SECTION 32 18 23 - NATURAL GRASS PLAYING FIELD SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section and the following Sections specify the Natural Grass Playing Field System and each of the elements that comprise the design and construction of the playing field.
   1. 32 18 23.13 - Natural Grass Playing Field Earthwork.
      a. Trenching, grading, filling, backfilling, compaction.
      b. Disposal of spoil materials.
   2. 32 18 23.19 - Natural Grass Playing Field Sub-Drainage.
      a. Filter Fabric.
      b. Gravel drainage material.
      c. Lateral drain pipe, collector pipe, cleanouts and fittings.
      d. Perimeter warning track drain.
   3. 32 18 23.23 - Natural Grass Playing Field Irrigation System.
      a. System Piping.
      b. Irrigation Heads.
      c. Automatic Control System.
      d. Booster Pump.
   4. 32 18 23.24 - Natural Grass Playing Field Material and Mixes.
      a. Soil materials and amendments.
      b. Infield Mix
      c. Warning Track Mix
      d. Batter's Box/Pitching Mound Clays
   5. 32 18 23.26 – Natural Grass Playing Field Sod
      a. Sod
   6. 32 18 24 – Synthetic Turf Playing Field Surfacing
      a. Synthetic Turf

1.2 SUBMITTALS REQUIRED WITH BID

A. Bidders Qualification Requirements: Each bidder shall have Certified Field Builder accreditation, as determined by the American Sports Builders Association (ASBA), and provide proof of three or more recent softball/baseball playing field installations at the NCAA Division I level or higher, which have been in use successfully for five (5) or more years. The representative sports field installations shall include sand-based, irrigation and subdrainage systems incorporated with the fields. If this cannot be adequately shown as stated above, the bidder shall submit the following additional information.
   1. Identification of Jobsite Superintendent and personnel to be used on this project and experience level of each.
   2. Letter of reference from owners and tenants of completed installations.
   3. Listing of equipment proposed to use for construction.
   4. The Architect and Owner will review this information for acceptance or rejection of the proposed Bidder, and reserve the tight to visit and inspect completed installations.
   5. All grading operations specified herein shall be performed with state-of-the-art laser grading equipment. Bidders not capable of providing laser graded subgrade, gravel layer, and rootzone layer will not be considered.

B. Each bidder shall submit a preliminary bar chart field construction schedule that lists the types of work to be performed and length of time for each.

1.3 SUBMITTALS REQUIRED AFTER AWARD OF CONTRACT

A. Test Reports: The following reports shall be submitted directly to the Architect from the testing services, with copy to the Owner:
   1. Field reports are specified in this Section under PART 3 - EXECUTION, “FIELD QUALITY CONTROL.”

B. Supplier List: Submit list of procured and contracted suppliers of all materials required for the Playing Field System no later than 21 days after notice to proceed. Contacts and phone numbers shall be included for verification.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with 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.

B. Owner’s Material Testing Agent: An agent representing the Owner shall be present during the preparation and packaging of samples from the processed sand, the sand and peat blended and the gravel drainage material. The sample shall consist of cross-sections taken from the top, bottom, and sides of the stockpile. A one-gallon sample in a sealed plastic bag shall be packaged and shipped to the Owner's testing agent.

C. Architect’s Recommended Testing Agent: Turf & Soil Diagnostics
   613 E 1st Street
   Linwood, Kansas 66052
   (855) 769-4231

1.5 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

1.6 COMPLETION DATES / OBSERVATIONS

A. General: Field completion and observations shall be separated into 3 phases, “Construction Observation”, “Initial Completion” and “Substantial Completion.”

B. Construction Observation: At a minimum, one construction observation visit shall take place when:
   1. Subgrade has been prepared, compacted, and to grade.
   2. Drainage system installed and proof of working order.
   3. Drainage gravel is installed and to grade.
   4. Irrigation is partially installed.
   5. Infield skinned area is prepared and partially installed.
   6. Rootzone layer is partially installed.

C. Initial Completion: Scheduled date for initial completion shall be at least 30 calendar days before substantial completion. Notify the Architect and Owner in writing, 7 days prior to scheduled date for observation for "Initial Completion." The Architect in written form shall provide a punch list of items necessary for completion to obtain "Substantial Completion". To be considered "Initially Complete" the following items shall be provided:
   1. Rootzone mixture in place, compacted and to grade.
   2. Drainage system installed and proof of working order.
   3. Irrigation system tested, installed and adjusted.
   4. Sod areas laid, joints and seams filled.
   5. Skinned areas including infield, pitcher's mound, batter's box area, and bullpens.
   6. Synthetic turf within the bullpens laid and infilled.

D. Substantial Completion: The Contractor shall notify the Architect and Owner in writing, 7 days prior to a requested date for a site observation to meet "Substantial Completion." To be considered "Substantially Complete" or "Playable" the following items shall be completed or provided:
   1. Verification that "Initial Completion" punchlist items are complete.
   2. Absence of all joints and cracks in sod installation as to appear "seamless" and a dense, green, consistent grass void of bare or patchy areas.
   3. Smooth, level playing surface compacted and leveled to grading tolerances.
   4. Written warranties/guarantees.
   5. Grass maintained at a height of 5/8 inch (15.9 mm) to 3/4 inch (19 mm) mowed with reel-type equipment.
   6. Stockpiled of field materials.
   7. Installation of skinned areas of playing field, pitchers mound, warning track and homeplate areas.
   8. Installation of bases and plates.
   9. Skin mixes, including warning track shall be firm, compacted and graded to a smooth surface and elevation as indicated on the Drawings.
   10. Grass edges shall be cut in crisp, straight lines as depicted on the drawings.
   11. Sod shall display an average of 3" of root growth across the entire playing field.

1.7 WARRANTY / GUARANTEE

A. General: Warranties / Guarantees specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties/guarantees made by the Contractor under requirements of the Contract Documents.

B. Installer Guarantee: Provide a "Full System Guarantee" agreement. The President of Playing Field System installer shall sign guarantee. Provide a guarantee for repairing or replacement of the Playing Field System materials and workmanship for the following period of time:
   1. One year after date of Substantial Completion.

C. The following are inclusive of the term "Playing Field System" for provisions of the guarantee:
   1. Working functions of the irrigation system.
   2. Working functions of the drainage system.
   3. Final grade tolerances to one-quarter inch in the length of 25 feet of finish grade in any direction.
   4. All materials and products specified.
   5. Rootzone mixture shall be guaranteed to have a saturated hydraulic conductivity of greater than or equal to 6.0 inches per hour.
   6. Grass shall be true of species and type and free from objectionable weeds and/or grasses.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION AND PROTECTION

A. Verification of Conditions: Examine areas and conditions under which all work of this Section is being performed. Do not proceed with any work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of all areas and conditions.

B. Protection of Work: Protect all on-going work, so as not to delay work due to weather or project related construction. This includes but is not limited to the use of tarps, geotextile, plywood and other protective measures.

C. Protect of Persons and Property: Provide all necessary measures to protect workmen and passersby. Barricade open excavations occurring as part of the work, as required by municipal or other authorities having jurisdiction.
   1. Protect adjacent construction throughout the entire operation. Protect newly graded areas from destruction by weather or runoff. Protect structures, utilities, pavements, and other improvements from damage caused by settlement, lateral movement, undermining and washout.

D. Unanticipated Conditions: Notify the Architect immediately upon finding evidence of previous structures, 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 geotechnical reports. Secure the Architect's instruction before proceeding with further work in such areas.

3.2 FIELD LAYOUT INSTALLATION

A. General: Layout of the field regarding all painted lines and logos shall be by the Owner following Substantial Completion.

3.3 FIELD QUALITY CONTROL

A. Compaction: Subgrade to be compacted to 95% proctor density in all locations. Testing regimen to be as recommended by Owner's geotechnical testing agent. Compaction testing to occur at a minimum of 8 locations, representative of the entire playing field. Compaction test reports to be provided to the Architect for review.

B. Failings: If, based on the testing and observation agency reports and observations, compacted subgrade or fills are found to be below specified density, provide additional compaction and testing in accordance with specifications.

C. Grade Verification Surveys: Submit a certified 3rd party survey with spot elevations at the specified spacing of the entire playing field surface, after completion of the following stages:
   1. Subgrade: Spot elevations on 25' centers
      a. Tolerance: ½" (12.7 mm) over 25 feet (7.6 m) in each direction
   2. Drainage Gravel Layer: Spot elevations on 25' centers
      a. Tolerance: ½" (12.7 mm) over 25 feet (7.6 m) in each direction
   3. Top of Rootzone: Spot elevations on 25' centers
      a. Tolerance: ¼" (6.4 mm) over 25 feet (7.6 m) in each direction

4. Finished Playing Field Surface
    a. Sod: Spot elevations on 25’ centers
        1) Tolerance: ¼” (6.4 mm) over 25 feet (7.6 m) in each direction
    b. Infield Mix: Spot elevations on 10’ centers
        1) Tolerance: ¼” (6.4 mm) over 10 feet (3.05 m) in each direction
    c. Warning Track: Spot elevations on 10’ centers, including at the base of field wall.
        1) Tolerance: ¼” (6.4 mm) over 10 feet (3.05 m) in each direction

D. Verification Survey of Field Layout: Submit a certified 3rd party survey for the layout of the following:
    1. Base Paths: Locate and determine the dimension and angle between each base path, as to display compliance with the plans and all NCAA Rules and Regulations.
    2. Foul Poles: Locate and determine the angle between the outside edge of the foul poles, taken from the apex of home plate, as to display compliance with the plans and all NCAA Rules and Regulations.

3.4 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Removal from Owner's Property: Remove waste materials, including materials not allowed for fill, backfill or site grading as specified within, trash, and debris, and properly dispose off Owner's property at Contractor's expense.

END OF SECTION

SECTION 32 18 23.13 - NATURAL GRASS PLAYING FIELD EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the earthwork and subgrade preparations for the Natural Grass Playing Field System, including, but not limited to the following:
   1. Trenching, grading, filling, backfilling, compaction.
   2. Disposal of spoil materials.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 32 18 23 "Natural Grass Playing Field Summary" for summary of the Natural Grass Playing Field System, and the following Sections as parts of the System:
      a. Section 32 18 23.19 "Natural Grass Playing Field Sub-Drainage" for filter fabric, gravel drainage material, pipe and fittings, and drains.
      b. Section 32 18 23.23 "Natural Grass Playing Field Irrigation System" for irrigation piping, heads, and automatic control system.
      c. Section 32 18 23.24 "Natural Grass Playing Field Materials and Mixes" for soil materials, amendments, infield mix, warning track mix and Batter's Box/Pitching Mound clays.
   2. Section 32 18 24 “Synthetic Turf Playing Field Surfacing” for synthetic turf.

1.2 INFORMATION AVAILABLE TO BIDDERS

A. The Owner has available subsurface investigation and engineering analysis report for the Playing Field System.

1.3 DEFINITIONS

A. Unauthorized Excavation: Inadvertent or purposely removing materials beyond indicated subgrade elevations or dimensions without specific direction of Architect. Unauthorized excavation, as well as remedial work resulting from unauthorized excavation directed by Architect shall be at Contractor's expense.
   1. Unauthorized excavation, including disposition of additional excavated materials and other work resulting from slides, cave-ins or remedial work shall be at Contractor's expense.

B. Additional Excavation: When excavation has reached required subgrade elevations, notify Architect, who will make an observation of conditions. If Architect determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Architect. Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.

C. Subgrade: The compacted soil layer immediately below proposed drainage fill or playing field soil materials.

1.4 SUBMITTALS REQUIRED AFTER AWARD OF CONTRACT

A. Test Reports: The following reports shall be submitted directly to the Architect from the testing services, with copy to the Contractor:
   1. Field reports are specified in this Section under PART 3 - EXECUTION, “FIELD QUALITY CONTROL.”

1.5 QUALITY ASSURANCE

A. Codes and Standards: Comply with 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.

B. Soil Testing and Observation Service: Owner will employ and pay for a qualified independent geotechnical testing and observation laboratory to perform soil testing and observation service during earthwork operations, provide necessary means to assure cooperation with testing firm.

1.6 PROJECT CONDITIONS

A. Site Information: Data in subsurface investigation reports was used for the basis of the design and is available to the Contractor for information only. Conditions are not intended as representations or warranties of accuracy or continuity between soil borings. Contractor will be responsible for interpretations or conclusions drawn from this report.
   1. Contractor may perform additional test borings and other exploratory operations, at the Contractor's option; however, no change in the Contract Sum will be authorized for such additional exploration.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: All fill material, regardless of intended use category, shall be clean and free from organic matter, roots, brush or other vegetation, trash, debris or other detrimental substances, and rocks or unbroken lumps larger than 3 inch, and shall be tested and approved by the soil testing and observation agency prior to placement.

B. Trench Backfill: Existing soils obtained from Playing Field System excavations, excluding broken and pulverized weathered bedrock.

C. Unacceptable Soil Materials: Existing on-site material or asphalt materials not suitable for fill.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is delivered by the General Contractor to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25.4 mm) in 25 feet (7.6 m) measured in any direction.

B. Proceed only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK EXECUTION

A. Grade playing field subgrade to a smooth surface, and to the elevations specified.

B. Backfill placed next to pipe shall be free of sharp objects, which may damage the pipe. Backfill material for mainline pipe is to be tamped in 4 inch layers under the pipe and uniformly on both sides of the full width of the trench or as shown, and the full length of the pipe.

C. Before compaction of subgrade, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

D. Failings: If, based on the testing and observation agency reports and observations, compacted subgrade or fills are found to be below specified density, provide additional compaction and testing in accordance with specifications.

E. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

F. Moisture Control: Where subgrade soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.
   1. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

3.3 FIELD QUALITY CONTROL

A. Compaction: Subgrade to be compacted to 95% proctor density in all locations. Testing regimen to be as recommended by Owner’s geotechnical testing agent. Compaction testing to occur at a minimum of 8 locations, representative of the entire playing field. Compaction test reports to be provided to the Architect for review.

B. Failings: If, based on the testing and observation agency reports and observations, compacted subgrade or fills are found to be below specified density, provide additional compaction and testing in accordance with specifications.

C. Grade Verification: A certified survey shall be made of the as-constructed condition at the subgrade level to assure that the subgrade is within a tolerance of plus or minus 1/2 inch in 25 feet in all directions.

END OF SECTION

SECTION 32 18 23.19 - NATURAL GRASS PLAYING FIELD SUB-DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the sub-drainage system for the Natural Grass Playing Field System, including the following:
   1. Filter Fabric.
   2. Gravel drainage material.
   3. Drain pipe, collector pipe, main line pipe and fittings.
   4. Clean-outs and Grates
   5. Perimeter warning track drain.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 32 18 23 "Natural Grass Playing Field Summary" for summary of the Natural Grass Playing Field System, and the following Sections as parts of the System:
      a. Section 32 18 23.13 "Natural Grass Playing Field Earthwork" for trenching, grading, filling, backfilling, compaction and disposal of soil materials.
      b. Section 32 18 23.23 "Natural Grass Playing Field Irrigation System" for irrigation piping, heads, and automatic control system.
      c. Section 32 18 23.24 "Natural Grass Playing Field Materials and Mixes" for soil materials, amendments, infield mix, warning track mix and Batter's Box/Pitching Mound clays.
      d. Section 32 18 23.26 “Natural Grass Playing Field Sod” for sod.
   2. Section 32 18 24 “Synthetic Turf Playing Field Surfacing” for synthetic turf.

1.2 SUBMITTALS REQUIRED AFTER AWARD OF CONTRACT

A. Product Data: Submit manufacturer's product data on the following:
   1. Filter Fabric.
   2. Gravel drainage material.
   3. Drain pipe, collector pipe, main line pipe and fittings.
   4. Clean-outs and Grates

B. Samples: Immediately upon notice to proceed, submit multiple samples simultaneously to insure meeting this requirement. Re-submit any materials accepted as substitutes in the pre-bid submittals.
   1. Gravel Drainage Material: Provide a one-gallon sample of each 500 cubic yard lot of gravel drainage material for testing.

C. Supplier List: Submit list of procured and contracted suppliers of all materials required for the Playing Field System no later than 21 days after notice to proceed. Contacts and phone numbers shall be included for verification.

1.3 QUALITY ASSURANCE

A. Materials Testing after Award of Contract: The Owner's Testing Agent shall test all specified materials, materials previously accepted as substitutes and materials pre-qualified during the pre-bid phase during construction. Testing shall be performed in the following phases:

1. Phase One - Materials Selection and Definition Prior to Construction: The Owner shall pay for the Phase One costs for only the first submittal including testing and shipping. All costs for subsequent testing required gaining approval of rejected materials shall be paid for by the Contractor.
    a. Gravel Drainage Material Testing: Gravel shall be submitted simultaneously with rootzone sand submittals. Upon approval of the gravel drainage materials, the test results will establish the specifications for approval or rejection of all subsequent submittals during construction.
2. Phase Two - Quality Control Testing during Construction: The Owner shall pay for the first submittal Phase Two costs during construction including testing and shipping. All costs for subsequent testing required gaining approval of rejected materials shall be borne by the Contractor. All materials shall be tested and approved prior to delivery to the Playing Field System site.
    a. Gravel Drainage Material Testing: A one- (1) gallon sample of each 500-ton lot of gravel shall be tested.
        1) Upon approval of each lot of materials, the gravel shall be released for delivery to the site and placement in the Playing Field System.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MATERIALS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
1. Lateral Drain Lines, Perimeter Drain Lines, Collector Lines, and Riser Pipe:
    a. Advanced Drainage System (614) 457-3051
    b. Hancor, Inc. (800) 472-9557
2. Clean-Outs:
    a. Nyloplast Drain Basins by ADS (614) 457-3051
    b. Grates: Heavy Duty, Solid, Ductile Iron
3. Geotextile Filter Fabric:
    a. Propex GeoTex 451
    b. TerraFix 270R
    c. Mirafi 140N

2.2 DRAINAGE SYSTEM MATERIALS

A. Gravel Drainage Material: The gravel shall consist of crushed stone or washed pea gravel that meets the following criteria. Gravel components shall not exceed 12 percent loss of materials as determined by a sulfate soundness test (ASTM C88).
1. 100 percent passing a 1/2-inch (12.5-mm) sieve
2. No more than 10 percent passing a 10 mesh (2.0-mm) sieve
3. No more than 5 percent passing a 18 mesh (1.0-mm) sieve
4. Uniformity Coefficient (Cu) = $D_{90}D_{15}$ Cu shall be less than 3.0
5. D_{15} Gravel less than or equal to 8 x D_{85} Sand (Bridging)
6. D_{15} Gravel greater than 5 x D_{15} Sand (Permeability)

B. Lateral Drain Lines, Collector Lines, and Riser Pipe: Perforated Corrugated or Solid Polyethylene Pipe meeting AASHTO 252CP for 3 to 10 inches diameters and AASHTO M294CP for 12 inch to 36 inch diameters. Provide drainage pipe complete with bends, reducers, adapters, couplings, collars, and joint materials. Perforated and slotted pipe shall have a minimum inlet area equal to 1.5 square inches per linear foot of pipe.

C. Clean Out: Provide clean out fittings fabricated from AASHTO-M252 polyethylene pipe that includes threaded polyethylene cap.

D. Geotextile Filter Fabric: Nonwoven filter fabric consisting of long-chain synthetic polymers, composed of at least 85 percent by weight polyolefin, polyesters, or polyamides and exhibiting the following physical properties:

TEST	PERFORMANCE	STANDARD
Grab Strength	90 lb. minimum	ASTM D4632
Puncture Resistance	50 lb. minimum	ASTM D4833
Mullen Burst strength	195 psi minimum	ASTM D3786
Trapezoid tear strength	45 lb. minimum	ASTM D4533
Permeability	0.1 cm/sec min.	ASTM D4491
Apparent Opening Size	#70 Sieve size	ASTM D4751

PART 3 - EXECUTION

3.1 EXAMINATION AND PROTECTION

A. Verification of Conditions: Examine areas and conditions under which all work of this Section is being performed. Do not proceed with any work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of all areas and conditions.

B. Protection of Work: Protect all on-going work, so as not to delay work due to weather or project related construction. This includes but is not limited to the use of tarps, geotextile, plywood and other protective measures.

C. Unanticipated Conditions: Notify the Architect immediately upon finding evidence of previous structures, 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 geotechnical reports. Secure the Architect's instruction before proceeding with further work in such areas.

3.2 EARTHWORK EXECUTION

A. Drainage System Trenching: Dig trenches to depth and width indicated on the drawings. Abnormal conditions such as large cobbles or unstable conditions that may cause trench to lose integrity shall be reported to Architect immediately. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum width of twice the pipe diameter.

1. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil.
2. Only perform trenching, drainage pipe installation and backfilling operations that can be completed in one day. Exposed trenches that collapse due to rain or other occurrences shall be widened and filled as specified or refilled with subgrade materials, compacted, and retrenched.
3. Compact the bottoms of all trenches to the density described in placement and compaction of this section. Architect has the option of observing the general trenching operation and will not observe the entire process for approval to backfill the remaining trench areas.
4. All cuttings and spoil from trenching are to be removed from the facility. Cuttings may not be left in place or spread across the subgrade.

3.3 FIELD DRAINAGE INSTALLATION

A. Installation of Geotextile Filter Fabric: Install filter fabric to bottom and sides of trenches. Extend fabric a minimum of 12 inches past each side of top of trench on top of the subgrade.

B. Laying Pipe Materials: Provide full bearing for each pipe section throughout its length with drainage fill material to true grades and alignment and continuous slope in direction of flow.
   1. Lay perforated pipe in accordance with pipe manufacturer's recommendations. Provide collars and couplings as required. A minimum of 1" of drainage gravel shall be placed atop the geotextile fabric prior to laying of pipe materials.
   2. Install locator tape around or on the drainage pipe for future detection after field installation is complete.

C. Clean Out: Cap shall be recessed from finish grade as shown on the drawings. Install bolt, washer and nut on cap for metal detection purposes.

D. Testing Drain Lines: Test or check lines before placing drainage fill material to assure free flow. Remove obstructions, replace damaged components, and retest system until satisfactory.

E. Drainage Fill: Place drainage fill material after testing of drainage system in a single layer. Place material around drainage pipe located in trench areas until drainage material is level with the surrounding subgrade. After filling of trench areas place drainage fill to depth above subgrade shown in the drawings.

F. Backfilling: Do not completely backfill trenches until tests and observations have been made and backfilling is authorized by Architect. Do not use compaction equipment directly over drain lines until sufficient backfill has been placed to insure that such equipment will not damage or disturb drainage lines.

G. Perimeter Warning Track Drainage System: Install as per manufacturer specifications and as shown on the drawings. Contractor shall cover the grate/exposed opening as necessary to prevent erosion of soil and other debris from contaminating drain lines. All trenches and lines shall be flushed prior to Substantial Completion.

H. Grade Verification: A certified survey shall be performed at 25 foot centers to verify grade and elevation of the gravel drainage blanket layer above the subgrade.
   1. Grade Elevation Tolerance: 1/2 inch (12.7 mm) in 25 feet (7.6 m) in all directions.

END OF SECTION

SECTION 32 18 23.23 - NATURAL GRASS PLAYING FIELD IRRIGATION SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the irrigation system for the Natural Grass Playing Field System, including, but not limited to the following:
1. System Piping.
2. Irrigation Heads.
3. Irrigation Control Valves.
4. Irrigation Quick Coupler Valves.
5. Irrigation Valve Boxes.
6. Irrigation Manual Ball Valves.
7. Irrigation Control Valve Wiring.
8. Automatic Control System and accessories.
9. Booster Pump.
10. Irrigation System Spare Parts.
11. Fertigation Equipment

B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Section 32 18 23 "Natural Grass Playing Field Summary" for summary of the Natural Grass Playing Field System, and the following Sections as parts of the System:
   a. Section 31 23 13 "Natural Grass Playing Field Earthwork" for trenching, grading, filling, backfilling, compaction and disposal of soil materials.
   b. Section 32 18 23.19 "Natural Grass Playing Field Sub-Drainage" for geotextile fabric, gravel drainage material, pipe and fittings, and drains.
   c. Section 32 18 23.24 "Natural Grass Playing Field Material and Mixes" for soil materials, amendments, infield mix, warning track mix and Batter's Box/Pitching Mound clays.
   d. Section 32 18 23.26 "Natural Grass Playing Field Sod" for sod.
2. Section 32 18 24 “Synthetic Turf Playing Field Surfacing” for synthetic turf.

1.2 SUBMITTALS REQUIRED AFTER AWARD OF CONTRACT

A. Test Reports: The following reports shall be submitted directly to the Architect from the testing services, with copy to the Contractor:
1. Field reports are specified in this Section under PART 3 - EXECUTION, “FIELD QUALITY CONTROL.”

B. Product Data: Submit manufacturer's product data on irrigation system heads, appurtenances, and automatic control system components.
1. System Piping
2. Irrigation Heads
3. Irrigation Control Valves
4. Quick Couplers
5. Valve Boxes
6. Controllers and Accessories
7. Booster Pump
8. Swing Joints

C. Supplier List: Submit list of procured and contracted suppliers of all materials required for the Playing Field System no later than 21 days after notice to proceed. Contacts and phone numbers shall be included for verification.

1.3 QUALITY ASSURANCE

A. Irrigation System Standards: Comply with all applicable provisions of the latest edition of the following codes:
   1. Uniform Plumbing Code: UPC
   2. International Building Code: IBC
   3. National Electric Code: NEC

B. Provide labeled equipment certifying approval, as hereinafter specified, by the following organizations:
   1. National Sanitation Foundation: NSF
   2. Underwriters Laboratories: UL

1.4 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from damage and deterioration during delivery, and while stored at site.

1.5 INITIAL MAINTENANCE

A. Irrigation System: The system shall be adjusted on a continual basis as necessary to maintain specified coverage. Heads shall be adjusted to elevation when necessary. All repairs to lines, valves, heads, and field mixes shall be performed in a timely manner restoring to the previous condition and specifications. Heads shall be cleaned as necessary to ensure full pop-up and flush lowered positions. Do not contaminate rootzone mix when making repairs that require deep excavation below the rootzone layer.
   1. Controller shall be set for appropriate watering intervals with adequate instructions to the Owner. When possible, Contractor shall demonstrate the operation of the system and it's controls in the presence of the Owner's or Tenants' Groundskeeper until they reasonably understand the system.

1.6 SPARE PARTS

A. Spare Parts: Provide the indicated quantities of following spare parts stored as directed by the Owner.
   1. Quick coupler valve keys: 2 per each size
   2. Hose swivel: 2 per each size
   3. Valve stem keys (48 inch): 2
   4. Spare heads of each type specified: 2

1.7 RECORD DOCUMENTS

A. Irrigation Record Drawings: Indicate actual location of all valves and controls including piping. Show dimensions from easily identifiable existing features such as walls, fences, steps, etc. Maintain progress drawings on the construction site at all times during installation of the irrigation system. Make a daily record of all work installed each day until completion of the work.
   1. Contractor shall install above the controller a laminated half-size copy of the as-built irrigation plan mounted under a 1/4-inch piece of Plexiglas.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MATERIALS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:

1. Irrigation Head Manufacturers: (purple rubber cover, stainless steel risers)
   a. Hunter I-40-**06**-SS-R, Nozzles as indicated on the plans
2. Irrigation System Components:
   a. Brass Ball Valves: Nibco T-FP600A
   b. Electric Remote Control Valves: Toro 220 Brass Globe Valves, Pressure Regulated
   c. Irrigation Swing Joints: **Spears 1" PVC C- 5807-01012**
   d. Quick Couplers: Hunter HQ44-LRC-AW-R
   e. Quick Coupler Swing Joints: **Spears 1" PVC C-5807-01012**
   f. Valve Boxes: Carson, Ametek, NDS, or Brooks Industries
   g. Quick Coupler Valve Boxes (for synthetic turf only): Sportsfield Specialties Model TCITQCV
3. Irrigation System Automatic Controller:
   a. Controller: Toro **Lynx 300-016P6M4A** Pedestal Mounted, **Plastic**.
   b. Controller Accessories:
      1)Flow Sensors: **Model FS- INSERT-B with Data Industrial 200 Series Insert**
4. Booster Pump:
   a. **Prodigy** Series as manufactured by QuantumFlo, 210 Springview Commerce Drive, Building 150, DeBary Florida 32713, 386-753-9702 or approved equal. Pump to be centrifugal, variable speed, sized according to actual on - site conditions. Contractor is to immediately notify the Architect of actual discrepancies.
5. **Catalytic Water Conditioner:**
   a. EcoFlow Catalytic Water Conditioning , (209) 838-2550
6. **Acid Injection/Fertigation System:**
   a. Werecon W-4 Series Fertigation system, 18 GPH capacity
   b. Required Flow Meter: Badger Meter 220 Series, sized to pipe
   c. Dimensions: 28" x 28" x 32"
   d. Frame Construction: 304 Stainless Steel
   e. Diaphragm: PTFE
   f. Motor Type: 240/480 3 Phase provided by On-Board VFD
   ~~a.~~**g. Pressure Maximum: 350 psi**

2.2 IRRIGATION SYSTEM MATERIALS

A. Plastic Pipe: All pipe and hose is free of blisters, internal striations, cracks or any other defects or imperfections. The pipe and hose are continuously and permanently marked with manufacturer's name, material type, size, and schedule or class and quality control identifications.

1. Mainline pipe, Quick Coupler Mainline pipe, **Lateral Pipe** and fittings: Rigid, HDPE DR 11 conforming to ASTM D2239, ASTM D2737, ASTM D3035, ASTM F714. Use butt fused joints and fittings. Provide joint restraints at all fittings, joints, and changes in direction. **Black in color. Minimum pipe size is 2 inch.**

2. Irrigation Valve Manifold pipe and fittings: Rigid, HDPE DR 11 conforming to ASTM D2239, ASTM D2737, ASTM D3035, ASTM F714. Use butt fused joints and fittings.

3. Sleeves: Provide PVC Schedule 40, with solvent welded joints. The sleeve diameter shall be 2 inch or twice that of the pipe or wiring bundle, whichever is greater.

B. Nipples:

1. Plastic: Factory-threaded Schedule 80, Type 1, Grade 1 polyvinyl chloride (PVC) pipe, threaded both ends. Pipe shall be in conformance with ASTM D1784 and D1785, gray color.

C. Solvent Cement: Compatible with PVC pipe and of proper consistency conforming to ASTM D2564.

D. Threaded connections: All threaded pipe, fittings, and valve connections excepting the sprinkler body inlet, shall use thread sealant.

E. HDPE Fittings: HDPE SDR 11 Butt Fused Fittings

F. Swing Joints: **Spears 1" PVC C5807-01012.** Product shall <u>not</u> be fabricated on site.

G. Electric Remote Control Wiring: 24 volt electric control wires from controller to automatic valves shall be 14 gauge for valve control and 12 gauge for common, direct burial wire, Type UF, 600 volt, solid copper only, single conductor wire with PVC insulation and bear UL approval for direct underground feeder cable.

H. Remote control valve wires shall be of a different color than the 120-volt service to controllers. The 24-volt common ground shall be of one continual color (white only) and a different color than the other 24-volt lines and the 110-volt service. Each control wire shall be tagged for zone identification at the controller, valve and where the conduit terminates at the main line loop.

I. Heads: All heads shall be as specified on the drawings or approved equal. Nozzle patterns are indicated and shown; however, specific site conditions may require that different nozzle patterns be used. Contractor shall adjust patterns to provide adequate coverage. All heads shown on the drawings shall be installed and have the following minimum characteristics:

1. Rotary gear driven.
2. Rubber covers affixed to top of head.
3. Stainless steel riser.

J. Valve Boxes: Valve boxes shall be of sufficient size to house (1) gate valve and still allow room for maintenance without having to excavate or perform similar operations meeting ASTM D368 for tensile strength of 18 inch deep and furnished with a non-hinged cover.

K. Brass Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following]:
   a. Hammond Valve.
   b. Legend Valve.
   c. NIBCO INC.
2. Description:
   a. Standard: ASME 16.44.
   b. SWP Rating: 150 psig.
   c. CWP Rating: 400 psig.
   d. Body Design: Two piece.
   e. Body Material: Forged brass.
   f. Ends: Threaded.

g. Seats: PTFE.
h. Stem: Brass.
i. Ball: Stainless Steel
j. Port: Full
k. Lever Handle: Steel, Plated
l. Lock Washer: Stainless Steel
m. Handle Nut: Stainless Steel

L. Thrust Blocks: Use 3,000 PSI concrete and 2-mil plastic to wrap fittings and pipe.

2.3 AUTOMATIC CONTROL SYSTEM

A. General: The automatic controllers shall be commercial type hybrid electromechanical controllers manufactured expressly for control of automatic circuit valves of landscape irrigation systems. Provide dual program clocks with number of circuits as noted on the drawings. Each controller shall have factory installed lightning and surge arrestors.

B. Interior Control Enclosure: Stainless Steel weatherproof locking cabinet complying with NFPA 70.

C. Circuit Control: Each circuit variable from 0-120 minutes. Include switch for manual or automatic operation of each circuit.

D. Timing Device: Adjustable, 24-hour clock, and 14-day calendar wheel with dual program and electric surge protection. Manual or semiautomatic operation.

E. Remote Maintenance Control System: The radio-controlled transceiver system shall consist of a transmitter receiver, power transformer for recharging transmitter, and permanent mounting connector. The receiver shall be capable of attaching to all electromechanical and solid state controllers and shall convert sprinkler controllers to remote control operation.

F. Control Wire: UF-UL listed color-coded copper conductor direct burial size 14. Use waterproof DBY wire connectors at splices. Provide one color wire for each of the following:
1. Zone control valves
2. Common wire
3. Spare wire

2.4 BOOSTER PUMP

A. General: The pump and all accessories furnished shall a pre-engineered unit suitable for the service specified. The pump shall be capable of continuous operation in the arrangement shown at any flow within 10 percent of the specified capacity without cavitation resulting from the design of the impeller.
1. Equipment shall be capable of both continuous and intermittent operation.
2. Add the following sizes and boosts as required for the project.

B. Motors: Motor shall be sized by the contractor to be capable of providing a flow of ~~100~~ **175** GPM and a pressure boost capable of achieving a total output pressure of 90 psi. The minimum pump efficiency shall be 70 percent. The temperature rise of the motor shall be to NEMA Standard MG-1-12.42 for class B or class F insulation.
1. Pump assembly shall be designed to permit the removal of the motor without disturbing the piping or volute casing.

C. Electrical Controls: The pumping station controls shall be mounted in a self containing NEMA 1 enclosure fabricated from not less than 14 gauge steel.
1. The pump motor start shall have a single access door and main disconnects. The starter shall have a single access door and main disconnects. The starter shall be protected on each power leg by time delay fuses of appropriate amperage. Overload relays shall be ambient compensating type installed on each power leg, set to trip at 105 percent of motor full-load current rating.

2. A three-pole main station disconnect shall be mounted in a separate NEMA R enclosure to completely isolate the electrical system from incoming power.

D. Pressure Regulating Valve: 4 inch

E. Weatherproof Enclosure: If not located within a conditioned area, a weatherproof enclosure shall be provided with easy access for pump maintenance.

PART 3 - EXECUTION

3.1 EXAMINATION AND PROTECTION

A. Verification of Conditions: Examine areas and conditions under which all work of this Section is being performed. Do not proceed with any work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of all areas and conditions.

B. Protection of Work: Protect all on-going work, so as not to delay work due to weather or project related construction. This includes but is not limited to the use of tarps, geotextile, plywood and other protective measures.

C. Unanticipated Conditions: Notify the Architect immediately upon finding evidence of previous structures, 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 geotechnical reports. Secure the Architect's instruction before proceeding with further work in such areas.

3.2 EARTHWORK EXECUTION

A. Irrigation System Trenching: Make trenches for main and laterals straight and true with the bottoms graded on uniform slopes to low points. Excavate trenches wide enough to allow a minimum of 6 inches between parallel irrigation pipe lines, 12 inches from lines of other trades. Do not install lines parallel and directly over one another. Maintain 2-inch vertical clearance between irrigation lines; minimum transverse angle is 45 degrees. A maximum of 2 lines per trench.

B. Trenches for pipelines shall be made of sufficient depths to provide the minimum cover from finished grade as follows:
1. 18 inches over main lines.
2. 14 inches over RCV controlled lines (lateral).

3.3 PLACEMENT AND COMPACTION OF SOIL MATERIALS

A. Backfill for Irrigation Lines: Excavated material is generally satisfactory for backfill. Backfill shall be free from rubbish, vegetable matter, frozen materials, and stones larger than 2-inches in maximum dimension. Remove material not suitable for backfill from site. Backfill placed next to pipe shall be free of sharp objects, which may damage the pipe. Backfill material for mainline pipe is to be tamped in 4 inch layers under the pipe and uniformly on both sides of the full width of the trench or as shown, and the full length of the pipe. PVC pipe shall not rest on concrete, rock, wood blocks, or similar items.
1. All irrigation pipes shall be immediately backfilled with preliminary backfill sufficient to prevent arching or slipping under pressure. Do not completely backfill trenches until the lines have been tested and reviewed.

3.4 IRRIGATION PIPING AND HEAD INSTALLATION

A. General: Plastic pipe and fittings shall be solvent welded using solvents and methods as recommended by manufacturer of the pipe, except where screwed connections are required.

Pipe and fittings shall be thoroughly cleaned of dirt, dust and moisture before applying solvent with a non-synthetic bristle brush.

1. Pipe may be assembled and welded on the surface. Snake pipe from side to side of trench bottom to allow for expansion and contraction.
2. Connections between plastic pipe and metal valves shall be made using plastic male adapters and applying the recommended threaded joint compound.
3. All metal screwed joints shall be tightened with tongs or wrenches and employ the specified joint compound. Caulking of any kind will not be permitted.

B. Sleeving: All lines shall be laid under hard surfaces in a PVC Schedule 40 pipe with solvent weld joints. Sleeve diameter shall be 2 inch or equal to twice that of the pipe or wiring bundle, whichever is greater, or that as shown on the drawings. Depth of sleeves to be determined by the type of line placed in sleeve. In the case of new construction, all sleeves shall be placed prior to laying of any hard surface.

C. Pipe Penetrations: Core drill penetrations in a manner approved by the Owner. Provide metal sleeves for all irrigation lines wherever passing through a concrete wall or floor. Provide a water stop or membrane clamp for every pipe or sleeve penetrating an exterior concrete wall or floor, whichever is appropriate to the waterproofing method.

D. Closing: Cap or plug openings in lateral and main lines leaving caps and plugs in place until removal is necessary for completion of installation. Take other precautions as necessary to prevent dirt and debris from entering pipe or equipment.

E. Flushing: Lines shall be thoroughly flushed out before installing quick coupling valves, sprinklers or emitters.

1. After flushing, main line pipe may be partially backfilled, butt joints, fittings and connections shall remain free and visible.

F. Heads: Nozzle patterns are indicated and shown on the drawings, however, specific site conditions may require that different nozzle patterns be used. Contractor shall adjust patterns to provide adequate coverage.

1. Adjustment: Adjust alignment and coverage of all heads. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage, make all necessary changes or make arrangements with the manufacturer to have adjustments made, prior to any planting. These changes or adjustments shall be made without additional cost.
2. Placement: Install heads perpendicular to grade. Set top of head to be ~~½~~ **1/4** inch below finish grade.
3. Valve Boxes: Locate boxes as indicated on drawings. Top of box shall be 1/2 inch below finish grade and covered to final grade with artificial turf.

G. Thrust Blocks: Use cast-in-place concrete bearing against undisturbed soil. Size, orientation, and placement shall be as shown on the drawings. Wrap fitting with plastic to protect bolts, joint, and fitting from concrete. Use on piping 3” or greater in diameter, wherever there is a change in pipe direction, at the end of the line, at all gate valves, and any slip joint connected pipe.

H. Purging and Testing: Immediately prior to hydrostatic testing, all irrigation lines shall be thoroughly purged of all entrapped air. Introduce water into lines to be tested at full operating head pressure. Observe water flow at end of discharge point until determination is made that all air and residual debris has been expelled from the line. Conduct Hydrostatic Testing followed by completing the piping assembly and adjust sprinkler heads for proper distribution.

3.5 IRRIGATION CONTROLLER INSTALLATION

A. Automatic Controllers: Wall mount in locking cabinets with direct surge protection. Verify power location and type, as well as power connection requirements. The contractor shall be responsible for any temporary controller installation.

1. Contractor shall perform a radio reception survey to determine the best location for the hand held remote control antennae location.

B. Electrical Control Wires: Installed in the same trench as the main line wherever possible. Wires shall be laid alongside the pipe by "snaking" in to the trench to allow as much slack as possible for contraction and expansion of the wire. All wire connections at remote control valves and at all wire splices shall be left with two feet of wire so that the splice or the valve manifold can be brought to the surface for repairs without disconnecting the wires. Each wire shall have a permanent label affixed to the wire at the controller designating the irrigation section remote control valve which it operates.
   1. Bundle control wire where two or more are in the same trench. Install common ground wire and one control wire for each remote control valve. Multiple remote control valves on a single control wire are not allowed. All splices should be made with wire connectors and waterproof sealant, installed per the manufacturer's instructions. Protect wire not installed with PVC main line pipe with a continuous run of warning tape placed in the backfill above the wiring.
   2. Joint shall be waterproof to prevent leakage of water and corrosion build-up on the connection. All wiring shall be accomplished with as few splices as possible.

3.6 BOOSTER PUMP AND ACID INJECTION/FERTIGATION SYSTEM INSTALLATION

A. Flush irrigation service main prior to installation of booster pump to remove all dirt, debris, gravel, or other materials detrimental to the operation of the booster pump.

B. Install booster pump per manufacturer specifications.
   1. **Booster pump shall be secured to the slab per manufacturer specifications.**

C. Install acid injection/fertigation system per manufacturer specifications.

D. Provide all manufacturer required testing to ensure proper operation.

3.7 FIELD QUALITY CONTROL

A. Irrigation Lines Trenching: Perform one field density and moisture test for every 200 square foot or major fraction thereof, of trench backfill, taken at the bottom of pipe elevation and at 18 inch vertical interval in the compacted fill depth. In no case will less than eight tests be made. Where underground utility lines penetrate foundations, perform field density tests at the bottom of pipe elevation and at every two feet of vertical rise in compacted fill elevation, at points two feet and ten feet in horizontal distance from the foundation wall.

B. Irrigation System Testing: Contractor is to notify the Architect and Owner in writing 7 days prior to testing. Owner's Representative shall be on premises for overall check of the system. Pipelines jointed with rubber gaskets or threaded connections may be subjected to a pressure test at any time after partial backfill. Pipelines jointed with solvent-welded PVC joints shall be allowed to cure at least 24 hours before testing.
   1. Hydrostatic Pressure Test: Subject all lateral pipes to a hydrostatic pressure equal to the anticipated operating pressure of the system. Backfill to prevent pipe from moving under pressure. Expose couplings and fittings. Leakage will be detected by visual observation. Replace all defective products. Repeat the test until the pipe passes. Cement or caulking to seal leaks is not allowed.
   2. Main Line Testing: Subject mainline to a pressure of 125 psi for 60 minutes. Backfill to prevent line from moving under pressure. Expose couplings and fittings. Purge all air from the mainline before the test. Maintain constant pressure by adding water. No pressure loss should occur. Replace all defective products and repeat test as necessary to gain a successful result. Cement or caulking to seal leaks is not allowed.
   3. Operational Test: Activate each remote control valve in sequence from the controller. The Owner's representative shall visually observe the operation, coverage and leakage. Replace, adjust, or move heads, couplers or other parts of the system as necessary to

correct operational, coverage deficiencies or leakage. Repeat testing until each zone passes all tests.

4. Control System Grounding Test: Test for proper grounding of control system per manufacturer's recommendations. Test results must meet or exceed manufacturer's guidelines for acceptance. Replace defective wire, grounding rod or other equipment. Repeat test until the guidelines are met.

END OF SECTION

SECTION 32 18 23.24 - NATURAL GRASS PLAYING FIELD MATERIALS AND MIXES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the playing surface for the Natural Grass Playing Field System, including, but not limited to the following:
   1. Soil materials and amendments.
   2. Infield Mix
   3. Warning Track Mix
   4. Batter's Box/Pitching Mound Clays

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 32 18 23 "Natural Grass Playing Field Summary" for summary of the Natural Grass Playing Field System, and the following Sections as parts of the System:
      a. Section 32 18 23.13 "Natural Grass Playing Field Earthwork" for trenching, grading, filling, backfilling, compaction and disposal of soil materials.
      b. Section 32 18 23.19 "Natural Grass Playing Field Sub-Drainage" for filter fabric, gravel drainage material, pipe and fittings, and drains.
      c. Section 32 18 23.23 "Natural Grass Playing Field Irrigation System" for irrigation piping, heads, and automatic control system.
      d. Section 32 18 23.26 "Natural Grass Playing Field Sod" for sod.
   2. Section 32 18 24 "Synthetic Turf Playing Field Surfacing" for synthetic turf.

1.2 DEFINITIONS

A. Subgrade: The compacted soil layer immediately below proposed playing field soil materials.

1.3 SUBMITTALS REQUIRED AFTER AWARD OF CONTRACT

A. Test Reports: The following reports shall be submitted directly to the Architect from the testing services, with copy to the Contractor:
   1. Field reports are specified in this Section under PART 3 - EXECUTION, "FIELD QUALITY CONTROL."

B. Product Data: Submit manufacturer's product data on the following:
   1. Infield mix.
   2. Warning track mix.
   3. Batter's Box/Pitching Mound Clays
   4. Infield Conditioners

C. Material Certifications: Manufacturer's or vendor's certified analysis for soil amendments and fertilizers. Records shall include products and application rates.

D. Samples: Immediately upon notice to proceed, submit multiple samples simultaneously to insure meeting this requirement. Re-submit any materials accepted as substitutes in the pre-bid submittals. If none were accepted at that time, do not submit substitutions at this time. All phase one testing materials shall be submitted, tested and approved 21 days after notice to proceed. Submit samples of each of the following materials:
   1. Playing Field Rootzone Material: Provide a one-gallon sample of each 500-ton lot(s) of rootzone for testing.
   2. Infield mix.
   3. Warning track mix.
   4. Batter's Box/Pitching Lane Clays

E. Supplier List: Submit list of procured and contracted suppliers of all materials required for the Natural Grass Playing Field System no later than 21 days after notice to proceed. Contacts and phone numbers shall be included for verification.

1.4 QUALITY ASSURANCE

A. Materials Testing after Award of Contract: The Owner's Testing Agent shall test all specified materials, materials previously accepted as substitutes and materials pre-qualified during the pre-bid phase during construction. Testing shall be performed in the following phases:
   1. Phase One - Materials Selection and Definition Prior to Construction: The Owner shall pay for the Phase One costs for only the first submittal including testing and shipping. All costs for subsequent testing required gaining approval of rejected materials shall be paid for by the Contractor.
      a. Rootzone Mix Testing: The rootzone mix shall be evaluated using the 2004 USGA testing protocol as a guideline.
         1) Processed Sand and Peat Testing: A processed sand sample and a processed peat sample shall be tested for compliance with the specifications. Upon approval of the sand and peat samples, the test results will establish the specifications for approval or rejection of all subsequent submittals during construction.
         2) Rootzone Mix Formulation and Testing: The Owner's Testing Agent shall produce several representative samples of the proposed rootzone mix by using different ratios of approved processed sand and peat. The physical and performance characteristics of these samples shall be tested in the laboratory and compared to the criteria established in the specifications. Upon approval of a successful rootzone mix ratio, its test results will establish the specifications for approval or rejection of all subsequent rootzone mix submittals during construction.
   2. Phase Two - Quality Control Testing during Construction: The Owner shall pay for the first submittal Phase Two costs during construction including testing and shipping. All costs for subsequent testing required gaining approval of rejected materials shall be borne by the Contractor. All materials shall be tested and approved prior to delivery to the Playing Field System site
      a. Suggested Sampling Collection Procedures: A 2.5 inch schedule 40 PVC pipe about 4 - 5 feet long shall be cut and a 45 degree angle cut on one end of pipe. The pipe acts as a sample collection tube. It is also useful to have a rubber mallet to tap samples out of the pipe. To collect the same the pipe shall be pushed into the stockpile in random locations. A minimum of 8 locations (sub samples) are sampled depending on the size of the stockpile. The material collected at each location shall be placed into a clean bucket. The samples in the bucket shall represent the stockpile being sampled. Thoroughly mix the samples in the bucket and fill a labeled zip lock freezer bag (1 gallon) with material from the bucket. Left over material can be discarded. To sample a new stockpile, clean bucket and pipe and repeat. Note locations of composite samples (not sub samples) and what

stockpile it corresponds to. Include a sample transmittal letter to identify the source of samples and sample location. Do not use labels to identify samples. Use a waterproof marker and double bag the sample(s). Send the sample to Owner's Testing Agent. Contractor to coordinate all weekend sample deliveries with Owner's Testing Agent.

b. An agent representing the owner shall be designated at the sand plant for the taking of samples. The designated employee shall participate in a brief training session at the sand plant with the owner's testing agent to ensure proper sampling procedures. Sand plant shall utilize standard chain of custody forms prepared by the owner's testing agent for all sand rootzone materials delivered to the site.

c. Rootzone Mix Testing: Processed peat shall not be mixed with any sand until the Owner's Testing Agent has approved the particle size distribution for each lot and determined that the peat and sand materials are uniform and representative of the approved samples per Phase One Testing Requirements. After approval of the Phase One rootzone components and mix, prepare the processed sand in lots of 500 tons. A one- (1) gallon sample from each 500-ton lot shall be submitted for testing. Subsequent to the approval of each 500-ton lot blend the sand with the processed peat at the ratio established by the Owner's Testing Agent.
   1) A one- (1) gallon sample of the first 500-ton lot of rootzone mix shall be submitted for testing including particle size distribution, performance, and organic matter.
   2) Upon approval of this submittal, a one- (1) gallon sample of each subsequent 500-ton lot of rootzone mix shall be submitted for particle size distribution, organic matter testing and visual observation only, unless the Testing Agent determines that inconsistencies in the materials are apparent.
   3) Upon approval of the first 500-ton lot of rootzone mix, every third 500-ton lot shall be tested for particle size distribution, performance, and organic matter.
   4) Upon approval of each lot of rootzone mix, the material shall be released for delivery to the site and placement on the Natural Grass Playing Field System.

1.5 PROJECT CONDITIONS

A. Existing Benchmarks: Carefully preserve and maintain existing bench marks, vertical/horizontal control, monuments, property line pipes and pins, and other reference points. If disturbed or destroyed, restore or replace at no additional cost to the Owner.

1.6 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

B. Rootzone Mix: Blend approved rootzone materials at an approved location that is not at the Playing Field System site. Deliver approved lots in clean, washed and covered trucks to eliminate contamination during transportation. Stockpile of approved material on site shall be coordinated with the Contractor. Location shall be free of contamination such as low, wet, and/or refuse areas if actual Playing Field area is not available.

1.7 MAINTENANCE

A. Stockpile Materials: Provide the indicated quantities of the following additional materials stored as directed by the Owner.
   1. Rootzone Mix: 45 tons
   2. Infield Mix: 15 tons
   3. Batter's Box/Pitcher's Mound Mix: 10 tons
   4. Infield Conditioner: 15 tons (bags)
   5. Warning Track Mix: 10 tons

PART 2 - PRODUCTS

2.1 ACCEPTABLE MATERIALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
   1. Peat Suppliers:
      a. Peat, Inc., Elk River, Minnesota, (800) 441-1880.
      b. Dakota Peat, Inc., Grand Forks, North Dakota, (800) 424-3443.
   2. Infield Mix:
      a. DuraEdge Pro by DuraEdge Products, Slippery Rock, PA (866) 867-0052
      b. Turface Diamond Elite by Turface Athletics, Buffalo Grove, IL (800) 207-6457
   3. Batter's Box/Pitcher's Mound Clay:
      a. BlackStick by DuraEdge Products, Slippery Rock, PA (866) 867-0052
      b. Turface Gumbo Gray by Turface Athletics, Buffalo Grove, IL (800) 207-6457
   4. Infield Conditioner:
      a. ProSlide Professional by DuraEdge Products, Slippery Rock, PA (866) 867-0052
      b. Turface Pro League Natural by Turface Athletics, Buffalo Grove, IL (800) 207-6457
   5. Warning Track Mix:
      a. DuraTrax by DuraEdge Products, Slippery Rock, PA (866) 867-0052
      b. Turface SAF Trac Elite by Turface Athletics, Buffalo Grove, IL (800) 207-6457

2.2 GROWING MEDIUM MATERIALS AND MIXES

A. Rootzone Mixture: Percentage of peat in the sand-peat mix shall be as determined through laboratory testing using performance criteria as outlined under Rootzone Mixture Performance and Testing.
   1. Processed Sand: The sand shall be non-calcareous, clean and processed and meet the following particle size criteria. Calcareous sand meeting the following criteria will be acceptable only if proven that a local source within a 100 mile radius cannot be found to supply non-calcareous material meeting the following criteria.

SIZE	SIEVE MESH	DIAMETER OF SIEVE (MM)	ALLOWABLE RANGE PERCENT RETAINED
Fine Gravel	10	2.00	No more than 10% combined particles in this range including maximum 3% Fine Gravel.
Very Coarse	18	1.00	
Coarse	35	0.50	Minimum 60% particles in the Coarse to Medium range.
Medium	60	0.25	
Fine	100	0.15	20 percent maximum
Very Fine	270	0.05	5 percent maximum
Silt	n/a	0.002	5 percent maximum
Clay	n/a	Less than 0.002	3 percent maximum

a. Combined fractions no more than 10 percent for material less than or equal to 0.05 in size.

2. Processed Peat: Reed Sedge Peat shall be free of sticks, stones and other debris and comply with the following:

PARAMETER	SPECIFICATIONS	SIEVE SIZE	PASSING RATE
Total ash	15 percent or less	2.0 mm	95 - 100
pH	6.5 to 7.5	1.0 mm	Greater than 80
Moisture	30 percent to 50 percent		

a. Organic Matter Content: ≥ 85% (ASTM D2974, Method D).
b. Peat shall be screened to no larger than 0.25 inches (6.4 mm).

B. Rootzone Mixture Performance and Testing: United States Golf Association (USGA) physical evaluation protocol. Water retention shall be measured at 25-cm tension for a 10" rootzone depth. Tests shall determine compliance with specified mixing ratio and provide calibration data for the quality control program. Tests shall comply with the following criteria on a core compacted to 14.3 ft. - lb./inches squared:

TEST REQUIREMENT	PERFORMANCE
Saturated Hydraulic Conductivity	≥ 6 inches per hour
Bulk Density, grams/cc	1.2 to 1.6
Total Porosity, percent	35 to 55
Air-filled Porosity, percent	15 to 30
Capillary Porosity, percent	15 to 30

1. Uniformity Coefficient (Cu): Minimum of 1.8, maximum of 3.5
2. Peat content will be verified using the Walkley-Black or loss on ignition organic matter determination process.

PART 3 - EXECUTION

3.1 EXAMINATION AND PROTECTION

A. Verification of Conditions: Examine areas and conditions under which all work of this Section is being performed. Do not proceed with any work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of all areas and conditions.

B. Protection of Work: Protect all on-going work, so as not to delay work due to weather or project related construction. This includes but is not limited to the use of tarps, geotextile, plywood and other protective measures.

C. Protect of Persons and Property: Provide all necessary measures to protect workmen and passersby. Barricade open excavations occurring as part of the work, as required by municipal or other authorities having jurisdiction.

1. Protect adjacent construction throughout the entire operation. Protect newly graded areas from destruction by weather or runoff. Protect structures, utilities, pavements, and other improvements from damage caused by settlement, lateral movement, undermining and washout.

D. Unanticipated Conditions: Notify the Architect immediately upon finding evidence of previous structures, 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 geotechnical reports. Secure the Architect's instruction before proceeding with further work in such areas.

3.2 PLAYING FIELD GROWING MEDIUM AND MATERIAL MIX INSTALLATION

A. Rootzone Mixture: Every load of rootzone mix delivered to site may be visually inspected for excessive contamination and obvious clumps of peat not properly ground into the blend. If samples appear to be contaminated or visually different from a uniform blend, a sample shall be sent to the Testing Agent for testing.
   1. Apply the rootzone soil mixture over the completed field drainage and irrigation systems to the depth and finish grades indicated on the drawings. Material shall be installed in a moist condition. Contractor shall move the rootzone mix from the stockpile(s) in such a manner that contaminated materials are not tracked onto the field from the tracks or tires. If determined by the Owner or Architect that contamination is occurring, on-site samples will be taken and tested by the Testing Agent at the expense of the Contractor. Any contamination or overcompacted conditions will require immediate action by the Contractor to satisfy the intent of the specifications. Equipment used on the field shall be of a size and weight and shall utilize turf type tires, tracks or tires which will not damage or overly compact the field installation. Finish grade shall be achieved by using a combination of laser-operated equipment, string lines, drag screens, rollers, and hand raking.

B. Compaction of Rootzone Mix: Operate the irrigation system and thoroughly flood the field. Fill all low spots to finish grade with rootzone mix and water in. This process shall be repeated as required to bring field to finish grade specifications and tolerance forming a smooth, firm surface. Finish grades and material depths shall be verified utilizing laser operated survey instruments. If roller is used to aid in obtaining field grade, surface shall be scarified prior to laying sod. Field compaction shall not exceed bulk density as performed in laboratory testing.

3.3 BASEBALL INFIELD INSTALLATION

A. Infield Mix: Mix shall be installed in accordance with manufacturer's instructions for the infield and base paths. Depth of material shall be as indicated on the drawings.
   1. Install approved infield mix material over a layer of processed sand.
   2. The edges of the skinned area of the infield, the base paths and the area around home plate as shown on the defined on the drawings shall be formed with a thin flexible form to a depth necessary to achieve the material depths. The area shall be graded to conform to the tolerances specified. After completion of mix installation, remove the forms and fill voids to conform to finish grade tolerances.

B. Infield Soil Conditioner: Incorporate conditioner into the infield mix at a depth according to the manufacturer's instructions.

C. Batter’s Box/Clay: Install at the batter’s box, catcher's box, around, up to, and underneath the home plate. Depth of material shall be as indicated on the drawings.
   1. Drag 1/4 inch of infield mix over top to finish grade when complete.

D. Pitcher's Lane Clay: For Playing Field and Bullpens.
   1. Install in accordance with manufacturer's instructions. Subbase material shall be stable local clay material placed to the depth and elevation indicated on the Drawings and compacted to 95 percent standard Procter.
   2. Drag 1/4 inch of infield mix over top to finish grade when complete.

E. All transitions from turf to infield skin shall be smooth. No elevation difference shall be allowed in these transition areas.

F. No cross-contamination of materials shall be allowed. All materials shall remain true to their intended location.

3.4 WARNING TRACK INSTALLATION

A. Mix shall be installed per manufacturer's instructions. Depth of material shall be as indicated on the drawings.

B. Subbase gravel material shall be ¾" minus, crushed stone rolled to 95 percent standard Procter compaction to a depth and elevation as shown on drawings.

C. The edges of the warning track shall be formed with a thin flexible form and to a depth necessary to achieve the depth of the warning track mix and its subbase material. The area shall be graded to meet the grading tolerances specified. After completion of the mix installation, remove the form and fill the voids to conform to grading tolerances specified.

D. All transitions from turf to warning track shall be smooth. No elevation difference shall be allowed in these transition areas.

3.5 FIELD LAYOUT INSTALLATION

A. General: Layout of the field regarding all painted lines and logos shall be by the Owner following Substantial Completion.

B. The Contractor shall verify and install homeplate so that the back corner of the plate is at a 90-degree angle and lined up on the outside edge of the foul ball pole. Verify locations at the beginning of playing field construction.

3.6 FIELD QUALITY CONTROL

A. Grade Verification:
   1. Before placement of sod, a certified survey shall be performed at 25-foot centers to verify grade and elevation of the rootzone mix material.
      a. Rootzone Elevation Tolerance: 1/4 inch (6.4 mm) in 25 feet (7.6 m) in all directions.
   2. After placement of Infield Mix and Conditioner, a certified survey shall be performed at 10-foot centers to verify grade and elevation of warning track material
      a. Infield Mix Tolerance: 1/4 inch (6.4 mm) in 10 feet (3.048 m) in all directions.
   3. After placement of Warning Track Material, a certified survey shall be performed at 10-foot centers to verify grade and elevation of warning track material
      a. Warning Track Material Tolerance: 1/4 inch (6.4 mm) in 10 feet (3.048 m) in all directions.

3.7 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Removal from Owner's Property: Remove waste materials, including materials not allowed for fill, backfill or site grading as specified within, trash, and debris, and properly dispose off Owner's property at Contractor's expense.

END OF SECTION

SECTION 32 18 23.26 - NATURAL GRASS PLAYING FIELD SOD

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the growth, harvest and delivery of the sod for the playing surface in the Natural Grass Playing Field System.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 32 18 23 "Natural Grass Playing Field Summary" for summary of the Natural Grass Playing Field System, and the following Sections as parts of the System:
      a. Section 32 18 23.13 "Natural Grass Playing Field Earthwork" for trenching, grading, filling, backfilling, compaction and disposal of soil materials.
      b. Section 32 18 23.19 "Natural Grass Playing Field Sub-Drainage" for filter fabric, gravel drainage material, pipe and fittings, and drains.
      c. Section 32 18 23.23 "Natural Grass Playing Field Irrigation System" for irrigation piping, heads, and automatic control system.
      d. Section 32 18 23.24 “Natural Grass Playing Field Materials and Mixes” for soil materials, amendments, infield mix, warning track mix and Batter's Box/Pitching Mound clays.
   2. Section 32 18 24 “Synthetic Turf Playing Field Surfacing” for synthetic turf.

1.2 SUBMITTALS REQUIRED PRIOR TO AWARD OF CONTRACT

A. Test Reports: The following reports shall be submitted directly to the Architect and Owner’s Representative from the testing services, with copy to the Contractor:

B. Material Certifications: Supplier’s certified analysis for soil amendments, fertilizers, sod and overseed mix used in the growing of the sod. Provide records of all fungicide and pesticide applications applied to sod at sod farm prior to harvest. Records shall include products and application rates.

C. Certification of Grass Sod: From sod vendor stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of planting.

D. Sod Samples: Immediately upon notice to proceed, submit directly to the Owner’s Testing Agent, a one square foot sample of the proposed sod with a minimum of one inch of soil below the thatch layer. Re-submit any materials accepted as substitutes in the pre-bid submittals. If none were accepted at that time, do not submit substitutions at this time. All phase one testing materials shall be submitted, tested and approved 21 days after notice to proceed. Submit samples of each of the following materials:
   1. Submit sample at a time agreed to by Architect and playing field contractor.

E. Supplier List: Submit list of procured and contracted suppliers of all materials required for the Playing Field System no later than 21 days after notice to proceed. Contacts and phone numbers shall be included for verification.

F. Architect’s Recommended Testing Agent: Turf & Soil Diagnostics
   613 E 1st Street
   Linwood, Kansas 66052
   (855) 769-4231

1.3 QUALITY ASSURANCE

A. Sod Supplier Grow-In Program: Upon approval of a sod material, submit to the Architect, the Owner's Representative, and the Owners' Testing Agent the location of the sod supply. The Sod Supplier shall submit to an on-site observation of the area to be used as the sod source. An area of sufficient size (3 acres minimum) to plant the project shall be designated and reserved for the project in the presence of an Owner's Representative. This area should also be where the tested and approved sample was taken. During the grow-in and harvest period, the Architect, the Owner's Representative, and Owner's Testing Agent shall be allowed to inspect the source at any time.
   1. The Sod Supplier shall submit a grow-in schedule for the sod including but not limited to:
      a. Watering
      b. Fertilization (rates, ratios)
      c. Weed Control
      d. Pest Control
      e. Mowing
   2. Height of Cut of Grass: Grass shall be maintained with reel-type equipment at a height of 1/2" to 5/8" inches at the farm.
   3. Fertility Testing: Fertility testing cost shall be borne by the Owner. The Sod Supplier shall submit monthly soil and tissue testing to the Owner's Testing Agent to determine and fine-tune the fertility program. The Owners Testing Agent shall also be utilized during the maintenance period of the stadium field.
   4. Plant Pathology Analysis: A Plant Pathology Analysis shall be conducted to determine and assess any disease complexes. Plant Pathology testing cost shall be borne by the Owner.
   5. Nematode Assay: A Nematode Assay shall be conducted to determine population density of Nematodes within the growing medium. Nematode Assay cost shall be borne by the Owner.
   6. Sod may require additional overseeding with Perennial Ryegrass varieties suited to the local climatic conditions at the Owner's discretion.
   7. Irrigation System Observation: Continual observation of the irrigation system shall be performed to insure even coverage of the total grow-in area throughout the Sod Supplier's contract.
   8. Sod Harvesting Procedure: Uniformity of cut is required. Sod shall be big roll cut in approximate widths of greater than or equal to 30 inches and minimum lengths of 50 feet having 1 inch of topsoil below the thatch layer across the width and length of each section. Thickness and width shall be kept to strict dimensions. Edges shall be cut at 90-degree angles to provide for tight fit during installation.
   9. Sod area shall be smooth, evenly graded and free of undulation to insure a smooth cut at time of harvest.
   10. Sod not meeting specifications indicated herein will be rejected.
   11. Sod supplier to provide a one-year warranty for sod beginning at date of delivery to project site.

B. Age of Sod: Minimum 12-16 months old at the time of harvest.
   1. Anticipated date of harvest: Mid-September to Early October, 2023

1.3 DELIVERY STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.

PART 2 - PRODUCTS

2.1 SOD AND GRASS MATERIALS

A. Playing Field Sod: 12- to 18-month-old USDA Certified sports rated Bermuda, grown in sand based soil medium consisting of a minimum of 90 percent sand, compatible with the rootzone mixture specified in Division 32 Section "Natural Grass Playing Field Materials and Mixes". Compatibility will be determined by the Owner's Testing Agent.

B. Sod Supplier shall provide pricing for the following USDA Certified hybrids:
   1. Latitude 36 Bermuda
   2. Tahoma 31 Bermuda

PART 3 - EXECUTION

2.1 SOD HARVEST

A. Sod Harvest: deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Sod supplier shall make arrangements for delivery of sod to project site. Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying. Provide refrigerated trucking if required, based on location of sod farm and intended haul route.

2.2 SOD INSTALLATION

A. Pre-sod Fertilization: Immediately prior to laying sod and after compaction of the rootzone mix is complete, incorporate into the upper 1 to 2 inches of the rootzone mix a fertilizer with the following ratios:
   1. 3.8 pounds N (40 percent soluble, 60 percent slow release)
   2. 6.5 pounds of P_2O_5
   3. 6.5 pounds K_2O
   4. Topdress rootzone with Mirimichi Green CarbonizPN Soil Enhancer at a rate of 45 pounds per 1000 s.f. (1 ton per acre).
   5. This fertilization shall only be installed according to the amount of sod to be laid on that day.
   6. Regimen specified above is for bidding purposes only. Final regimen shall be as recommended by Owner's Testing Agency, Facility's Head Groundskeeper and Sod Supplier.

B. Laying Sod: The entire area shall be approved by the Architect and the Owner prior to laying sod. Areas to receive sod shall be firm and the irrigation and drainage system shall be operational. Lay sod within 24 hours of harvesting. Sod not placed within 24 hours will be rejected.
   1. Lay sod to form a solid mass with tightly fitted joint. Overlap all ends or wherever a break in the big roll occurs and trim to butt tight. Butt sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Sod lengths shall be installed so that they outline skinned or track areas. Work from boards when necessary to avoid damage to finish grade. Tamp or roll lightly to ensure contact with subgrade. If plastic mesh was used to help harvest big roll sod, this material should be removed prior to field installation. Contractor should take care not to rut or damage big roll sod with tires or tracks of the sod machine.
   2. Patching: All patches necessary to fill in undesirable areas shall be a minimum size of 12 inches in length and width to match that of the roll. Patches shall be of the same source

and type as the original installation and shall be installed at specified finish grade and watered in firm.

C. Filling Joints: After laying and rolling of sod, fill joints and seams with approved rootzone mixture. Broom or sweep excess material to avoid smothering grass. Sod areas requiring more than 1/4 inch of topdress to meet specified grade shall be lifted. Rootzone mix shall be added below the sod area and thoroughly compacted prior to the re-installation of the sod area. Thoroughly walk all seams to verify that all have been filled and that all low or irregular areas have been brought to specified grade tolerances.

2.3 FIELD GROW IN MAINTENANCE

A. General: Perform all operations necessary to maintain the Playing Field System through the date of Substantial Completion. At that time, an extended maintenance agreement may or may not be negotiated at the Owner's request. Field Installer and Contractor shall be on site to direct all field subcontractors during this period.

B. Minimum Requirements: The following list of items represents the minimum operations necessary to maintain the fields during the installation period. Prepare and present to the Owner and Architect in writing a maintenance schedule prior to installation for consideration. Representative schedule items shall include, but not be limited to the following:

1. Mowing: Grass shall be maintained to a neat uniform appearance using only reel-type, clean, sharp, non-contaminated equipment. Grass shall be maintained to a height of 1 inch to 1 1/4 inch during initial and substantial completion. Remove grass clippings only when an unsightly condition will occur. Frequency will be dependent on the removal of no more than 1/3 of the blade height at any one time to maintain the desired grass height. Mowing pattern shall vary with each cut.
2. Rolling: The grass field shall be rolled in two directions on initial planting of the sod. Care shall be taken not to damage irrigation heads. Additional rolling shall be accompanied by additional aerification operations. One and one halve to two ton rollers maximum.
3. Sod Replacement/Patching: Verified sod of the same type and source shall be used when necessary. All patches shall be a minimum of 12 inches in width and length.

C. Fertilization: Establish pre- and post-installation fertilization regimen after testing and analysis by Testing Agency and Sod Supplier. Final regimen shall be agreed upon in writing by each of the parties, as well as the head groundskeeper.

D. Weed and Pest Control: All treatments will comply with local and state codes. Utilize only commercially licensed personnel and applicators to perform these operations. Treatments shall be made according to the needs of the field as determined by the Owner, Owner's Testing Agent, Head Groundskeeper, and Architect.

2.4 IRRIGATION OF SOD

A. General: Begin irrigation as sod is completed in any one section and water to a depth of four inches below the new sod pad. After a short drying period, roll the sod area in two directions to ensure contact with soil mixture and to smooth the area. Water sod areas, as required, through Substantial Completion and until Owner takes possession. Adjust irrigation heads as required for spray pattern and depth to finish grade.

1. Initially set zones for 3-4 intervals of 15 minutes each or 45-60 minutes per zone per day. Zones with 1/2 heads shall be set for 7-1/2 minutes. Closely monitor moisture levels in the top 4 inches of rootzone mixture and at the surface and adjust timing accordingly to climactic conditions and the installed material requirements.

2.5 FIELD QUALITY CONTROL

A. Acceptance of Grass: At the end of each day, the Architect or Owner's Representative shall inspect in place grass for conformance with requirements. Unacceptable grass shall be

removed immediately from the site and replaced the following workday. This preliminary acceptance does not guarantee final acceptance at Substantial Completion.

B. Grass Root Depth: Grass shall display a minimum average of roots 3-1/2 inches in depth prior to acceptance of Substantial Completion.

C. Grade Verification: Provide a certified survey of the as-constructed condition of the sodded areas at 25-foot centers.
   1. Final Playing Field Tolerance: 1/4” over 25 feet in all directions.

2.6 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Removal from Owner's Property: Remove waste materials, including materials not allowed for fill, backfill or site grading as specified within, trash, and debris, and properly dispose off Owner's property at Contractor's expense.

END OF SECTION

SECTION 32 18 24 – SYNTHETIC TURF PLAYING FIELD SURFACING

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the synthetic turf playing field surfacing and associated components, including, but not limited to the following
   1. Earthwork and Compaction
   2. Gravel Drainage Layer
   3. Shock Attenuation Pad
   4. Infilled Synthetic Turf
   5. Turf Edge Curbs and Fasteners

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 32 18 23 "Natural Grass Playing Field Summary" for summary of the Natural Grass Playing Field System, and the following Sections as parts of the System:
      a. Section 32 18 23.13 "Natural Grass Playing Field Earthwork" for trenching, grading, filling, backfilling, compaction and disposal of soil materials.
      b. Section 32 18 23.19 "Natural Grass Playing Field Sub-Drainage" for filter fabric, gravel drainage material, pipe and fittings, and drains.
      c. Section 32 18 23.23 "Natural Grass Playing Field Irrigation System" for irrigation piping, heads, and automatic control system.
      d. Section 32 18 23.24 “Natural Grass Playing Field Materials and Mixes” for soil materials, amendments, infield mix, warning track mix and Batter's Box/Pitching Mound clays.
      e. Section 32 18 23.26 “Natural Grass Playing Field Sod” for sod.

1.2 SCOPE OF WORK

A. Work included in this Section shall involve the furnishing of all labor, materials and equipment necessary to install a complete, new, vertically drained infilled synthetic turf system. The Scope of Work shall include, but is not specifically limited to, the following:
   1. Review and certification of previous work performed by others, specifically related to the work indicated in this section.
   2. Provision for compaction of subgrade
   3. Installation of sub-surface drainage system.
   4. Installation of granular base layer to meet tolerances described herein.
   5. Installation of infilled synthetic turf system.
   6. Installation of all inlaid or tufted lines, logos, and borders.
   7. Provision of samples per specifications.
   8. Provision of extra turf materials for future repairs.
   9. Provide maintenance and repair manuals as well as warranty package per the specifications.
   10. Infill procedure to be performed per manufacturer specifications.
   11. All testing indicated herein shall be paid for by the contractor.

1.3 REFERENCES

A. Comply with applicable requirements of the following Standards:
   1. American Society of Testing and Materials (ASTM):
      a. D 1577 – Linear Density of Textile Fibers
      b. D 2256 – Tensile Properties of Yarns by the Single-Strand Method
      c. D 5034 – Breaking Strength and Elongation of Textile Fabrics
      d. D 5823 – Tuft Height of Pile Floor Coverings

e. D 5848 – Mass per Unit Area of Pile Yarn Floor Coverings
f. D 5793 – Binding Sites per Unit Length or Width of Pile Yarn Floor Coverings
g. D 1335 – Tuft Bind of Pile Yarn Floor Coverings
h. D 2859-06 – Ignition Characteristics of Finished Textile Floor Covering Materials
i. D 4632 – Grab Breaking Load and Elongation of Geotextiles
j. D 4533 – Trapezoid Tearing Strength of Geotextiles
k. D 4491 – Water Permeability of Geotextiles by Permittivity
l. D 6241 – Static Puncture Strength of Geotextiles
m. D 6928 – Resistance of Coarse Aggregates to Degradation (Micro-Deval)
n. F 355 – Impact Attenuation of Playing Surface Systems
o. F 1015-03 – Relative Abrasiveness of Synthetic Turf Playing Surfaces

B. Dynamic Cushioning Requirements: Shall not exceed the maximum value as stated in the specifications throughout the warranty period.

C. Synthetic Turf Pile Surface: The pile surface shall provide good traction in all types of weather with the use of conventional “sneaker-type shoes” and composition, molded sole athletic shoes. The pile surface shall be suitable for both temporary and permanent line markings using rubber-based paint where applicable.

1.4 SYSTEM DESCRIPTION

A. General: Synthetic surfacing system shall be comprised of a subsurface drainage system, shock attenuation pad, and synthetic grass with infill material of granulated rubber and silica sand.
1. Components are to include, but are not limited to:
a. Earthwork Requirements:
1) Excavation, trenching, grading, filling, backfilling, compaction.
2) Graded and compacted subgrade
3) Disposal of spoil materials.
b. Porous Aggregate Layer: Thickness per plan over prepared subgrade.
c. Subdrainage System:
1) Geotextile Fabric.
2) Gravel drainage material.
3) Lateral drain pipe, collector pipe, and cleanouts.
d. Shock Attenuation Pad
e. Infilled Synthetic Turf

B. Performance: Synthetic turf playing field system shall comply with the following performance criteria:
1. Initial GMax (ASTM F 355): Shall not exceed 135 G’s when tested in accordance with ASTM Test Method F-1936
a. At no time in the life of the warranty period shall the GMax exceed 165 G’s.
2. Percolation (ASTM F 2898):
a. Gravel Layer: 50 inches per hour minimum
b. Finished Playing Field: 15 inches per hour minimum

1.5 SUBMITTALS REQUIRED WITH BID

A. Product Data: For each product specified.

B. Samples: Provide two samples of the following components:
1. Synthetic Turf: 12” X 12” samples each of green turf with perforated backing intact. Include third party test reports.
2. Synthetic Turf and Infill material in an 11 inch x 7 inch containerized conditions resembling and installed conditions as closely as possible. Include third party test reports.

3. Infill Mixture: Two pounds of proposed material. Include toxic analysis from third party testing laboratory.

C. Turf Vendor Qualifications:
1. Written document describing firm's annual volume and number of years in business under current ownership.
2. Written record of firm's past installation schedules and performances.
3. Provide the names of existing clients for whom significant after-the-sale service work has been performed or significant synthetic turf warranty services have been performed. Provide names of local representatives who will be responsible for warranty and post-installation support for this project.
4. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of surfacing material with requirements based on comprehensive testing of current systems.

D. Turf Manufacturer's Qualifications:
1. Written document describing the history and experience of the Manufacturer with this particular product. Provide number of years of experience and number of installations, both in North America and world-wide.
2. Provide field locations, client contact (name, address, phone number), type of synthetic turf product installed, date of installation, and general contractor (if used) for a minimum of 5 competition baseball or softball installations at the NCAA Division 1 level or higher.

E. Playing Field Contractor Qualifications:
1. Written document describing the history and experience with this particular type of installation and products. Provide number of years of experience and number of similar installations, both in North America and world-wide.
2. Provide documentation of current Certified Field Builder designation from American Sports Builders Association for playing field base builder and turf installer.
3. Provide field locations, client contact (name, address, phone number), type of synthetic turf product installed, date of installation, and general contractor (if used) for a minimum of 5 competition synthetic turf baseball or softball installations at the NCAA Division 1 level or higher.
4. List of subcontractors to be under the direct responsibility of the playing field contractor in association with the construction of this project.

1.6 QUALITY ASSURANCE

A. Turf Manufacturer Qualifications: The firm shall comply with the following requirements and shall be experienced in manufacturing synthetic playing surface materials similar to those indicated for this Project and with a record of successful in-service performance.
1. Assumes responsibility for engineering synthetic playing surface components to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive analysis by a qualified professional engineer.
2. Has provided infilled synthetic turf playing surface components for at least 5 full-size competition baseball or softball fields at the NCAA Division 1 level or higher within the past 5 years.
3. Has sufficient production capacity to produce required materials without delaying the Work.

B. Playing Field Contractor Qualifications: The Playing Field Contractor chosen to perform the work described in this Section shall comply with the following:
1. Playing field base builder and turf installer shall be certified by the American Sports Builders Association (ASBA) as a Certified Field Builder.
2. Shall have installed at least 5 full-size infilled synthetic competition baseball or softball fields at the NCAA Division I level or higher, similar to that required for this Project, and who is acceptable to the manufacturer.

C. The Playing Field Contractor shall be responsible for the protection of the synthetic turf playing field system through Substantial Completion. Damages caused by construction activities shall be immediately corrected at no additional cost to the Owner.

D. Synthetic turf system shall comply with all EPA, CSPC, and all other relevant regulatory agency requirements.

1.7 QUALITY CONTROL

A. Subgrade Compaction Testing: Modified Proctor (ASTM D 1557). Compaction testing shall be performed to determine the compacted density of the fill materials. Testing regimen to be as recommended by Owner's geotechnical testing agent.
   1. Number of Tests: A minimum of 9 locations representative of the entire playing field area per vertical lift.
   2. Failings: If, based on the testing and observation agency reports and observations, compacted subgrade or fills are found to be below specified density, provide additional compaction and testing in accordance with specifications.

B. Synthetic Turf Pre-Shipment Requirements: Prior to shipment of the synthetic turf materials to the jobsite, a 7' x 11" sample from every fifth roll shall be randomly sampled and tested by an independent testing laboratory experienced with testing synthetic turf materials. The testing laboratory shall be completely independent with no ties to the turf manufacturer. The testing shall include the following:
   1. Pile composition and denier
   2. Pile weight
   3. Total Weight
   4. Pile height
   5. Primary & Secondary backing weight
   6. Permeability
   7. Tuft bind (without infill)
   8. Grab/tear strength (length/width)

C. Base Stone and Finishing Gravel Test Data: The gravel drainage material shall be submitted to and approved by a qualified independent testing laboratory for conformance to the specifications. All costs associated with testing of gravel materials shall be borne by the Playing Field Contractor.
   1. Phase I Testing: Prior to Construction, submit a one gallon sample of each type of gravel for testing to establish baseline specification for the remainder of the construction process. Sample is to be tested for:
      a. Composition and Shape
      b. Gradation – ASTM C 136
      c. Resistance to Degradation – ASTM D 6928
      d. Bridging Characteristics
      e. Infiltration Rate
   2. Phase II Testing: During Construction, a one gallon sample of each type of gravel shall be submitted for testing as follows:
      a. A one gallon sample from the first and every subsequent 250-ton lot of each type of gravel shall be submitted and tested for:
         1) Composition and Shape
         2) Gradation – ASTM C 136
      b. A one gallon sample from the first and every subsequent 500-ton lot of each type of gravel shall be submitted and tested for:
         1) Composition and Shape
         2) Gradation – ASTM C 136
         3) Resistance to Degradation – ASTM D 6928
         4) Infiltration Rate

D. Grade Verification Surveys: Provide certified as-built topographic surveys with gridded spot elevations spaced at 25 feet on center at the following milestones to display compliance with the intended grades and tolerances of each layer. Surveys shall be certified by a State licensed land surveyor:
   1. Final Subgrade: ½ inch over 25 feet in each direction
   2. Top of Base Gravel: ½ inch over 25 feet in each direction
   3. Top of Finishing Stone: ¼ inch over 25 feet in each direction
   4. Top of Synthetic turf (Pre-Infill): ¼ inch over 25 feet in each direction
   5. Finished Grade of Synthetic turf (Post-Infill): ¼ inch over 25 feet in each direction

E. Gravel Layer Percolation Testing: Upon completion of the installation of the Base and Finishing Gravel layers, percolation testing (ASTM 2898) is to be conducted on the finished gravel layer. Testing shall occur at a minimum of 9 locations representing the entire playing field area.

F. Finished Playing Surface Testing:
   1. Impact Attenuation (ASTM F 355): GMax
   2. Percolation (ASTM F 2898):
   3. Infill Depth: Measurements taken at a minimum of 9 locations representative of the entire playing field.

1.8 SUBMITTALS REQUIRED AFTER NOTICE TO PROCEED

A. Manufacturer's Product Data: For each product specified, submit three copies each of the manufacturer's specifications, product brochures, and installation instructions. Include details of construction relative to materials and dimensions of individual components, and certifications and other data required to show compliance with the contract documents.

B. Supplier List: Provide list of contracted suppliers of all materials required for the synthetic turf system.

C. Project Schedule: Provide work schedule for all work described in these documents. Schedule is to be updated and submitted as progress continues through completion of the project.

D. Samples: Provide to the Architect and the Owner the following within two weeks of the Notice to Proceed:
   1. 3 samples each of green colored turf measuring approximately 7" x 11"
   2. 3 samples of each color of turf used for markings, measuring approximately 4" x 4"
   3. 1 turf sample measuring 36" x 36" showing method of seam make-up, perforations, and tufted and inlaid lines, representative of the construction methods to be used on this project.
   4. 1 color card for each custom synthetic turf color. Color card shall be wound with actual turf fiber, covering an area of no less than 2" square. Owner shall approve custom colors prior to tufting of custom colored turf.
   5. 3 one quart sized bags of infill material with proper sand/rubber ratio.
   6. 3 one gallon sized bags of each gravel drainage material.

E. Infill Material: Sieve Analysis of proposed infill materials

F. Shop Drawings: Provide to the Architect and the Owner (3) copies of complete and detailed drawings showing all components and parts of the infilled synthetic turf system, within two weeks of the Notice to Proceed. The shop drawings shall be to scale and include the following:
   1. Synthetic Turf:
      a. Seaming Detail
      b. Seaming Plan
      c. Edge Detail
      d. Inlay Detail
      e. Lines and Logos.

G. Synthetic Turf Product Pre-Shipment Test Data: Provide to the Owner and Architect, certified copies of the pre-shipment test results delineated in paragraph 1.7 Quality Control. All tests

shall be certified by an independent (third-party) testing laboratory experienced with the testing of synthetic turf. The qualifications of the testing laboratory to be utilized for the submittal and pre-shipment testing shall be submitted to the Architect for approval. Rolls with samples that do not gain approval shall not be shipped.

H. Compaction Test Data: Provide to the Owner and Architect, certified copies of the Compaction test results delineated in paragraph 1.7 Quality Control.

I. Base Stone and Finishing Gravel Test Data: Provide to the Owner and Architect, certified copies of the Base Stone and Finishing Gravel test results delineated in paragraph 1.7 Quality Control. Gravel test results shall be approved by the Owner and Architect prior to delivery of material to the site.

J. Grade Verification Surveys: Submit to the Owner and Architect, certified grade verification surveys as delineated in paragraph 1.7 Quality Control. Grade verification surveys shall be approved by the Owner and Architect prior to proceeding to the next phase of construction.

K. Gravel Layer Percolation Test Data: Provide to the Owner and Architect, certified copies of percolation test results delineated in paragraph 1.7 Quality Control.

L. Finished Playing Field Test Data: Provide to the Owner and Architect, certified copies of Finished Playing Field Test results delineated in paragraph 1.7 Quality Control.

M. Synthetic Turf Product Hold Harmless: Provide a written statement from the turf manufacturer/vendor holding the Owner, Architect and it's representatives harmless as to any liability and/or costs of any type, including but not limited to legal costs, royalties, replacement costs, etc. associated with any claim by the turf manufacturer/vendor or it's associates and infringements of any current or future patent issued for the synthetic turf product, infill materials, installation methods, or drainage characteristics. It is not the intent of these documents to promote or induce the use of intellectual property belonging to others or promote infringement of any known or currently not known patents, licenses, or rights of others.

1.9 WARRANTY

A. General Synthetic Turf Warranty: Warranty shall cover, in general, the usability of the turf surface, accessories, use characteristics, and suitability of the installation. All items covered by the warranty are to be replaced or repaired with new materials, including installation at the sole expense of the warranting contractor for the period of (8) years to the Owner, for the designated uses enumerated as follows:
   1. Football
   2. Soccer
   3. Lacrosse
   4. Rugby
   5. Baseball
   6. Softball
   7. Marching Band
   8. Physical Exercises
   9. Physical Education Activities
   10. Pneumatic rubber-tired maintenance and service vehicles.
   11. Pedestrian traffic.

B. A principal of the applicable firm, duly authorized to make contracts, shall sign the turf vendor's warranty. If the turf vendor is not the manufacturer, the manufacturing firm shall also sign the warranty. The term "Contractor" contained herein refers to the firm furnishing the warranty. Warranty period shall be a minimum of (8) years from date of acceptance of the installed system by the Owner.

C. Warranty of Synthetic Turf System:
   1. The following are inclusive of the term "Synthetic Turf System" for provisions of the warranty:

a. Synthetic turf product as specified and represented by the Turf Manufacturer/Vendor including seams and adhesives.
b. All materials and products specified
c. Materials and working functions of the drainage system
d. Final grade tolerances to one-quarter inch over 25 feet in any direction.

2. The Contractor warrants to the Owner that its synthetic turf materials shall not fade, fail, shrink, wrinkle, or reflect excessive wear. Contractor shall, at their sole expense and cost, replace such areas of the synthetic turf system not performing to these standards for the life of the Warranty.
   a. The term “Not Fade” in the context of this warranty shall mean that the synthetic turf material shall remain a uniform shade of green, or other color installed, with no significant loss of color.
3. In the event the Synthetic Turf System does not retain its fiber height or shock absorbency and is consequently no longer serviceable during the warranty period, the Contractor shall, at his sole expense, replace such portion of the system that is no longer service-able.
4. The Contractor warrants to the Owner that the permeable Synthetic Turf System shall drain vertically a minimum of 15 inches per hour without visible surface ponding.
5. The Contractor shall not be held liable for any incidental or consequential damages.
6. These warranties and the Contractor’s obligations hereunder are expressly conditioned upon:
   a. The Owner making all minor repairs to the synthetic turf system upon the discovery of the need for such repairs in accordance with the turf manufacturer’s repair manual.
   b. The Owner maintaining and properly caring for the synthetic turf system in accordance with the Contractor’s maintenance manual and instructions.
   c. The Owner complying with the dynamic and static load specifications established by the Contractor.

D. Warranty Testing: The infilled synthetic turf field is to be tested and paid for by the Contractor through the end of the manufacturer’s warranty period upon:
1. Completion
2. End of Year One
3. Beginning of Year Five
4. Year 8 and Every Year After through the end of the manufacturer’s warranty period.

E. Warranty Tests: The following tests are to be performed in accordance with applicable ASTM and other applicable standards (All tests to be paid for by Contractor):
1. G-Max and HIC Testing: as designated in F-1936-98 (Test shall be performed in 8 locations as opposed to 6 as outlined in the ASTM procedure. Measured depth of infill shall be provided in all 8 test locations). Testing shall be completed by third party certified testing laboratory.
2. Force Reduction
3. Percolation
4. Infill Level
5. Pile Height
6. Tuft Bind
7. Rotational Resistance
8. Deformation

F. Third Party Warranty/Insurance: Provide to the Architect and the Owner three copies of the Third Party Warranty package within two weeks of the Notice to Proceed. The Third Party insurance shall cover the turf system for the entire warranty period. The insurance shall be in the amount for a full 100% replacement of the turf system.

1.10 COMPLETION AND CLOSEOUT

A. General: Field completion shall occur in 2 phases

1. Punch List Phase: Punch List inspections shall be completed at least 15 days prior to Substantial Completion. Contractor to provide minimum 7 days notice of anticipated Punch List Inspection date. Items required to be completed prior to scheduling Punch List Inspection include:
    a. Field attachment curbing installed.
    b. Compaction complete with test results submitted to and approved by the Architect.
    c. Subdrainage system installed.
    d. Gravel drainage material installed and laser graded.
    e. Percolation of gravel drainage layer complete with test results submitted to and approved by the Architect.
    f. Synthetic turf installed, including field makings, inlays, and logos.
    g. Infill materials installed and leveled to designed grade.
    h. Certified grade verification surveys completed for subgrade, gravel drainage layer and top of turf (pre-infill), submitted to and approved by the Architect.
2. Substantial Completion: After Punch List Inspection, the Architect shall prepare and submit to the contractor, a list of items for correction or completion (if any) that must be brought fully in to compliance prior to Substantial Completion. Contractor to provide minimum 7 days notice of anticipated Substantial Completion date. To be considered "substantially complete", the following must be provided:
    a. All items from Punch List phase of completion described in Paragraph 1.10.A.1 above complete.
    b. All items from the Architect's provided list of completion/correction items must be complete.
    c. Certified survey for finished playing field surface completed, submitted to and approved by the Architect.
    d. Percolation testing completed on finished playing field surface with results submitted to and approved by the Architect.

B. Prior to final acceptance and/or occupancy by the Owner, furnish to the Architect (5) copies in hard cover form of the following:
1. Maintenance and operating data with imprinted Project, Owner, Project Engineer, Contractor, and Turf Subcontractor names, and date of turf installation.
2. Use and Limitations: Provide a separate page stating approved activity usage for the turf and activities not recommended relative to warranty.
3. Index with Tab dividers and data as follows:
    a. Materials installed with their characteristics.
    b. Testing Reports/Results for all testing required herein.
    c. Certified Grade Verification Surveys
    d. Maintenance and Operation Data including, but not limited to
        1) General maintenance and uses to be avoided to protect playing field surface and to maintain installation's warranty.
        2) Small repair procedures.
        3) Minor seam repair.
        4) Maintenance Equipment User Manuals
    e. Written Warranties/Guarantees
    f. G-Max Testing Results per ASTM F355.

C. Prior to acceptance and/or occupancy by the Owner, contractor shall provide training to the owner on the operation and maintenance of turf grooming equipment provided.

1.11 EXTRA MATERIALS

A. Furnish to the Owner extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Receive Owner's written receipt for all materials. Deliver receipt to Owner's Turf Consultant and Architect.

1. Turf for Future Repairs: The following are minimum areas for the extra synthetic turf to be provided by the Contractor to the Owner:
    a. Each Green Colored Turf: 500 sq. ft.
    b. Additional Used Colors: 20 sq. ft. each
    c. Extra Turf Configuration: Material may be roll ends or cutoffs; however, each piece of fabric shall be at least 5' x 10'. At least one green turf piece shall be a minimum 10' x 15'

PART 2 - PRODUCTS

2.1 GENERAL

A. General: the synthetic turf system shall be a vertically draining permeable synthetic turf system. The turf system shall consist of a synthetic grass-like surface pile, which shall be tufted into a synthetic backing. All backing layers and coatings shall be firmly bonded together. Coating material must be completely cured and bonded to the other backing layers. Synthetic turf panels or rolls that do not meet the requirements of this specification will be rejected. The entire system shall be resistant to weather, insects, rot, mildew, and fungus growth, and shall be non-allergenic and non-toxic. The entire system shall be constructed to maximize dimensional stability, to resist damage and normal wear and tear from its designated use, and to minimize ultraviolet degradation. All adhesives used in bonding the system together shall be resistant to moisture, bacterial and fungal attacks, and resistant to ultraviolet rays at any point in the system.

2.2 DRAINAGE SYSTEM MATERIALS

A. Gravel Drainage Material: Shall consist of a mechanically crushed limestone or granite, angular and elongated in nature, that meets the following criteria:
    1. Gravel Drainage Material shall not exceed 18 percent loss of materials as determined by the 2018 MicroDeval method (ASTM D6928). Soft limestone, sandstone, and shale materials are not suitable.
    2. No shell or shell fragments shall be present and be denoted in the laboratory test reports.
    3. Rounded or river stone is not acceptable.
    4. Gravel from multiple quarry sources shall not be used in a single playing field area.
    5. Infiltration Rates
        a. Base Coarse Gravel: greater than 150 inches per hour
        b. Finish Coarse Gravel: greater than 50 inches per hour
        c. Porosity of the finished drainage gravel layer shall be greater than 25% when compacted and saturated.
    6. Bridging Characteristics
        a. 3 < (D50 Base Stone / D50 Finish Stone) < 6
        b. (D85 Finish Stone / D15 Base Stone) < 2
    7. The gravel shall conform to the following gradation chart using ASTM Method C136. Turf manufacturer to review gravel specification and confirm compatibility with turf system prior to delivery and installation of the drainage gravel:

Sieve Size	Base Coarse AASHTO No. 57 Percent Passing	Finish Coarse AASHTO No. 89 Percent Passing
1.5 inch	100	
1 inch	95 - 100	
3/4 inch		
1/2 inch	25 - 80	100
3/8 inch		90 - 100

#4	0-10	20-55
#8	0-5	5-30
#16	0	0 - 10
#50	0	0 - 5

2.3 SHOCK ATTENUATION PAD

A. A permeable shock attenuation pad shall be provided atop the finished gravel layer, under the infilled synthetic turf.

B. Basis of Design: Subject to compliance with requirements, provide the following shock attenuation pad, or approved equivalent:
   1. **ProPlay-EcoSport by Schmitz Foam**

2.4 SYNTHETIC TURF COMPONENTS

A. Basis of Deisgn Product: Subject to compliance with requirements, provide the following synthetic turf system, or approved equivalent:
   1. Infield Skin/Clay Areas: Shaw Sports Turf B1K Six4Three
      a. Yarn Type: High Density Slit Film with Thatch Layer
      b. Tufted Pile Height: 1.625”
      c. Pile Weight: 55 oz. per square yard
      d. Primary Backing: Woven Polypropylene, minimum 8 oz. per square yard
      e. Secondary Backing: Polyurethane Coating, minimum 20 oz. per square yard
      f. Total Product Weight: 83 oz. per square yard
   2. Grass Areas: Shaw Sports Turf B1K TagUp
      a. Yarn Type: Combination Slit Film and Monofilament
      b. Tufted Pile Height: **2”**
      c. Pile Weight: 40 oz. per square yard
      d. Primary Backing: Woven Polypropylene, minimum 8 oz. per square yard
      e. Secondary Backing: Polyurethane Coating, minimum 20 oz. per square yard
      f. Total Product Weight: 68 oz. per square yard
   3. Warning Track Areas: Shaw Sports Turf B1K TruTrack
      a. Yarn Type: Low Density Slit Film
      b. Tufted Pile Height: 1.625”
      c. Pile Weight: 17 oz. per square yard
      d. Primary Backing: Woven Polypropylene, minimum 8 oz. per square yard
      e. Secondary Backing: Polyurethane Coating, minimum 20 oz. per square yard
      f. Total Product Weight: 45 oz. per square yard

B. Synthetic Turf Fabric Surface: the fabric surface shall be constructed and installed in minimum 15’ widths with no longitudinal or transverse seams, except for head or tee seams at field boundaries and inlaid lines within a finished roll assembly. The seams shall be at 15’0” spacing.

C. Synthetic Turf Appearance and Colors: The turf color shall be uniform with no visible deviations in shade permitted. Rolls that do not meet this requirement will be rejected. Pile fibers shall resemble freshly grown natural grass in appearance, texture and color. Pile surface shall be nominally uniform in length for all portions of the field. Synthetic turf panels with irregular pile heights or with “J hooked” fibers will be rejected.
   1. Color A: Field Green/Lime Green Combination
   2. Color B: Chestnut

D. Seams
   1. All turf seams shall be bonded with a supplemental backing material or sewn with high strength polyester fiber cord. For bonded seams, use either open graded nylon or

polyester scrim/backing material, or non-permeable backing with perforation in accordance with paragraph 2.5 of this section.

E. Turf Perforations
   1. Synthetic turf with tufted fibers and coated backing must include perforations in the backing for vertical drainage. Perforations to be a minimum of 3/16" diameter clear opening and shall be spaced at a maximum of 4" uniformly on center. The turf shall be perforated with a minimum 95% integrity over the entire surface. Holes must be full diameter, completely through the underside of the turf backing with no material residue or fragmented fibers remaining.

F. Infill Materials
   1. Warning Track and Indoor Infield Clay Area Infill
      a. Combination of Sand and SafeShell in weight ratios as recommended by the turf manufacturer to achieve the physical performance criteria as outlined herein.
   2. Green Turf Area Infill
      a. Combination of silica sand and GeoFill, in by weight ratios as recommended by the turf manufacturer to achieve the physical performance criteria as outlined herein.
   3. Infill material shall be placed to a depth as recommended by the turf manufacturer, based upon the specified pile height, and to achieve the physical performance criteria as outlined herein.
   4. Infill material test results shall be verified and approved by the Turf Vendor.

G. Field Markings

1. Manufacturer to guarantee that turf is capable of receiving painted lines in the event painting is utilized in the future.
2. Inlaid markings shall be of the identical synthetic turf product as the primary turf.
3. Markings shall be uniform in color and shall provide sharp visual contrast to the turf color.
4. Markings shall have sharp and distinct edges, and shall not vary more than 7/32" from specified widths and location.
5. Contractor to provide shop drawing of all field markings for approval by Owner, Architect and Owner's Turf Consultant prior to fabrication of the turf system.

2.5 CONCRETE CURBING

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

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

C. Concrete Mix Design: Locally sourced concrete mixture as commonly used in local curb and gutter.
   1. Portland Cement: ASTM C 150/C 150M, gray portland cement
   2. Normal-Weight Aggregates: ASTM C 33/C 33M. Uniformly graded limestone from a single source.
      a. Maximum aggregate size: 1-inch
      b. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
   3. Minimum Compressive Strength: 4000 psi.

2.6 TURF EDGE FASTENERS

A. Turf edge fastener to be comprised of a treated or synthetic 2 x 4 nailer board attached to the perimeter concrete or structure in an approved manner. Treated lumber used as nailer board shall have "Ground Contact" designation from manufacturer.

PART 4 - EXECUTION

4.1 EXAMINATION

A. Examine substrates, areas, and conditions where playing surface is to be installed, with Installer present, for compliance with requirements for conditions affecting performance of installed playing surface.
   1. Verify that substrates for placing playing surface are firm; dry; clean; free from oil, and waxy films.
   2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located under playing surface has been completed before installing drainage tile.
   3. Verify that joints and cracks in substrates will not adversely affect installed playing surface.
   4. Verify ambient temperatures are in compliance with manufacturer's recommendations for installation.

B. Acceptance of Field Base Installation: The Contractor or the Contractor's subcontractor shall perform an inspection of the aggregate subbase and submit written certification of the acceptance of the aggregate subbase prior to the installation of the infilled synthetic turf system. The written certification shall include, but not be limited to:
   1. Acceptance of the subbase construction finished surface as totally suitable for the application of work specified in this section.

2. Verification and certification of the infiltration and permeability rates of the aggregate subbase per the specified requirements – 50” per hour minimum.
3. Final grade to be within ¼” (one-quarter inch) in 25’ of proposed grades.

C. Do not proceed with installation until unsatisfactory conditions have been corrected.

D. Inspection of Materials: Prior to installation and immediately upon delivery of synthetic turf system materials to the project site, the synthetic turf surfacing contractor shall inspect materials as follows:
1. For damaged or defective items.
2. Measure turf pile height of each roll.
3. Measure backing perforation diameter and spacing.
4. Reject damaged materials and all materials out of tolerance with the specifications.
5. Results of pre-shipment testing of turf as required in section 1.6C.

E. Owner Testing of Materials: The Owner may at any time have samples of turf submitted and tested for verification of conformance to specifications. Turf system acceptance will be subject to approval of these tests. Any material so tested and found not conforming to specifications will be rejected and replaced with material conforming to the specification at the Contractor’s expense. Resubmittal will be required.

F. Post Installation Inspection: Immediately after installation, inspect project area for acceptable seaming, adhesive bonding, uniformity of color of turf, field lines and markings, insert installations, and edge details. Remove and/or repair deficient workmanship prior to requesting the Architect and Owner’s Turf Consultant inspection pursuant to completion and acceptance of the work.

G. Product Testing: the Owner may have samples of the turf submitted and tested for verification of conformance to specifications at any time during the installation process. Turf system acceptance is subject to the results of these tests. Any material so tested and found not in conformance to the specifications will be rejected and replaced with material conforming to the specifications at the Contractor’s expense.

4.2 EARTHWORK EXECUTION

A. General: Remove material of every nature or description encountered in obtaining required lines and grades. Excavate and/or place and compact fill to provide for elevation(s) required by drawings.

B. Establish required lines, levels, contours and datum.

C. Remove vegetation, debris, unsuitable soil materials, obstructions, and deleterious materials from surface prior to placement of fill materials.

D. Prior to placing fill materials over undisturbed material, scarify to a minimum depth of six inches.

E. Place backfill and fill materials in lifts not more than six inches in loose depth. Before compaction of subgrade, moisten or aerate each layer as necessary to provide optimum moisture content to facilitate compaction to the required density. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

F. Compact each layer to 95% proctor density (ASTM D 1557).

G. Failings: If, based on the testing and observation agency reports and observations, compacted subgrade or fills are found to be below specified density, provide additional compaction and testing in accordance with specifications.

H. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

I. Moisture Control: Where subgrade soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.
   1. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

J. Subgrade Delivery to Playing Field Contractor: subgrade within the extents of the playing field shall be delivered to the Playing Field Contractor with one inch +/- tolerance of the finished subgrade elevations.

K. Subgrade Grading: Shape surface of areas under gravel drainage material to line, grade, and cross-section, with finish surface not more than ½" (one-half inch) in 25 feet either direction above or below required subgrade elevation. At no point shall two adjacent spot elevations vary by more than one-half inch.

L. Contractor to provide a certified survey of the finished subgrade with spot elevations at 25' on center for Owner review.

M. Contractor's Geotechnical Consultant to provide compaction & density reports for Owner review upon completion of subgrade preparation.

N. Contractor shall bear sole responsibility for the stability and performance of the subgrade throughout the warranty period. Any fluctuation in the subgrade resulting in failure of the finish grade of the playing surface to meet specified tolerances will be immediately corrected by the Contractor.

O. The Contractor shall not proceed with drainage system trenching operations or installation of gravel drainage blanket until all subgrade geotechnical tests and certified surveys have been reviewed and approved by the Owner.

4.3 FIELD DRAINAGE INSTALLATION

A. Drainage System Trenching: Dig trenches to depth and width indicated on the drawings. Abnormal conditions such as large cobbles or unstable conditions that may cause trench to lose integrity shall be reported to Architect immediately. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum width of twice the pipe diameter.
   1. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil.
   2. Only perform trenching, drainage pipe installation and backfilling operations that can be completed in one day. Exposed trenches that collapse due to rain or other occurrences shall be widened and filled as specified or refilled with subgrade materials, compacted, and retrenched.
   3. Compact the bottoms of all trenches to the density described in placement and compaction of this section. Architect has the option of observing the general trenching operation and will not observe the entire process for approval to backfill the remaining trench areas.
   4. All cuttings and spoil from trenching are to be removed from the facility. Cuttings may not be left in place or spread across the subgrade.

B. Installation of Geotextile Fabric: Place geotextile fabric according to manufacturer specifications.
   1. Install geotextile fabric on bottom and sides of trenches. Extend fabric a minimum of 12 inches past each side of top of trench on top of the subgrade.
   2. Install geotextile fabric across prepared subgrade, overlapping edges and roll ends a minimum of two feet (2').

C. Laying Pipe Materials: per section 32 18 23.19 "Natural Grass Playing Field Subdrainage".

D. Clean Outs: per section 32 18 23.19 "Natural Grass Playing Field Subdrainage".

E. Testing Drain Lines: per section 32 18 23.19 “Natural Grass Playing Field Subdrainage”.

F. Placement of Base Gravel: Place base gravel material after testing of drainage system in a single layer for each layer.
   1. Place material around drainage pipe located in trench areas until drainage material is level with the surrounding subgrade.
   2. After filling of trench areas place base gravel to depth above subgrade shown in the drawings.
   3. Care shall be taken as to not disturb the geotextile fabric during base gravel installation. A minimum of four inches (4”) of base gravel shall be maintained between the geotextile fabric and the wheels of trucks or spreading equipment. Construction equipment such as dozer blades, etc. shall not make direct contact with the geotextile fabric. If tears occur in the geotextile fabric during the spreading of base gravel, gravel is to be removed and the damaged section is to be repaired prior to continuing base gravel installation operations.

G. Placement of Finishing Gravel: Place finishing gravel material over the base gravel in a single layer, to the elevations indicated on the drawings.
   1. After placement of finishing gravel, finishing gravel layer is to be rolled with a steel wheel tandem roller to achieve planarity at the elevation indicated, and meet tolerances as described below.

H. Gravel Drainage Layer Grading: Shape surface of gravel drainage layer to line, grade, and cross-section, with finish surface not more than ¼” (one-quarter inch) in 25 feet either direction above or below required elevation. At no point shall two adjacent spot elevations vary by more than one-quarter inch.

I. Contractor to provide a certified survey of the finished gravel drainage layer with spot elevations at 25’ on center for Owner review

J. Contractor shall bear sole responsibility for the stability and performance of the gravel drainage layer throughout the warranty period. Any fluctuation in the gravel drainage layer resulting in failure of the finish grade of the playing surface to meet specified tolerances will be immediately corrected by the Contractor.

K. The Contractor shall not proceed with installation of the synthetic turf until the certified survey of the gravel drainage layer has been reviewed and approved by the Owner and the Architect.

4.4 SYNTHETIC TURF INSTALLATION

A. Immediately prior to installation of the synthetic turf, the base shall be thoroughly cleaned of all foreign material, soil, and any other substances that may be detrimental to the permeability and the installation of the turf system.

B. Over gravel drainage layer, install synthetic turf carpet in accordance with manufacturer’s written instructions. Seams shall be sewn with thread especially made for the carpet materials, glued, bonded or welded according to manufacturer’s written instructions.

C. Synthetic turf edge shall be mechanically fastened to the installed turf edge fastener per manufacturer’s instructions and per the drawing details.

D. Special care shall be taken not to disturb finish grade of approved gravel drainage layer during synthetic turf carpet installation.

E. Bonding of Material Surface: The bonding or fastening of all system material components shall provide a permanent, tight, secure and hazard-free athletic playing surface. System material components include:
   1. Bonding and/or sewing of all seams and inlaid lines and markings
   2. Bonding and seaming must maintain their integrity for the total length of the warranty period.

F. All turf seams shall be bonded with supplemental backing material or sewn with high strength polyester fiber cord.
   1. All sewn seams shall be brushed to provide full coverage of fiber over the thread.
   2. All bonded/glued seams shall be brushed to eliminate adhesive materials from turf fibers.

G. Contractor to provide a certified survey of the installed synthetic turf carpet with spot elevations at 25' on center, as to display maintained integrity and planarity of gravel layer, for Owner, Architect, and Owner's Turf Consultant review.

4.5 LINES AND MARKINGS INSTALLATION

A. Field markings shall be provided with the initial installation of the surfacing system. Provide lines and markings in conformance with these specifications. Layouts shall be accurately surveyed and marked prior to installation.

B. If overlapping backing materials are utilized for the inlaid lines and markings, the backing material shall be perforated after gluing and prior to installation of the infill material.

C. Installation of inlays: All inlaid markings shall be shaved in and glued to backing per Turf Manufacturer's recommendations.

4.6 ADHESIVE AND INFILL MATERIAL INSTALLATION

A. Environmental Conditions: Do not apply adhesive materials or infill material when:
   1. Ambient air temperature is below 40 degrees F.
   2. Material temperatures are below 40 degrees F.
   3. Rain is falling or pending
   4. Conditions exist, or are pending that will be unsuitable to the installation of the system.

B. Remove debris from turf installation prior to installation of infill materials.

C. Inspect seams and inlays for secure bonding. Bonded seams and inlays shall be properly cured before infill is installed.

D. Vibrate and brush infill materials into synthetic turf at a rate and depth recommended by the manufacturer. Infill material shall be applied in a dry condition, and only when the turf is dry. It shall be applied in uniform layers, utilizing a SandMatic as manufactured by SMG or approved equal.

E. The Contractor shall utilize a combination of rolling and watering the surface after infill material installation to aid in the settlement of infill materials into the turf.

F. Contractor to provide a certified survey of the final infilled synthetic turf playing surface with spot elevations at 25' on center for Owner, Architect, and Owner's Turf Consultant review. Any disturbance of synthetic turf layer causing the final playing surface to fall out of specified grading tolerance shall be immediately remedied by the Contractor prior to final acceptance.

4.7 CLEANING AND PROTECTION

A. Remove all excess materials of all types; equipment, debris, etc. from site daily, immediately after completion of the work. Remove all stains and other blemishes from all finished surfaces. Leave work in clean, new appearing condition, ready for use by Owner.

B. Upon completion of infill installation, prior to Punch List, Contractor to use magnetic device to remove all metallic materials on field.

C. Adequate protection of material and work from damage will be the responsibility of the installer during installation and until acceptance of their work. Contractor will be responsible for protection after the acceptance of the work until final acceptance of all contract work by the

Owner. All material damaged prior to final acceptance by the Owner shall be replaced at no cost to the Owner.

END OF SECTION