey, and approved by the Owner. It is the responsibility of the Sports Field Contractor to maintain the finish grade throughout the installation process.
D. Confirm that the irrigation system is fully operational prior to scheduling the delivery of the sod to the construction site. Coordination with the Owner will be critical for this work. Owner to confirm irrigation system is fully operational.

3.02 - SITE PREPARATION

A. It is the responsibility of the Sports Field Contractor to maintain and preserve the accepted finish grade for sodding once the Owner has accepted the final grade, and prior to the start of sod installation.
B. Any areas of the finish grade, which are damaged or disturbed, during or prior to sod installation, must be re-graded, re-floated, etc., to their previous approved elevations and at no expense to the Owner. Any areas that are repaired, shall be subject to inspection and approval, in writing, by the Owner, and prior to any sod being installed to those areas.
C. The Sports Field Contractor shall be responsible for repairing any, and or all, settlement of the sand root zone, or other field components.

3.03 - SOD INSTALLATION

A. The entire root zone surface shall be approved by the *Owner*, in writing, prior to installation. The areas to receive sod shall be firm, and the irrigation/drainage systems operational. Lay sod within 24 hours from time of harvest. Sod that is not placed within 24 hours, will be rejected by the owner with no exceptions. The Sports Field Contractor will pay for the cost of replacing any sod rejected due to delayed, or improper installation and initial maintenance and watering.
B. During the installation of the sod, the Sports Field Contractor shall maintain the finish grade by floating, hand ranking, dragging, or whatever approved leveling operations are necessary and required.
C. Absolutely no forklift or heavy equipment will be allowed on finish graded root zone. Machines, properly sized in weight and equipped with high flotation turf tires, or rubber tracks, shall be used to install sod. Equipment shall be operated at speeds as so not to disturb the previously established finished grade. All areas disturbed by the Sports Field Contractor shall be hand raked back to the project finish grade, prior to installation of the sod on that area or areas.

D. The *Owner's Rep* will be on site to observe the installation of the sod. All defects, as deemed by the Owner, shall be repaired, or replaced by the Sports Field Contractor immediately. The Owner's sole judgment shall determine any rejection, replacement, and repair of the daily installed sod.

E. Working in conjunction with the *Owner*, and using the new irrigation system, the sod shall be laid on a moist planting bed to ensure the new roots have exposure to adequate water for optimum growth. The rolls shall be fitted together as tightly as possible and all cracks between the sod roll seams must be filled, by hand, with sand used for the root zone construction. Tamp or roll the sod (3-ton roller) to remove air pockets and ensure close contact between the sod and root zone material (See 2.4 Watering and Rolling below).

F. The *Owner* will discuss, and coordinate with the Sports Field Contractor, the starting point and installation layout prior to the beginning of the sodding process. Consideration will be given to the zoning of the irrigation system. However, the process shall include the first roll laid in a straight line with subsequent rolls placed parallel to and tightly against each other. The roll end lateral joints shall be staggered to promote more uniform growth and strength. Care should be exercised to ensure that the sod is not stretched or overlapped, and all seams are tight to prevent any holes. All netting shall be removed from the sod roll as it is being installed. **Absolutely no netting shall remain under and between the root zone and the sod soil mat.**

G. The installing personnel shall tamp each sod roll side to ensure contact with adjacent sod roll and rootzone surface. **Any patches used for repair shall be no less than 36" in length and the full roll width.** They shall be cleanly cut in straight edges and installed tight. **Any, and all patching of sod shall occur prior to rolling of sod.**

H. In the event of inclement weather, such as rains, and to complete the sodding on schedule, the Sports Field Contractor may continue to lay the big roll sod with the approval of the *Owner*. However, in this case the *Owner* may require, to avoid damage to the already placed sod, that plywood sheets be placed on newly installed sod as the sod is being installed.

I. No equipment, or vehicles, will be allowed to travel over any sodded area after installation, unless approved by the *Owner*.

J. The *Owner* shall have the right, at any stage of the sod installation, to reject any, or all work and materials, which in their opinion, does not meet the requirements of the plans and specifications. Rejected materials must be immediately removed from the site and replaced with the acceptable new sod material. The replacement of the rejected sod, and all associated costs, shall be at no expense to the owner.

K. To prevent excessive drying, and to enhance rooting and establishment, irrigation of the sod should begin immediately after installation of each row. Use a hand-held water hose with a spray nozzle, or by whatever approved means necessary, to irrigate each row to a soil depth of 1-inch after installation of each row, or sooner.

1. Working in conjunction with the owner, and after each row has been hand watered, ensure that the irrigation system is operating so that the sod will remain wet, as well as the non-planted root zone surface, remains firm and moist for placement of the reminder of the day's sod.

L. Seams and Joints: After installing and rolling of the sod, fill all joints and seams with the approved root zone sand and water in thoroughly by hand, removing any excess sand that may remain above the sod layer.

M. No equipment or vehicles will be permitted to drive over sodded areas after installation, without prior consent of the owner.

N. Acceptance of the sod: After each day, the owner shall inspect the sod installed during that day, to ensure compliance with all specifications and plans. Unacceptable sod shall be removed

immediately from the site and replaced the following day with newly delivered, fresh sod. The replacement of any rejected sod, and any additional installation cost, shall be at no expense to the *Owner*. This preliminary acceptance does not guarantee final acceptance by the *Owner's Rep* at the completion of the entire sod installation by the Sports Field Contractor.

O. Irrigation System: The system shall be monitored and adjusted, on a continual basis, throughout the sod installation, to ensure that the system is functioning correctly. Report any issues or concerns immediately to the *Owner* and Contractor. During the entire installation process, the Sports Field Contractor shall coordinate, with the *Owner*, irrigation timing, cycles, etc. to provide optimum conditions for the rooting and establishment of the sod.
The *Consultant* will have final say on the how and when the irrigation will be used during the installation of the sod.

3.04 - WATERING AND ROLLING

A. The *Owner,* working in conjunction with the Sports Field Constructor, shall roll the sod with a mechanical roller as sodding is completed in any one section, or as determined by the owner.

B. The Sports Field Constructor is responsible for watering of the sod until completion and acceptance by the Owner. Please note K & O above in section 3.03 – Sod Installation.

C. All patching of sod shall take place prior to rolling of the completed accepted sod by *Owner*.

3.05 - ACCEPTANCE

A. After completion of the sodding, the *Owner*, to ensure that the sod installation has been completed to their satisfaction, will perform a provisional acceptance inspection. The *Owner* will immediately begin maintaining the sod upon provisional acceptance. All requirements of the specifications shall apply until final acceptance by the *Owner*

B. The *Owner* shall solely determine the acceptability of all material, workmanship, and compliance with the specifications and standards.

C. Final acceptance, which will be reviewed at the three (3) week completion date, shall be determined by the *Owner* and will occur with the following:

1. A minimum root depth of three (3) inches over the sodded area as determined by eight (8)-core samples taken by the *Owner*.
2. Dense, green, consistent turf that is void of any dead areas and weeds over the entire sodded area.
3. A smooth, level-playing surface that is appropriately compacted and considered safe and playable as determined by the *Owner*.

END OF SECTION