

Section 32 18 13
SYNTHETIC GRASS SURFACING

ADDENDUM 2 – January 17, 2019

The following specification sections have been modified:

- 1.4 QUALITY ASSURANCE
- 2.1 MATERIALS AND PRODUCTS

ADDENDUM 3 – January 22, 2019

The following specification sections have been modified:

- 1.3.1 SHOCK PAD SUBMITTALS
- 2.1 MATERIALS AND PRODUCTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish all labor, materials, tools and equipment necessary to install slit-film artificial grass turf 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, cast-in-place concrete curb, piping and drain components as provided under its respective trade section.

1.2 REFERENCE STANDARDS

- A. FM Factory Mutual
P7825 - Approval Guide; Factory Mutual Research Corporation; current edition
- B. ASTM – American Society for Testing and Materials.
D1577 - Standard Test Method for Linear Density of Textile Fiber
D5848 - Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Covering
D1338 - Standard Test Method for Tuft Bind of Pile Yarn Floor Covering
D1682 - Standard Method of Test for Breaking Load and Elongation of Textile Fabrics
D5034 - Standard Test Method of Breaking Strength and Elongation of Textile Fabrics (Grab Test)
F1015 - Standard Test Method for Relative Abrasiveness of Synthetic Turf Playing Surfaces
D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity
D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials
F355 - Standard Test Method for Shock-Absorbing Properties of Playing Surfaces.
F1936 - Standard Test Method for Shock-Absorbing Properties of North American Football Field Playing Systems as Measured in the Field
D1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Indicate field layout; field marking plan and details for the specified sports; i.e., Football, Soccer, and Lacrosse Field markings with outside dimensions as indicated on Project Drawings; 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.
- B. 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.
- C. Samples:
 - 1. Submit samples, 6 x 6 inches, illustrating details of finished product in amounts as required by General Requirements, or as requested by Architect.
- D. 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.
- E. Project Record Documents: Record actual locations of seams, drains and other pertinent information in accordance with Division 1 Specifications Series, General Requirements.
- F. List of existing installations: Submit list including respective Owner's representative and telephone number.
- G. Warranties: Submit warranty and ensure that forms have been completed in Owner's name and registered with approved manufacturer.
- H. Testing data to the Owner to substantiate that the finished field meets the required shock attenuation, as per ASTM F1936.
- I. 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. Shock Attenuation, ASTM F1936.
 - 6. Water Permeability, ASTM D4491

1.3.1 SHOCK PAD SUBMITTALS

- A. Shop Drawings: Submit cross-sectional view showing product installation in relation to sub-base and synthetic turf (including edge attachment).
- B. Product Data: Submit 8" x 8" product sample and technical data sheet.
- C. Warranty: Submit copy of product 16-Year warranty coverage.
- D. Testing data:
 - 1. Submit listing of all applicable test data for compliance to specifications.
 - 2. All testing to be performed by independent sources following applicable ASTM or other internationally recognized standards and procedures.
- E. Installation:
 - 1. Submit copy of product installation instructions.
 - 2. Submit copy of turf installation recommendations.

1.4 QUALITY ASSURANCE

- A. Comply with Section "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 specified type of infilled slit-film synthetic grass system for a minimum of three years. This includes a slit-film fiber, backing, the backing coating, and the installation method.
 - 2. Shall have 100 slit-film fields in play for at least two years. Fields shall be 65,000 ft² or more
 - 3. Shall have a minimum of 100 fields that are at least 8 years old, which is equal to the respective warranty period, with the same infill system.
 - 4. The manufacturer must have ISO 9001, ISO 14001 and OHSAS 18001 certifications demonstrating its manufacturing efficiency with regards to quality, environment and safety management systems.
 - 5. Shall have a minimum of 25 installations in the State of MA.
- 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 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, The Owner's representative, and the Architect.
- E. The Contractor shall verify special conditions required for the installation of the system.
 - F. The Contractor shall notify the Architect of any discrepancies.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 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.

1.7 WARRANTY AND GUARANTEE

- The Contractor shall provide a warranty to the Owner 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.
 - Policy cannot include any form of deductible amount.
 - Sample policy must be provided at time of bid to prove that policy is in force. A letter from an agent or a sample Certificate of Insurance will not be acceptable.
- A. The artificial grass system must maintain a G-max of less than 200 for the life of the Warranty as per ASTM F1936.

1.8 MAINTENANCE SERVICE

- A. Contractor shall train the Owner's facility maintenance staff in the use of the turf manufacturer's recommended maintenance equipment.
- B. Manufacturer shall provide maintenance guidelines and a maintenance video to the facility maintenance staff.

PART 2 - PRODUCTS

2.1 MATERIALS AND PRODUCTS

- A. Synthetic grass surfacing system materials shall consist of the following:
1. Carpet made of slit-film polyethylene fibers with a thickness of 100 microns tufted into a fibrous, perforated backing.
 2. Min. 2" pile height
 3. Min. 40 oz/yd pile weight
 4. Infill: Controlled mixture of graded sand and rubber crumb that partially covers the carpet. Min. infill depth of 1-3/4"
 5. Minimum 5 pounds of infill per sq. ft. with a minimum of 3 pounds of rubber per sq. ft.
 6. Glue, thread seaming fabric and other materials used to install and mark the artificial grass slit-film turf.

- B. The installed artificial grass slit-film turf shall have the following properties:

Standard	Property	Specification
ASTM D1577	Fiber Denier	10,800
ASTM D2256	Yarn Breaking Strength	18 lbs
ASTM D3218	Tape Thickness	100 Microns
ASTM D5823	Pile Height	2"
ASTM D5793	Stitch Gauge	3/4"
ASTM D5848	Pile Weight	40 oz/square yard
ASTM D5848	Primary Backing	7oz/square yard
ASTM D5848	Secondary Backing	16+ oz/square yard
ASTM D5848	Total Weight	59oz/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 F355/F1936	Impact Attenuation (Gmax)	<200
	Infill Material Depth	1.75 inches
	Sand Infill Component	4 lbs/square foot
	SBR Rubber Infill Component	3 lbs/square foot
	Total Product Weight	1067oz/square yard

- 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 double-layered polypropylene fabric treated with UV inhibitors.
 2. Secondary backing shall consist of an application of porous, heat-activated

-
- urethane to permanently lock the fiber tufts in place.
3. Perforated (with punched holes), backed carpet are acceptable.
- F. Fiber shall be 10,800 denier, low friction, and UV-resistant fiber measuring not less than 2 inches high. Systems with less than a 2 inch fibers are unacceptable.
- G. Infill materials shall be approved by the manufacturer.
1. Infill shall consist of a resilient layered granular system, comprising selected and graded dust-free silica sand and SBR rubber crumb.
 2. The sand component of the infill must represent a minimum of 51% or more of the total infill, by weight.
- H. Thread for sewing seams of turf shall be as recommended by the synthetic turf manufacturer.
- I. Glue and seaming fabric for inlaying lines and markings shall be as recommended by the synthetic turf manufacturer.
- J. GENERAL BASE DESCRIPTION
1. The synthetic grass system shall have a permeable base as shown on the drawings.
- K. PREPARATION OF THE SOIL BED – IF REQUIRED
1. A soil test is required on the intended surface to be covered by the synthetic turf. These tests must provide the following information:
 - a. Permeability and/or hydraulic conductivity
 - b. Percolation rate
 - c. Moisture content at the time of the test
 - d. Sieve analysis and plasticity limits determination test
 - e. Depth to the water table
 - f. In situ compaction, estimated or measured
 - g. Any external features that could affect the drainage characteristics of the field. Surrounding slopes and conditions that could bring additional water to the field in question.
 - h. Verification of existing drainage shown on project drawings, including but not limited to, approximate location and condition of existing drainage structures, panel drains, & collector drains.
 - i. Pictures or video of the site on CD-ROM or portable storage device (thumb drive or similar).
 2. All topsoil, organic, and non-compactable materials shall be removed.
 3. The soil bed must have a minimum slope of 1% or more from east to west sides of the field.
 4. The soil bed must be compacted in both directions to attain the specified compaction rate which is 95% standard Proctor.
 5. The soil bed must be prepared to tolerances of not more than 1/4" in 10' from the nominal height to allow for even drainage.

6. A geotextile fabric is required to cover the soil bed.

L. CRUSHED STONE BASE – IF REQUIRED

1. The crushed stone shall be laid without damaging the soil bed. The specified stone or aggregate supplied must conform to the specifications. The finished crushed stone or aggregate base supplied must be stable and permeable.
2. The base shall be constructed in 2 or lifts of equal thickness. Each layer must be compacted in both directions to attain the specified compaction rate.
3. The finished crushed stone base shall be sloped 0.5% from east to west sides of the field or as specified.
4. The finished crushed stone base surface of the leveling course shall not vary from the specified grade by more than $\frac{1}{4}$ " in 10' when measured in any direction.

M. NAILER BOARD – IF REQUIRED

1. If required by manufacturer, a composite lumber nailer board shall be provided at the perimeter of the turf installation per the contract drawings.

N. FINISHING STONE – IF REQUIRED

1. The finishing stone shall be generally described as 3/8" minus material. The finishing stone shall be laid without damaging the crushed stone base. The specified stone or aggregate supplied must conform to the sieve analysis below. The finished finishing stone or aggregate base supplied must be stable and permeable.
2. The finishing stone layer must be compacted in both directions to attain the specified compaction rate.
3. The finished finishing stone shall be sloped to match existing grades and/or drainage conditions. Contractor to verify existing grades in field.
4. The finished finishing stone surface shall not vary from the specified grade by more than $\frac{1}{4}$ " in 10' when measured in any direction.

O. CRUSHED STONE AND FINISHING STONE SPECIFICATIONS

<u>Sieves</u>	<u>Base Stone</u>	<u>Finishing Stone</u>
3" or 75mm		
2" or 50mm	100	
1½" or 38mm	90-100	
1" or 25mm	75-100	
¾ or 19mm	65-95	
½" or 12.5mm	55-85	100
3/8" or 9.5mm	40-75	85-100
¼" or 6.3mm	25-65	75-100

US #4 or 4.75mm	15-60	60-90
US #8 or 2.36mm	0-40	35-75
US #16 or 1.18mm	0-20	10-55
US #30 or 600mm	0-7	0-40
US #60 or 250mm	0-5	0-15
US #100 or 150mm	0-3	0-8
US #200 or 75mm	0-2	0-2

P. PANEL DRAINS – IF REQUIRED

1. Contractor to verify existing drainage as shown on project plans. If replacement is needed, panel drains shall meet the following conditions:
2. Panel drain shall be 12" oblong corrugated pipe for use in subsurface drainage applications.
3. Panel drain shall meet ASTM D7001 and have outside dimensions of 1.5" wide by 13" tall.
4. Panel drain shall have internal bracing adjoining each long wall to prevent crushing under typical loading.
5. All panel drain pipe and fittings shall be made of polyethylene with a minimum cell classification of 424420C as defined and described in ASTM D3350.
6. Panel drain shall be laid flat on geotextile over prepared subgrade and covered with crushed stone base.
7. Panel drain shall tie into existing collector drains as shown on the project drawings.

Q. FINAL GRADE

1. The final grade aggregate layer shall not be more than 2" thick.
2. The final grade material must be sloped 0.5% from east to west sides of the field unless otherwise specified.
3. The final grade must be compacted in both directions according to the specifications.

R. FIELD GROOMER & SWEEPER

1. Supply field groomer as part of the work.
2. Field Groomer shall include a towing attachment compatible with a field utility vehicle.

S. SHOCK PAD

1. Shock pad under turf system shall be 14 mm and shall be approved by the turf manufacturer and Owner.
2. Shock pad shall be 14 mm. thick expanded polypropylene designed for athletic fields. Material thickness shall be based upon product thickness needed in order to meet the system performance requirements.
3. Gmax shall be between 75-135 throughout warranty period and must not exceed 135 for the life of the turf/infill/pad system.
4. HIC not to exceed 1000 for full turf system from a 1.4m drop height.
5. System must meet minimum critical fall height of 1.4m at installation per IRB Reg 22 and One Turf Concept with specified turf system.

6. Product shall drain at greater than 300 inches per hour.
7. Product shall come as interlocking panels. Products that come in rolls are not acceptable.
8. Warranty shall be 16 years or more and cover the cost to replace or repair the turf in affected area in the event of product failure. Warranty must guarantee the turf/pad system not to exceed 135 Gmax for the life of the turf with no less than 1" of infill.
9. Product shall be 100% closed loop recycled. Recycling for energy not acceptable - Downcycling product is not acceptable.
10. When tested with the Deltec field tester, vertical deformation must remain between 7-11mm.
11. Supplier must provide documentation that product meets human health screening levels and total threshold limit concentration using EPA Method 3052 and Title 22(CAM17) metals using EPA Method 6020/7471A and for hexavalent chromium using EPA Method 7196A.
12. Manufacturer must prove absence of heavy metals in production material, and a controlled chain of custody for all materials used.
13. All material used in the artificial system must meet environmental and human health standards established in this specification. Documentation of chain of custody for materials may be required.
14. Product must be of a homogeneous material composition. Variable material content will not be accepted.
15. Product must be made in the USA.

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 Owner's 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, topdressing 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 Architect or Owner 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 Architect and/or Owner, 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 along the selvedge edging flap of the turf roll.

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, turf carpet field fibers 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. Two-layered infill shall be installed in a systematic order.
3. 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 SBR rubber. The Infill shall be installed to the depth of 1 ¾". Infill density shall consist of 4 pounds of sand and 3 pounds of rubber per square foot. The Infill shall be placed so that there is a void of ¾" to the top of the fibers.

G. Synthetic turf shall be attached to the perimeter edge detail in accordance with the manufacturer's standard procedures.

H. Upon completion of installation, the finished field shall be inspected by the installation crew and an installation supervisor, and certified in writing by the installer as conforming to the contract documents.

3.5 FIELD MARKINGS

- A. Field markings shall be installed in accordance with approved shop drawings. Football is designated as the primary sport, and all five yard lines will be tufted-in.
- B. Balance of sports markings will be inlaid in accordance with the Drawings.

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 Owner.
- 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 Owner.

3.7 PROTECTION

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

END OF SECTION