

32 11 16.17
SYNTHETIC TURF BASE COURSES – 2 LIFT SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Crushed Aggregate Permeable Base, HDPE Perimeter Piping, Perimeter Curbing, and Turf Fabric Attachment Nailer.
- B. Related work specified elsewhere:
 - 1. Excavation / Earthwork
 - 2. Concrete
 - 3. Irrigation
 - 4. Synthetic Grass System

1.2 DESCRIPTION OF WORK:

- A. The general contractor shall provide the synthetic turf aggregate base system and related appurtenances, including but not limited to HDPE Perimeter Piping, perimeter curbing & edge anchorage details, crushed aggregate permeable base, ready to receive the synthetic turf fabric.
 - 1. It is the intent of this paragraph that all work necessary to provide the specified synthetic sports turf, complete and ready for play, shall be included in the scope of the General Contract.

1.3 QUALITY ASSURANCE

- A. Contractor qualifications:
 - 1. Installers of the synthetic turf base system shall:
 - a. Possess all necessary Contractor's Licenses required by the jurisdiction in which the project is located.
 - b. Have prior direct experience in preparing a drainage base for synthetic turf sports fields and must have installed a minimum of 10 such base systems in the state in which the project is located during the past 3 years, with a minimum size of 60,000 SF per synthetic turf field. Contractor shall submit previous experience and references for each project at time of Bid submittal. Previous experience submittal form is provided in bid documents.
 - 2. Submit evidence of installing contractor qualifications **at the time of bid submittal**.
- B. Changes & Substitutions:
 - 1. The contractor shall strictly adhere to the procedures outlined under this Section. Any variance from these requirements will only be accepted by the government upon acceptance in writing by the synthetic turf contractor onsite representative, verifying that the changes do not in any way affect the synthetic turf warranty.
- C. Synthetic Turf Base Planarity and Compaction Requirements:
 - 1. Completed Work of this section shall comply with the following:
 - a. Compaction of sub-grade: minimum 92%. Modified Proctor density.
 - b. Planarity of sub-grade: tolerance of one quarter inch (1/4") in ten feet (10').
 - c. Compaction of crushed aggregate permeable base: Shall be compacted to a minimum of 92%, and no more than 95%, Modified Proctor density.
 - d. Surface tolerance of crushed aggregate permeable base: not to exceed 1/4 inch over 10 feet and a maximum of 1/2" from design grade.
- D. Coordination:

1. Coordinate locations of connections to storm drainage system.
2. Coordinate work with installation of underground piping beneath synthetic turf and with installation of field appurtenances such quick couplers, electrical outlets in synthetic turf and other items required by Contract Documents.

1.4 FIELD QUALITY CONTROL & ACCEPTANCE OF WORK

- A. Testing Agency: The Contractor will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing. Contractor shall provide project schedule and timeline to recognize, allow for, and coordinate with the geotechnical engineer's specified testing operations.
 1. Tests shall include compaction and Proof Roll testing of sub-grade, finish grade and each lift of synthetic turf base, measured at a minimum of 12 locations randomly spaced across the surface of each field.
 2. The Independent Testing Agency shall also test the crushed aggregate permeable base material upon delivery to the job site to verify that material meets the specified gradation & permeability requirements. Testing shall be provided for every 10,000 SF of Synthetic Turf surface.
 - a. Installed drainage properties to comply with the following
 - 1) Testing Methods:
 - a) For lab samples, ASTM D 2434-68(2006) "Standard Test Method for Permeability of Granular Soils (Constant Head)
 - b) For field tests:
 1. If access to a water source with a hose is available the preferred test method is the ASTM F 2898, "Standard Test Method for Permeability of Synthetic Turf Sports Field Base Stone and Surface System by Non-confined Area Flood test Method." –Test results shall exceed 60" hr.
 2. If access to water with a hose is not available on site then the follow test method can be used: ASTM D 3385-09 "Standard Test Method for Infiltration Rate of Soils Using Double Ring Infiltrometer or BSI 7044 "Artificial Sports Surfaces – Test Method 4, Test shall exceed 120" per hour.
 - c) Final approval of infiltration requirements are to be through field testing only.
 - d) Methods not specifically listed above shall be submitted for approval.
 3. Testing agency will test compaction of soils & base materials in place according to ASTM D1557, ASTM D 6938, as applicable.
 4. Contractor's surveyor will verify proper elevation of nailer board around entire perimeter of field, and submit to the contracting officer for approval. Contractor's surveyor shall be a licensed surveyor in the jurisdiction where the project is located, and shall be an independent sub consultant of the General Contractor.
- B. Contractor provided independent testing agency results verifying compliance with compaction & permeability requirements shall be supplied to the synthetic turf contractor prior to the commencement of synthetic turf installation.
 1. The synthetic turf contractor shall not proceed with the installation of the synthetic turf surfacing system until acceptable compaction and permeability test results have been achieved.
- C. Contractor to provide surface planarity verification using a string line method in presence of synthetic turf contractor and contracting officer or representative.

1. A mason's line held taught between two workman separated by a distance of approximately 40 feet, shall be placed directly on the finished surface, parallel to the direction of greatest slope. A third workman shall check for separations between the mason's line and the finished surface that are equal to or greater than the tolerances specified.
 2. Final crushed aggregate permeable base elevations shall conform to the lines and grades shown on the drawings. The measured grades shall not deviate more than (1/2") from the planned grades and not vary more than (1/4") feet in 10 feet in any direction. Laser grading of the finish surface is mandatory.
 3. General Contractor's responsibility shall include correction of any defects in synthetic turf aggregate base and edge anchorage details identified by the government's synthetic turf contractor.
 4. Roller marks, tire tracks, footprints or other impressions on the finished surface shall be raked out where they are equal to or greater than the tolerances specified. Following long and short axis checking and corrections, the Contractor shall notify the contracting officer, that the finished surface is ready for inspection.
 5. The Contractor shall perform a final string line check along the long axis of the field in the presence of the Synthetic Turf Surfacing Installer. Finished surface planarity shall be approved by the contracting officer or representative and Synthetic Turf installation contractor.
 - a. Please be advised that the visual string line examination and acceptance of the base should not be used as a substitute for independent testing and analysis by a qualified professional engineer. As with all bases, there exists the possibility of hidden, latent or other defects that can only be reliably discovered through inspection, survey or testing by qualified experts in the fields of geology and soils engineering.
 6. Damage to the finished surface planarity occurring after approval shall be corrected by the Contractor using the method described above.
- D. Materials and Work not conforming to specified requirements shall be promptly removed, replaced and reinstalled as part of the work of this section at no cost to the government.

1.5 SUBMITTALS

- A. General: Submit in accordance with General Provisions.
- B. Contractor Qualifications.
- C. Product Data: Submittals required:
 1. Permeable aggregate base material (25 lb sample) including sieve size analysis & source.
 2. Subgrade/Trench Separation Barrier
 3. HDPE pipe & fittings
 4. 1" x 12" Panel Drains
 5. Certification that the submitted products are in compliance with the specifications
- D. Samples: Submittals required:
 1. Subgrade/Trench Separation Barrier

PART 2 - PRODUCTS

2.1 SUBGRADE/ PERIMETER DRAINAGE TRENCH SEPARATION BARRIER

- A. The prepared soil subsurface is to be isolated from the installed field and drainage system above it with a geotextile/geomembrane placed across the entire surface of the field. This insures no mixing of the soil sub surface with the aggregate drainage system.
 1. Separation fabric shall be laid and overlapped in accordance with the manufacturer and project geotechnical engineer's written recommendations.
- B. Subgrade/Trench Separation Barrier:

1. For permeable subgrade applications: Subgrade/Trench separation barrier shall be a 4oz. Non-Woven Geotextile – Mirafi 140N or approved equal
2. For Silty/Clayey subgrade applications where the fines content <35% and the Plasticity Index (PI) is < 20 – 4oz. Woven Geotextile – Mirafi 500X or approved equal
3. For plastic and moisture sensitive soils – 20 mil Woven Coated Polyethylene Geomembrane as manufactured by Brawler Industries, LLC.
4. Geotechnical Engineer of Record shall approve separation barrier selection based on actual site conditions.

NOTE: Contractor to provide a geotechnical report for specific separation barrier requirements.

2.2 PERFORATED FLAT DRAIN AND HDPE PERIMETER PIPING

- A. All specific pipes are noted on the Contract Drawings
- B. 4" through 10" solid wall and perforated drainpipe shall be smooth interior wall conforming to AASHTO M252.
 - C. 12" through 36" solid wall and perforated drainpipe shall be smooth interior wall conforming to AASHTO M294 Type S.
- D. Fittings and couplers shall be split couplings or snap couplings manufactured by the same manufacturer as the corrugated polyethylene pipe.
 - E. Panel Drains shall be a 3-dimensional rigid HDPE (1" x 12" flat panel pipe), AdvanEdge, MultiFlow, or approved equal.

2.3 CRUSHED AGGREGATE PERMEABLE BASE

- A. Material to be open graded, fractured friction course that provides adequate mechanical stability and compaction for athletic field applications.
- B. Material to be clean with minimal fines as described in gradation table below.
- C. Material to be minimum 100% fractured with at least one mechanical fracture per particle greater than 1/4" sieve size. Rounded River Rock is not acceptable.
- D. Base Stone: Comply with the below criteria for ASTM #57 Stone, and the following gradation:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
1 1/2" (37.5mm)	100
1" (19mm)	95-100
1/2" (12.5mm)	25-60
No. 4 (4.75mm)	0-10
No. 8 (2.36mm)	0-5

- E. Topping Stone: Comply with the below criteria for ASTM #89 Stone, and the following gradation:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
1/2"	100
3/8"	85-100
No. 4	10-30
No. 8	0-10
No. 16	0-5
No. 200 (.074mm)	0-2

1. Soft lime stones and shale materials are not acceptable.
2. Questionable materials, as determined by the project geotechnical engineer, shall be tested at the Contractor's expense using a sulfate soundness test (ASTM C 88) and LA Abrasion Test (ASTM C 131).

Test Method	Criteria
Sulfate Soundness (ASTM C 88)	Not to exceed 12% Loss
LA Abrasion (ASTM C 131)	Not to exceed 40

- F. Aggregate material for bedding and backfill around the Perforated Perimeter Collector pipe system shall be ASTM #57 Crushed Stone and shall meet criteria D above.

2.4 INDEPENDENT CRUSHED AGGREGATE PERMEABLE BASE TESTING

- A. Contractor to coordinate schedule as required for contractor's independent lab to continually monitor and test the crushed aggregate base as follows:
1. Sampling and testing of crushed aggregate permeable base both at the batch plant and on-site will be performed to confirm that the proposed material is in conformance with the project specifications prior to and following deliver of material to the site. Contractor's representative shall be in attendance at batch plant and at project site at time of material acquisition by the contractor-provided independent testing agency.
 2. Batch plant sampling and testing shall consist of a minimum of two (2) gradation samples and two (2) permeability samples for the project for initial approval. Contractor shall continuously monitor the requirements in sections 1.4 and 2.3 above throughout placement of the crushed aggregate permeable base material.
 3. On-site testing of the installed crushed aggregate permeable base shall be in accordance with section 1.4 above.
 4. The contractors Testing Agent may choose to periodically inspect and/or obtain samples of aggregate materials at the source and/or as they are delivered or installed on site. Any rock aggregate material that does not conform to the approved submittal samples will be rejected immediately or tested by the Contractor Testing Agent to verify compliance with the specifications. Such tests shall imply no warranty of the Contractor's work or compliance with the specifications.
 1. Costs for initial and follow up aggregate material testing by the contractor's Testing Agent are the responsibility of the contractor.

PERIMETER CURBING AND TURF FABRIC ATTACHMENT NAILER

- B. All perimeter curbing shall be formed utilizing either steel forms in good working order or 2" nominal dimensioned lumber.
1. Concrete curb shall be, trowel finished where exposed.
 2. Concrete shall be as specified in project specifications and geotechnical report requirements for site concrete.
 3. All cast-in-place concrete shall be ready mixed concrete meeting the following criteria:
 - a. 28 day compressive strength - 3500 psi
 - b. Air entrainment - 4% to 8%
 - c. Slump - 2" to 4"
 4. Synthetic Turf nailer board.
 - a. TREX polymer landscape board, 2 x 4 nominal thickness, or equal

- b. Attachment anchors shall be tapcon screw type anchors of appropriate size spaced 12" center to center and installed in accordance with manufacturer recommendations

PART 3 - EXECUTION

3.1 PREPARATORY WORK

- A. Examination of Site:
 - 1. Examine site for conditions that will adversely affect execution, permanence, and quality of work.
 - 2. Verify that underground utility & irrigation piping below sub-grade of synthetic turf base has been completed and the work of this section can properly proceed.
 - 3. The Contractor shall be responsible to close and cover, in a manner acceptable to the contracting officer, any existing basins, which the contracting officer determines to be detrimental to the function of the new synthetic turf field.

3.2 EXCAVATION & SUB-GRADE PREPARATION

- A. Methods as specified in appropriate section of the Contract Documents, and Sections 1.3 and 1.4 above.
- B. Subgrade grading and preparation shall comply with criteria outlined in the project geotechnical report as it relates to compaction, removal of existing turf, percent organic matter, debris, etc.
 - 1. Sub-grade of the crushed aggregate permeable base material shall be sloped as shown on the drawings. Contractor's surveyor will verify proper elevation of the subgrade on 25' centers, and submit to the contracting officer for approval. Contractor's surveyor shall be a licensed surveyor in the jurisdiction where the project is located, and shall be an independent sub consultant of the General Contractor.
- C. Trench sub-grade locally as required to achieve design slopes on sub-drain collector pipes.
- D. Compaction:
 - 1. After sub-grade has been properly graded, contoured and sloped as required, compact soil materials as outlined in section 1.3 above.
- E. Tolerances:
 - 1. Compacted sub-grade shall conform to shall conform to section 1.3 above.

3.3 SUBGRADE/TRENCH SEPARATION BARRIER

- A. The prepared soil subsurface is to be isolated from the installed field and drainage system above it with the specified separation barrier placed across the entire surface of the field. See these specifications and project geotechnical report.
- B. The subgrade surface shall be free from large stones; 3" or larger, and sharp objects that may puncture or tear the separation barrier.
- C. The separation barrier shall be placed and overlapped in accordance with the Manufacturer's written recommendations.
- D. The Subgrade/Trench separation barrier shall be continuous through the drainage trenches to insure separation of surrounding soil and drainage stone.

3.4 PERFORATED HDPE DRAINAGE PIPE

- A. Examine the areas and conditions under which the subsurface drainage system work is to be installed. Correct any and all conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until satisfactory conditions have been corrected.
- B. EXCAVATION FOR PIPE
 - 1. Excavation shall consist of the removal of all material of every description to the depths

- and grades designated on the plans and specified herein.
2. If the material at or below the designated grade for which the pipe is to be laid is unsuitable for pipe foundation, then the material shall be removed to such depths and widths as required and replaced with approved foundation material.
3. Excavation for installation of pipes shall be in trenches to the lines, grades and widths as per the Contract Drawings and in accordance with Safety and Health Regulations (OSHA). In all cases trenches shall be excavated in a manner to ensure the proper and timely completion of the work.

C. INSTALLATION

1. Once said trench has been excavated to the proper lines, grades and widths, the geotextile fabric shall be installed as per Manufacturer's Specification.
2. Perforated HDPE drainage pipe shall be installed according to recommended installation practices by the pipe manufacturer. Drain lines shall be installed to comply with drain line elevations noted on project plans.
3. Pipe laying work shall commence at the main collector line and shall proceed upgrade. Pipe shall be laid true to line and grade in such a manner as to assure a close concentric joint with the adjoining pipe.
4. Trenches shall be kept free of water and debris. Pipe shall not be laid when the condition of the trench or weather is unsuitable for such work.
5. Install Panel Drains as shown on Drawings.
6. At the completion of each drainage line installation, place a cap or plug in the up- stream end as to prevent unwanted material and debris from entering the pipe.

D. INSPECTION

1. After installation of pipe, inspect to determine whether line displacement or other damage has occurred.
2. Make inspections after lines have been installed prior to backfilling, during the backfilling process, and again at the completion of backfilling. Backfill material shall conform to the material as specified in section-2.3 above.
3. If inspection indicated poor alignment, debris, displaced pipe, infiltration or other defects, take whatever steps are necessary to correct such defects at no additional cost the government.

3.5 PERIMETER CURBING AND TURF FABRIC ANCHORAGE NAILER

- A. A continuous perimeter concrete curb, either exposed or concealed as shown on plans, is required around the entire perimeter of all synthetic turf areas with #4 rebar.
- B. Top of 2x4 nailer boards shall be set or recessed per the following table and as indicated on design plans:

Pile Height	Nailer Depth
2.5" pile height	1.75"
1.25" pile height	1.5"
2" pile height	1.25"
1.6" Pile Height	1.0"

3.6 INSTALLATION OF PERIMTER HDPE DRAINAGE PIPE AND CRUSHED AGGREGATE

PERMEABLE BASE

- A. Place permeable base materials in layers not more than 6 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
 - 1. Minimum nominal compacted thickness of base layer - 4 inches. Minimum nominal compacted to the topping stone layer – 2 inches.
- B. Place materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact permeable base materials to the following percentages of maximum dry unit weight according to ASTM D 1557:
 - 1. Crushed aggregate permeable base material shall be placed with adequate moisture content to prevent segregation of the particles during grading.
 - 2. Care shall be taken during placement and compaction of the crushed aggregate permeable base material in order to insure that the separation barrier is not torn punctured.
 - 3. Contractor to refer to compactions requirements as outlined in section 1.3 above.
- D. The finished elevations of the crushed aggregate permeable base shall meet all requirements as outlined in sections 1.3 and 1.4 above.

3.7 FIELD BOXES

- A. Install field boxes as required for all field appurtenances such as irrigation, quick coupler valves, electric outlets, etc. as specified elsewhere and as detailed.
- B. Backfill around field boxes with crushed aggregate permeable base material in lifts not to exceed 6 inches in loose depth and compact backfill using methods approved by the Geotechnical Engineer.
 - 1. Required compaction percentages around field boxes shall match requirements as outlines in section 1.3 above.

3.8 FIELD QUALITY CONTROL

- A. Proceed with subsequent work only once test results for previously completed work complies with requirements of section 1.3 and 1.4 above.
- B. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace materials to depth required; re-compact and retest until specified compaction is obtained.
- C. Areas that exhibit segregation of the crushed aggregate permeable base material shall be removed and replaced with properly moisture conditioned crushed aggregate permeable base material, compacted, and graded to the tolerances noted in this specification.

3.9 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep area free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, contaminated, or where they lose compaction due to subsequent construction operations or weather conditions.

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Keesler AFB.

END OF SECTION

SECTION 32 18 16.16

ARTIFICIAL GRASS – SLIT-FILM 2.25”

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish all labor, materials, tools and equipment necessary to install slit-film artificial grass as indicated on the plans and as specified herein; including components and accessories required for a complete installation. including but not limited to
 - 1. Acceptance of prepared sub-base.
 - 2. Coordination with related trades to ensure a complete, integrated, and timely installation: Aggregate base course, sub-base material (tested for permeability), grading and compacting, piping and drain components (when required); as provided under its respective trade section.

1.2 RELATED SECTIONS

- A. Section 00 0000 - Site Preparation
- B. Section 31 23 00 – Excavation and Fill
- C. Section 31 23 16 – Excavation
- D. Section Series 31 23 23 - Fill
- E. Section 31 23 23.13 - Backfill
- F. Section Series 32 13 23 - Aggregate Base Courses
- G. Section 12 93 00 - Site Furnishings

1.3 REFERENCE STANDARDS

- A. FM Factory Mutual
 - 1. P7825 - Approval Guide; Factory Mutual Research Corporation; current edition
- B. ASTM – American Society for Testing and Materials.
 - 1. D1577 - Standard Test Method for Linear Density of Textile Fiber
 - 2. D5848 - Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Covering
 - 3. D1338 - Standard Test Method for Tuft Bind of Pile Yarn Floor Covering
 - 4. D1682 - Standard Method of Test for Breaking Load and Elongation of Textile Fabrics
 - 5. D5034 - Standard Test Method of Breaking Strength and Elongation of Textile Fabrics (Grab Test)
 - 6. F1015 - Standard Test Method for Relative Abrasiveness of Synthetic Turf Playing Surfaces
 - 7. D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity
 - 8. D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor

Covering Materials

9. F355 - Standard Test Method for Shock-Absorbing Properties of Playing Surfaces.
10. F1936 - Standard Test Method for Shock-Absorbing Properties of North American Football Field Playing Systems as Measured in the Field

1.4 SUBMITTALS

- A. Substitutions: Other products are acceptable if in compliance with all requirements of these specifications. Submit alternate products to Architect for approval prior to installation in accordance Section 01 25 13, Product Substitution Procedures.
 1. Provide substantiation that proposed system does not violate any other manufacturer's patents, patents allowed or patents pending.
 2. Provide a sample copy of insured, non-prorated warranty and insurance policy information.
- B. Comply with Section 01 33 00, Submittals Procedures. Submit for approval prior to fabrication.
- C. Shop Drawings:
 1. Indicate field layout; field marking plan and details for the specified sports; i.e., NCAA Football; roll/seaming layout; methods of attachment, field openings and perimeter conditions.
 2. Show installation methods and construction indicating field verified conditions, clearances, measurements, terminations, drainage.
 3. Provide joint submission with related trades when requested by Architect.
- D. Product Data:
 1. Submit manufacturer's catalog cuts, material safety data sheets (MSDS), brochures, specifications; preparation and installation instructions and recommendations; storage, handling requirements and recommendations.
 2. Submit fiber manufacturer's name, type of fiber and composition of fiber.
 3. Submit data in sufficient detail to indicate compliance with the contract documents.
 4. Submit manufacturer's instructions for installation.
 5. Submit manufacturer's instructions for maintenance for the proper care and preventative maintenance of the synthetic turf system, including painting and markings.
- E. Product Certification:
 1. Submit manufacturer's certification that products and materials comply with requirements of the specifications.
 2. Submit test results indicating compliance with Reference Standards.
- F. Project Record Documents: Record actual locations of seams, drains and other pertinent information in accordance with Specifications and General Requirements.
- G. List of existing installations: Submit list including respective Owner's representative and telephone number.
- H. Warranties: Submit warranty and ensure that forms have been completed in government's name and registered with approved manufacturer.

- I. Submit Bills of Lading/Material Delivery Receipts for synthetic turf infill materials. Bills of lading shall bear the name of the project/delivery address, quantity of materials delivered, source/location of origin of infill materials and/or manufacturer, and date of delivery.
- J. Testing Certification: Submit certified copies of independent (third-party) laboratory reports on ASTM testing:
 - 1. Pile Height, Face Weight & Total Fabric Weight, ASTM D5848.
 - 2. Primary & Secondary Backing Weights, ASTM D5848.
 - 3. Tuft Bind, ASTM D1335.
 - 4. Grab Tear Strength, ASTM D1682 or D5034.
 - 5. Water Permeability, ASTM D4491
- K. The Turf Vendor shall submit a document holding the Government 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 Vendor or others associated and with any patents or 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.

1.5 QUALITY ASSURANCE

- A. Comply with Section 01 43 00, Quality Assurance.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section. The turf contractor and/or the turf manufacturer:
 - 1. Shall be experienced in the manufacture and installation of slit-film grass turf for a minimum of three years. This includes use of a slit-film fiber, and the installation method.
 - 2. Shall have 100 fields in play for at least two years. Fields shall be 65,000 ft² or more.
 - 3. Turf manufacturer shall have installed a minimum of 5 fields that are at least 8 years old, which is equal to the respective warranty period.
 - 4. Shall have a minimum of 100 installations in North America with a slit-film fiber, each field of 65,000 ft² or more.
- C. Installer: Company shall specialize in performing the work of this section. The Contractor shall provide competent workmen skilled in this specific type of synthetic grass installation.
 - 1. The designated Supervisory Personnel on the project shall be certified, in writing by the turf manufacturer, as competent in the installation of specified slit-film material, including sewing seams and proper installation of the infill mixture.
 - 2. Installer shall be certified by the manufacturer and licensed.
 - 3. The installer supervisor shall have a minimum of 5 years' experience as either a construction manager or a supervisor of synthetic turf installations
- D. Pre-Installation Conference: Conduct conference at project site at time to be determined by Architect. Review methods and procedures related to installation including, but not limited

to, the following:

1. Inspect and discuss existing conditions and preparatory work performed under other contracts.
 2. In addition to the Contractor and the installer, arrange for the attendance of installers affected by the Work, and the contracting officer.
- E. The Contractor shall verify special conditions required for the installation of the system.
- F. The Contractor shall notify the Architect of any discrepancies.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Section 01 60 00, Product Requirements.
- B. Prevent contact with materials that may cause dysfunction.
- C. Deliver and store components with labels intact and legible.
- D. Store materials/components in a safe place, under cover, and elevated above grade.
- E. Protect from damage during delivery, storage, handling and installation. Protect from damage by other trades.
- F. Inspect all delivered materials and products to ensure they are undamaged and in good condition.

1.7 SEQUENCING AND SCHEDULING

- A. Coordinate the Work with installation of work of related trades as the Work proceeds.
- B. Sequence the Work in order to prevent deterioration of installed system.

1.8 WARRANTY AND GUARANTEE

- A. See Section 01780 - Closeout Submittals, For Additional Warranty Requirements.
- B. The Contractor shall provide a warranty to the contracting officer that covers defects in materials and workmanship of the turf for a period of eight (8) years from the date of substantial completion. The turf manufacturer must verify that their representative has inspected the installation and that the work conforms to the manufacturer's requirements. The manufacturer's warranty shall include general wear and damage caused from UV degradation. The warranty shall specifically exclude vandalism, and acts of God beyond the control of the government or the manufacturer. The warranty shall be fully third party insured; prepaid for the entire 8 year term and be non-prorated. The Contractor shall provide a warranty to the government that covers defects in the installation workmanship, and further warrant that the installation was done in accordance with both the manufacturer's recommendations and any written directives of the manufacturer's representative. Prior to final payment for the synthetic turf, the Contractor shall submit to the contracting officer notification in writing that the field is officially added to the annual policy coverage, guaranteeing the warranty to the government. The insurance policy must be underwritten by an "AM Best" A rated carrier and must reflect the following values:
- Pre-Paid 8-year insured warranty from a single source.

- Maximum per claim coverage amount of \$33,000,000.
- Minimum of thirty-three million dollars (\$33,000,000) annual.
- Must cover full 100% replacement value of total square footage installed, minimum of \$7.00 per sq ft. (in case of complete product failure, which will include removal and disposal of the existing surface)
- Provide a sample copy of insured, non-prorated warranty and insurance policy information.
- Policy cannot include any form of deductible to be paid by the government.

C. The artificial grass system must maintain a G-max of less than 200 for the life of the Warranty as per ASTM F1936

1.9 MAINTENANCE SERVICE

- Contractor shall train the facility maintenance staff in the use of the turf manufacturer's recommended maintenance equipment.
- Manufacturer must provide maintenance guidelines to the facility maintenance staff.

PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS

- Approved products are as follows:
 - FieldTurf USA
175 N. Industrial Blvd
Calhoun, GA 30701
P: 800-724-2969
Model: FieldTurf XT-57

*****Equals shall accepted upon approval by the contracting officer prior to installation. Equals must match performance and composition to the product listed*****

2.2 MATERIALS AND PRODUCTS

- Artificial grass system materials shall consist of the following:
 - Carpet made of slit-film polyethylene fibers tufted into a perforated backing.
 - Infill: Graded sand and ambient rubber that partially covers the carpet.
 - Glue, thread, paint, seaming fabric and other materials used to install and mark the artificial grass slit-film turf.
- The installed artificial grass slit-film turf shall have the following properties:

<u>Standard</u>	<u>Property</u>	<u>Specification</u>
ASTM D1577	Fiber Denier	10,800+
ASTM D3218	Tape Thickness	130+ Microns

ASTM D5823	Min. Pile Height	2 ¼"
ASTM D5793	Stitch Gauge	1/2" – 3/4"
ASTM D5848	Pile Weight	33+oz/square yard
ASTM D5848	Primary Backing	7+oz/square yard
ASTM D5848	Secondary Backing	16+oz/square yard
ASTM D5848	Total Weight	56+oz/square yard
ASTM D1335	Tuft Bind (Without Infill)	8+ lbs
ASTM D5034	Grab Tear (Width)	>200 lbs/force
ASTM D5034	Grab Tear (Length)	>200 lbs/force
ASTM D4491	Carpet Permeability	>40 inches/hour
ASTM F1936	Impact Attenuation (Gmax)	<200
	Min. Infill Material Depth	1.5 inches
	Minimum Sand Infill	3lbs/sq.ft
	Minimum SBR Rubber Infill	3lbs/sq.ft
	Total Product Weight	920+oz/sq. yard

Variation of +/- 5% on above listed properties is within normal manufacturing tolerances

- C. Carpet shall consist of slit-film fibers tufted into a primary backing with a secondary backing.
- D. Carpet Rolls shall be 15' wide rolls.
 1. Rolls shall be long enough to go from field sideline to sideline.
 2. Where the playing field is for football, the perimeter white line shall be tufted into the individual sideline rolls.
- E. Backing:
 1. Primary backing shall be a minimum double-layered polypropylene fabric.
 2. Secondary backing shall permanently lock the fiber tufts in place.
 3. Perforated (with punched holes), backed carpet are acceptable.
- F. Fiber shall be measuring no less than 2 ¼ inches high.
 1. Systems with less than a 2 ¼ inch fibers are unacceptable.
- G. Infill materials shall be approved by the manufacturer.
 1. The infill shall consist of a resilient-layered, granular system, comprising selected graded sand and ambient rubber.
- H. The sand infill will comply within the following characteristics:
 - Average Particle size between 20 and 30 mesh [calculated based on summing the midpoint of sieve pan fractions times the % retained on given screen fractions]
 - Average Particle shape > 0.4 on the Krumbein scale
 - Particle structure predominantly single grain
 - Produce < 0.4%, -50M in API crush test at 80psig
- I. Non-tufted or inlaid lines and markings shall be painted with paint approved by the synthetic turf manufacturer.
- J. Thread for sewing seams of turf shall be as recommended by the synthetic turf manufacturer.

- K. Glue and seaming fabric for inlaying lines and markings shall be as recommended by the synthetic turf manufacturer

2.3 QUALITY CONTROL IN MANUFACTURING

- A. The manufacturer shall own and operate its own manufacturing plant in North America. Both tufting of the field fibers into the backing materials and coating of the turf system must be done in-house by the turf manufacturer. Outsourcing of either is unacceptable.
- B. The manufacturer's full-time in-house certified inspectors shall perform pre-tufting fiber testing on tensile strength, elongation, tenacity, denier, shrinkage, and twist i.e., turns per inch, upon receipt of fiber spools from fiber manufacturer.
- C. The manufacturer shall have its own, in-house laboratory where samples of turf are retained and analyzed, based on standard industry tests, performed by full-time, in-house, certified inspectors.

2.4 FIELD GROOMER & SWEEPER

Supply field groomer as part of the work.

- 1. Field Groomer and Sweeper shall include a towing attachments compatible with a field utility vehicle. Both shall be approved by the turf manufacturer for use on the provided product.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that all sub-base leveling is complete prior to installation.
- B. Installer shall examine the surface to receive the synthetic turf and accept the sub-base planarity in writing prior to the beginning of installation.
 - 1. Acceptance is dependent upon the contractor provided third party test results indicating compaction and planarity are in compliance with manufacturer's specifications.
 - 2. The surface shall be accepted by Installer as "clean" as installation commences and shall be maintained in that condition throughout the process.
- C. Compaction of the aggregate base shall be 95%, in accordance with ASTM D1557 (Modified Proctor procedure); and the surface tolerance shall not exceed 0-1/4 inch over 10 feet and 0-1/2" from design grade.
- D. Correct conditions detrimental to timely and proper completion of Work.
- E. Do not proceed until unsatisfactory conditions are corrected.
- F. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

- A. Prior to the beginning of installation, inspect the sub-base for tolerance to grade.

- B. Sub-base acceptance shall be subject to receipt of test results (by others) for compaction and planarity that sub-base is in compliance with manufacturer's specifications and recommendations.
- C. Dimensions of the field and locations for markings shall be measured by a registered surveyor to verify conformity to the specifications and applicable standards. A record of the finished field as-built measurements shall be made.
- D. When requested by Architect, installed sub-base shall be tested for porosity prior to the installation of the slit-film turf. A sub base that drains poorly is an unacceptable substrate

3.3 INSTALLATION - GENERAL

- A. The installation shall be performed in full compliance with approved Shop Drawings.
- B. Only trained technicians, skilled in the installation of athletic caliber synthetic turf systems working under the direct supervision of the approved installer supervisors, shall undertake any cutting, sewing, gluing, shearing, top-dressing or brushing operations.
- C. The designated Supervisory personnel on the project must be certified, in writing by the turf manufacturer, as competent in the installation of this material, including sewing seams and proper installation of the Infill mixture.
- D. Designs, markings, layouts, and materials shall conform to all currently applicable National Collegiate Athletic Association rules, NFHS rules, and/or other rules or standards that may apply to this type of synthetic grass installation. Designs, markings and layouts shall first be approved by the contracting officer in the form of final shop drawings. All markings will be in full compliance with final shop drawings.

3.4 INSTALLATION

- A. Install at location(s) indicated, to comply with final shop drawings, manufacturers'/installer's instructions.
- B. The Contractor shall strictly adhere to specified procedures. Any variance from these requirements shall be provided in writing, by the manufacturer's on-site representative, and submitted to the contracting officer, verifying that the changes do not in any way affect the Warranty. Infill materials shall be approved by the manufacturer and installed in accordance with the manufacturer's standard procedures.
- C. Carpet rolls shall be installed directly over the properly prepared aggregate base. Extreme care shall be taken to avoid disturbing the aggregate base, both in regard to compaction and planarity.
 - 1. Repair and properly compact any disturbed areas of the aggregate base as recommended by manufacturer.
- D. Full width rolls shall be laid out across the field.
 - 1. Turf shall be of sufficient length to permit full cross-field installation from sideline to sideline.
 - 2. No cross seams will be allowed in the main playing area between the sidelines.
 - 3. Each roll shall be attached to the next roll utilizing standard state-of-the- art sewing procedures.

4. When all of the rolls of the playing surface have been installed, the sideline areas shall be installed at right angles to the playing surface.
- E. Artificial turf panel seams shall be sewn. Other than extension inlays, seams secured by other means including gluing are unacceptable. Installation shall be 99% sewn.
 1. Minimum gluing will only be permitted to repair problem areas, corner completions, and to cut in any logos or inlaid lines as required by the specifications.
 2. Seams shall be flat, tight, and permanent with no separation or fraying.
 3. In the case of all lines and logos, turf carpet must be sheared to the backing (do not cut the backing) and adhered using hot melt adhesives.
- F. Infill Materials:
 1. Infill materials shall be applied in numerous thin lifts. The turf shall be brushed as the mixture is applied. The infill material shall be installed to a depth determined by the manufacturer.
 2. Infill materials shall be installed to fill the voids between the fibers and allow the fibers to remain vertical and non-directional. The Infill installation consists of a base layer of sand followed by a final application of specifically sized rubber that completes the system. The Infill shall be installed to the depth of minimum 1.5”.
- G. Non-tufted or inlaid lines and markings shall be painted in accordance with turf and paint manufacturers’ recommendations. Number of applications will be dependent upon installation and field conditions.
- H. Synthetic turf shall be attached to the perimeter edge detail in accordance with the manufacturers’ standard procedures.
- I. Upon completion of installation, the finished field shall be inspected by the installation crew and an installation supervisor.

3.5 FIELD MARKINGS

- A. Field markings shall be installed in accordance with approved shop drawings. If football is designated as the primary sport, all five yard lines will be tufted-in.
- B. Balance of sports markings will be inlaid or painted in accordance with the Drawings.
- C. Center field logo shall be either painted or inlaid according to artwork indicated on Drawings and in accordance with manufacturer’s standard palette of turf colors.
- D. End-zone letters and logos shall be either painted, or inlaid according to artwork and fonts indicated on the Drawings, and in accordance with manufacturer’s standard palette of turf colors.

3.6 ADJUSTMENT AND CLEANING

- A. Do not permit traffic over unprotected surface.
- B. Contractor shall provide the labor, supplies, and equipment as necessary for final cleaning of surfaces and installed items.

- C. All usable remnants of new material shall become the property of the government.
- D. The Contractor shall keep the area clean throughout the project and clear of debris.
- E. Surfaces, recesses, enclosures, and related spaces shall be cleaned as necessary to leave the work area in a clean, immaculate condition ready for immediate occupancy and use by the government.

3.7 PROTECTION

- A. Protect installation throughout construction process until date of final completion.