**ADDENDUM A**
**10/20/2025**

**RE:** **Buena Park School District**
**Mabel L. Pendleton Elementary School – New Soccer Field**
**DSA File Number: 30-4**
**DSA Application Number: 04-124678**
**Studio W Project Number: 25030**

From: Studio W Associates
424 32nd Street
Suite D&E
Newport Beach, CA 92663

To: Prospective Bidders

This Addendum forms a part of the Contract Documents and modifies the original bidding documents dated 09/15/2025 as noted below. Acknowledge receipt of this Addendum, failure to do so may subject Bidder to disqualification.

**The following drawings are attached and contain changes or clarifications and shall be made part of the Bid Documents taken into consideration when submitting bids.**

**Specifications:**

| | |
|---|---|
| 321825 | SYNTHETIC FIELD SPORT SURFACING<br>Updated this section, attached. |

**Specifications: (Specifications noted with Addendum A and dated 10/20/2025)**

END OF ADDENDUM

Distribution:
(1) Buena Park School District
(1) Studio W Project File 25030, 6.0 Bid

Note: It is incumbent upon the Prime Bidder to notify his subcontractor and/or materials supplier of the above changes in the Contract Documents.

For: Buena Park School District
6865 Orangethorpe Ave.
Buena Park, CA 92660

Studio W Architects
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Brian P. Whitmore, President C30345

# SECTION 321825 - SYNTHETIC FIELD SPORT SURFACING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes: Synthetic turf system consisting of OWNER´s approved turf components, yarns, backings, infill, drainage pad, and geotextile liner or geotextile drainage fabric.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 4524 - Environmental Import/Export Materials Testing.
3. Section 11 6500 – Athletic Equipment.
4. Section 31 2200 - Grading.
5. Section 31 2333 - Excavation and Fill for Synthetic Play Fields.
6. Section 32 1313 - Site Concrete Work.
7. Section 32 8413 - Potable Water Irrigation.
8. Section 33 4000 - Storm Drainage Utilities.

### 1.2 REFERENCES

A. ASTM International:

1. ASTM C1444 – Standard Test Method for Measuring the Angle of Repose of Free-Flowing Mold Powders.
2. ASTM D395 - ASTM D3575 – Standard Test Methods for Rubber Property Compression Set.
3. ASTM D751 - Standard Test Methods for Coated Fabrics.
4. ASTM D1335 - Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings.
5. ASTM D1577 – Standard Test Methods for Linear density of Textile Fibers.
6. ASTM D1682 – Standard Methods of Test for Breaking Load and Elongation of Textile Fabrics.
7. ASTM D2256 – Standard Test Method for Tensile Properties of Yarns by the Single-Strand Method.
8. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.
9. ASTM D3218 – Standard Specifications for Polyolefin Monofilaments.
10. ASTM D3786 – Standard Test Method for Bursting Strength of Textile Fabrics—Diaphragm Bursting Strength Tester Method.
11. ASTM D4355 – Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.

12. ASTM D4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
13. ASTM D4533 – Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
14. ASTM D4566 - Standard Test Methods for Electrical Performance Properties of Insulations and Jackets for Telecommunications Wire and Cable.
15. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
16. ASTM D4546 – Standard Test Methods for One-Dimensional Swell or Collapse of Soils.
17. ASTM D4716 - Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
18. ASTM D4751 – Standard Test Method for Determining Apparent Opening Size of a Geotextile.
19. ASTM D5034 - Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test).
20. ASTM D5261 - Standard Test Method for Measuring Mass per Unit Area of Geotextiles.
21. ASTM D5793 - Standard Test Method for Binding Sites per Unit Length or Width of Pile Yarn Floor Coverings.
22. ASTM D5823 – Standard Test Method for Tuft Height of Pile Floor Coverings.
23. ASTM D5848 - Standard Test Method for Mass per Unit Area of Pile Yarn Floor Coverings.
24. ASTM D6241 – Standard Test Method for Static Puncture Strength of Geotextiles and Geosynthetic-Related Products Using a 50 mm Probe.
25. ASTM D6918 – Standard Test Method for Testing Vertical Strip Drains in the Crimped Condition.
26. ASTM D7003 - Standard Test Method for Strip Tensile Properties of Reinforced Geomembranes.
27. ASTM D7004 - Standard Test Method for Grab Tensile Properties of Reinforced Geomembranes.
28. ASTM D7138 - Standard Test Method to Determine Melting Temperature of Synthetic Fibers.
29. ASTM E648 – Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
30. ASTM F355 - Standard Test Method for Impact Attenuation of Playing Surface Systems, Other Protective Sports Systems, and Materials used for Athletics, Recreation and Play.
31. ASTM F1015 – Standard Test Method for Relative Abrasiveness of Synthetic Turf Playing Surfaces.

32. ASTM F1551 - Standard Test Methods for Comprehensive Characterization of Synthetic Turf Playing Surfaces and Materials.

33. ASTM F1632 - Standard Test Methods for Particle Size Analysis and Sand Shape Grading of Golf Course Putting Green and Sports Field Rootzone Mixes.

34. ASTM F1815 - Standard Test Methods for Saturated Hydraulic Conductivity, Water Retention, Porosity and Bulk Density of Athletic Field Rootzones.

35. ASTM F1936 - Standard Specification for Impact Attenuation of Turf Playing Systems as Measured in the Field.

36. ASTM F2765 - Standard Specification for Total Lead Content in Synthetic Turf Fibers.

37. ASTM F2898 – Standard Test Method for Permeability of Synthetic Turf Sports Field Base Stone and Surface System by Non-Confined Area Flood Test Method.

38. ASTM F1951 – Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment.

B. FIFA (Federal International Football Association):

1. FIFA 01 - Vertical Ball Rebound (Laboratory and Field Testing Required).

2. FIFA 17 - Ball Roll, 1 (Laboratory Testing Required).

3. FIFA 04a - Shock Absorption. (Laboratory and Field Testing Required).

4. FIFA 05a - Vertical Deformation (Laboratory and Field Testing Required).

5. FIFA 06 - Rotational resistance (Laboratory and Field Testing Required).

C. Norms (EN Standards), International Organization for Standardization (ISO):

1. EN 933 – Tests for Geometrical Properties of Aggregates.

2. EN 14808 – Surfaces for Sport Areas – Determination of Shock Absorption.

3. EN 14809 – Surfaces for Sport Areas – Determination of Vertical Deformation.

4. EN 22768 - General Tolerances.

D. The California Office of Environmental Health Hazard Assessment (OEHHA):

1. Proposition 65: Safe Drinking Water and Toxic Enforcement Act of 1986.

E. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.

1.3 DEFINITIONS

A. Manufacturer: Company and/or manufacture that furnishes the complete synthetic turf system starting with and including final review and approval of the base, liner, pre-molded resilient drainage pad, carpet, inlaid and painted event markings, infill materials through and including final grooming and training. In the case of synthetic turf system Resellers or Rebranders, that obtain white label synthetic turf system products upon which they apply their label for installation from other Manufacturers, they are defined as the Manufacturer herein. Manufacturers shall meet requirements of Article 1.07, Quality Assurance.

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1.4 SYSTEM DESCRIPTION

A. Synthetic Field Sport Surfacing System shall meet the following requirements:

1. System shall consist of a combination approved by the turf manufacturer of synthetic turf, infill and pre-molded resilient drainage pad, geotextile liner or geotextile drainage fabric products specified in Part 2 of this Section. Synthetic field surfacing system shall have been successfully utilized on work of similar scope to that shown and specified for this Project.

2. System shall be warrantied in accordance with the provisions of Article 1.09, "Synthetic Turf Product and Performance Guarantees".

B. Environmental Requirements: Synthetic field sport surfacing components, drainage pad and infills shall be approved by the OWNER, and meet the technical requirements specified in this Section. Products will be tested by the OWNER upon arrival at the Project Site prior to installation for conformance to the CAM 17 Test Reports submitted by manufacturer and the Hazardous Waste Criteria and Human Health Screening Levels established by the OWNER. Refer to Article 1.06, "Substitution Procedures for 'or Equal" Products".

C. Performance Requirements:

1. Impact Attenuation: G-max shall be between 80 and 110 when installed and shall not exceed 165 for the length of the 8-year warranty at any one point on the field. G-max shall be tested at the completion of the installation by an independent laboratory approved by the OWNER and paid by the manufacturer. If initial g-max test result exceeds 110, the manufacturer shall take appropriate action to correct the g-max at his own expense. Proposed remedial work shall be submitted to OWNER for approval prior to execution.

2. Permeability: The system shall allow a minimum percolation rate of 25 inches per hour.

3. Surface Ball and Surface Player Performance: Synthetic turf field shall meet the performance characteristics listed below during the first year of installation.

a. FIFA 01 - Vertical Ball Rebound (Laboratory and Field Testing Required: 60 cm to 100 cm).

b. FIFA 17 - Ball Roll, 1 (Laboratory and Field Testing Required: 4 m to 10 m +/-15%).

c. FIFA 04a - Shock Absorption (Laboratory Testing Required: 55% to 70%).

d. FIFA 05a - Vertical Deformation (Laboratory and Field Testing Required: 4 mm to 11 mm).

e. FIFA 06 - Rotational resistance (Laboratory and Field Testing Required: 25 Nm to 50 Nm +/-10%).

1.5 SUBMITTALS

A. Conformance to OWNER's Approval: Products already approved by the OWNER do not require the submittal of Safety Data Sheets, Proposition 65 Statements or CAM 17 Test Reports unless there has been a change in the chemical formulation of the product, a change of name of the product or the manufacturer has changed.

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1. Submit List of the synthetic turf assembly components, per Appendix 'C', "List of OWNER Approved Synthetic Turf Components", for each type of fiber and each color used (monofilament, slit film and thatch), primary and secondary backings, drainage pad and infill materials, indicating the manufacturer and the product names. OAR to forward to the OWNER for review.
2. For products, yarn and infill colors that have not been reviewed and approved by the OWNER refer to Article 1.06, "Substitution Procedures for Or Equal Products".

B. Product Data: Submit manufacturer's technical data describing materials and installation procedures for each system component:

1. Turf and backing, including seaming tape, adhesives, inlaid and painted color data.
2. Pre-molded resilient drainage pad.
3. Resilient infill and sand.
4. Geotextile membrane.

C. Physical Properties Data:

1. Submit manufacturer's literature or test reports stating conformance to the synthetic turf physical properties specified in this Section.
2. Using the information submitted on the subparagraph above, complete Appendix 'D', Synthetic Turf Properties Comparison.

D. Shop Drawings: Submit details of construction noting proposed deviations from Contract Documents.

1. Seam layout plan of geotechnical liner showing head and side seams.
2. Synthetic turf seaming / roll layout plan.
3. Striping Plans: Provide layouts for the sports indicated on the drawings, showing field lines, markings and boundaries on the appropriate field. Provide details depicting priority on field markings and special treatment where markings of differing sports overlap or intersect. Where centerfield logo and end zone texts are indicated in the Construction Documents, provide details and indicate yarn colors.
4. Details for inserts, fixed equipment such as goal posts, covers, edge termination, utility vaults and other details required for a complete installation.

E. Sand/Infill Depth Calculation: Complete page 2 of Appendix 'B', Sand/Infill Depth Calculation, providing the following information:

1. Specific density of the proposed sand and infill materials.
2. Calculation of the proposed sand/infill ratio by weight and by volume illustrating conformance to the requirements of this Section.
3. Dimensioned section of the synthetic turf in full-scale or larger, showing turf fibers and thickness of sand and infill layers.
4. Clear fiber dimension over infill.
5. Percentage of the sand/infill depth in relation to the fiber height.

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F. Mock-up: Upon installation of the synthetic turf, and prior to broadcasting of the infill, provide one square yard mock-up at a location determined by the OAR. The mock-up shall illustrate the application of the infill to the depths established in the submitted calculations and will establish the standard of quality by which the Work will be judged.

G. Samples: Submit three sets of samples of the following items:

1. Full section sample of approximately 7-inch by 11-inch in clear presentation box depicting installed turf with infill over pre-molded resilient drainage pad. Assembled sample shall reflect the specified system components.
2. Colored turf for inlays, three samples.
3. Fiber samples, three of each color and type.
4. Separate pre-molded resilient drainage pad.
5. Separate synthetic turf rag showing fiber configuration, primary color, perforations or drainage method.
6. Infill materials, three 100 grams samples of each type.
7. Geotextile liner or geotextile drainage fabric.

H. Test Reports:

1. At installation completion submit g-max test report in conformance with ASTM F1936, refer to Article 3.09, “Field Performance Testing”. Field testing equipment shall conform to ASTM F355, Procedure A.
2. Submit copies of independent field testing as outlined in paragraph 1.04, C, 3.

I. Quality Assurance and Control Submittals:

1. The synthetic field surfacing manufacturer shall provide evidence indicating that the specified materials have been successfully utilized on work of similar scope to that shown and specified for this Project. The synthetic field surfacing system examples cited shall have been completed and in use for three years without any evidence of failure.
2. Manufacturer shall submit certification indicating that installer is approved or certified by the manufacturer to install their products, in conformance to Article 1.07, “Quality Assurance”.
3. Substrate Acceptability: Submit written statement issued by the synthetic field surfacing manufacturer and installer certifying the following: “We attest that all areas and surfaces designated to receive synthetic field surfacing have been inspected and found satisfactory for the reception of the Work covered under this Section; and not in conflict with “Warranty” requirements that may affect coverage. Application of synthetic field surfacing materials including liner/geotextile, pre-molded resilient drainage pad, and turf system will be construed as acceptance of finish graded base system. The inspection has included review of the finish base final compliance as-built, string-lining at 7.5 foot intervals in both directions, confirming corrections to finish stone surfaces, and providing and review of EN 22768 compliance evaluation.”
4. Statement of Supervision: Upon completion of the Work, submit a written statement signed by the synthetic field surfacing manufacturer certifying that the field supervision of the manufacturer’s representative was sufficient to insure

proper application of the materials, that the Work was installed in accordance with the manufacturer's instructions and Contract Documents, and that the installation meets the quality requirements of the manufacturer to perform as intended.

5. Statement of Design Suitability: Submit written statement, signed by synthetic field surfacing manufacturer and installer certifying the following: "The Construction Documents have been thoroughly reviewed and the details and the materials used in the base system, compaction and installation tolerances are compatible with the intended use."

6. Warranty Samples: Submit in conformance to Article 1.09, "Synthetic Turf Product and Performance Guarantees", and to Appendix 'A'.

   a. Sample warranty from field sport surfacing manufacturer.

J. Sample maintenance manual and maintenance check lists outlining typical maintenance schedule.

K. Statement of review of included maintenance equipment and a listing, if any, of additional maintenance equipment that may be needed.

L. Warranty Final Approved Document: Submit as part of the Closeout Submittal the Manufacturer's Warranty assigned to the OWNER.

M. Closeout Submittals: Submit Closeout Manual including all submitted product data, test data, product contact information, all associated warranties, required certifications and letter of approval, manufacturer's maintenance manuals for the proper care of the synthetic turf system, a recommended maintenance check list and all record post construction testing.

N. Post Installation Test Report Submittals:

1. Submit g-max testing report during each year of the life of the Warranty for conformance to Impact Absorbency, as indicated on Article 3.09, "Field Performance Testing".

2. Submit test report during the first year after turf installation for conformance to Surface Ball and Surface Player Performance requirements, as indicated on Article 3.09 "Field Performance Testing". In no case shall the Surface Ball and Surface Player Performance testing be done during the first three months of use.

## 1.6 SUBSTITUTION PROCEDURES FOR 'OR EQUAL" PRODUCTS

A. Substitutions for the synthetic field sport surfacing turf system, pre-molded resilient drainage pads or infill requested on an "or equal" basis shall be submitted for OWNER´s review within the time limitation stated in Division 00, Procurement and Contracting Requirements.

B. Substitution requests for "Or Equal" products shall be submitted as a complete package, and shall include the information requested under Article 1.05, "Submittals", and the information for chemical evaluation indicated on paragraphs below. Incomplete substitutions will be rejected.

C. Submit for chemical evaluation by the OWNER the information listed below for each type and color of synthetic turf yarns, primary and secondary backings, pre-molded resilient drainage pads and infill. Submittals shall be complete, partial submittals are not acceptable. Manufacturer and product names shall match exactly on each document submitted for review.

1. CAM 17 Test Reports from an accredited laboratory for the synthetic field sport surfacing turf system components; pre-molded resilient drainage pad and infill, as applicable. CAM 17 testing shall be per EPA Method 6020 ICP/MS and shall clearly indicate the manufacturer and product names. Test reports shall be in mg/kg units. Submit all pages of test reports, including chain of custody. The CAM 17 test report and the chain of custody documents shall clearly mention explicitly the name of the product being reviewed, which should be the same as listed in the Safety Data Sheet (SDS), even if the lab also uses an internal reference number. The lab dates need to be consecutive and logical i.e., date sampled, date received, date of the refrigerator inspection, etc. CAM 17 metal test results to be indicated on the test report are Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium, Silver, Thallium, Vanadium, Zinc. The OWNER will review the test results for risk-based screening levels (RBSL), See Appendix 'E'.

2. Safety Data Sheet (SDS) of the synthetic field sport surfacing turf components; pre-molded resilient drainage pad and infill, as applicable. SDS shall clearly indicate the SDS date, the product name, manufacturer and the Chemical Abstracts Service (CAS) for all the chemicals constituting the product indicating its percentage in the product. Total of CAS percentage shall add to one hundred percent. If the product manufacturer preference is not to disclose a proprietary component on the SDS, but on a separate document, the product manufacturer should contact the OWNER's to sign a non-disclosure agreement.

3. The product manufacturer shall indicate on the SDS or submit a letter on their letterhead, signed by a company official and indicating his/her title, listing the chemicals constituting the product that are found on the California Safe Drinking Water and Toxic Enforcement Act of 1986, Proposition 65. If there are no chemicals in the product that are listed on the Proposition 65, the statement should indicate this fact. For reference, the link to the Safe Drinking Water and Toxic Enforcement Act of 1986 list of chemicals is:

   http://www.oehha.ca.gov/prop65/prop65_list/Newlist.html

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Synthetic manufacturer shall have at least three years of continuous business under the same name (includes DBA) and or same organizational structure. Companies that have formed alliances and or business partnerships to comply with any of the synthetic turf manufacturer requirements listed here will not be accepted.

2. Synthetic turf manufacturer shall have at least sixty projects of equal scope in the past five years, with 20% being in a similar climate. These installations shall clearly show experience in football, soccer, or baseball, as applicable to this project. In defining systems as similar size and type both, synthetic and sand and synthetic infill systems, can be included as equal and interchangeable. Traditional type non-infill systems are not considered similar. Indoor installations are not considered similar. Fields with a gross area of less than that contained in this Project are not considered similar.

3. The synthetic turf manufacturer shall as a matter of standard practice install systems using their own employees as installation supervisor and installation

crews. In cases in which the synthetic turf manufacturer installs using licensed distributors or licensed installers both the turf supplier and the work by the installation company shall be covered by the manufacturer product warranty. In all cases, the manufacturer shall have an employee supervisor on site representing the manufacturer at key points, such as during the base inspection and anchor system installation. At minimum the Synthetic Turf Representative shall observe the condition of the anchor shelf, the top of the base, the fine graded topping stone, as-built and surface evenness testing, and the permeability testing in cases where the base provides system drainage.

B. Installer Qualifications:

1. Installer, if other than direct employees of the Manufacturer, shall be approved and certified by turf manufacturer to install their products.

2. Installer shall have at least three years of continuous business under the same name (includes DBA) and or same organizational structure.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver products in original unopened packaging with legible manufacturers' identification. All materials shall be stored in a dry place out of the direct sunlight and protected from damage and vandalism.

B. Bulk Materials: Deliver materials bulk materials in clean, washed and covered trucks to eliminate contamination during transportation. On site stockpiling locations shall be preapproved by OAR prior to deliveries. Stockpile only in areas free of debris and away from drainage routes. Cover materials with plastic or geotextile fabric if materials are to be stockpiled more than 48 hours.

C. Immediately upon delivery of materials to the Project Site, and prior to installation, CONTRACTOR shall inspect and verify the following:

1. Damaged or defective items.

2. Appropriate turf pile height and roll lengths.

3. Uniformity of perforations.

4. Arrival of adhesives in sealed, dry containers.

1.9 SYNTHETIC TURF PRODUCT AND PERFORMANCE GUARANTEES

A. Keep work in repair without expense to OWNER as far as it concerns defects in workmanship or materials for a period of not less than eight (8) years from date of Substantial Completion.

1. The Warranties covered under this Article shall be issued under the following structure:

a. In all cases the synthetic turf system Product Warranty shall be provided by the Manufacturer.

b. In cases in which the synthetic turf system is provided by a synthetic turf system Reseller/Rebrander or other similar business relationship, the Reseller or Rebrander Warranty shall be provided by the Reseller/Rebrander. In this case the Reseller/Rebrander shall carry a

Warranty from the Manufacturer of the white label product responsible for the manufacture of their systems.

c. Separate installation companies shall not serve as the manufacturer.

d. The Warrantees shall be assigned to the OWNER and delivered to the OWNER as part of the Closeout Manual.

B. Eight Year Synthetic Turf Manufacturer's Product and System Warranty:

1. Provide a manufacturer's 8 year product warranty for the synthetic turf system including carpet and infill materials and their installation.

2. The Premolded Resilient Drainage Pad Manufacture shall provide a separate Manufacturer's 20 year Product Warranty. The Synthetic Turf Manufacturer shall include the Premolded Resilient Drainage Pad Manufacturer's Warranty as part of their closeout documents.

3. Where the Infill Manufacture provides a separate Manufacturer's Product Warranty the Synthetic Turf Manufacturer shall include the Infill Manufacturer's Warranty as part of their closeout documents. If not, the infill warranty shall be the responsibility of the manufacturer.

4. Where the Geotextile/Liner Manufacture provides a separate Manufacturer's Product Warranty the Synthetic Turf Manufacturer shall include the Geotextile/Liner Manufacturer's Warranty as part of their closeout documents. If not the Geotextile/Liner warranty shall be the responsibility of the manufacturer.

5. This warranty shall include all materials and components of the finished system including the assembly of the carpet system, and components including yarn, fibers, backing materials, seaming tape, adhesives, sewing yarn, infill products, anchoring method.

6. The warranty shall be in writing and shall be signed by the synthetic turf field manufacturer.

7. Warranty shall include removal and replacement of materials as required to repair the synthetic field surfacing and or system at no cost to the OWNER. This includes any base system remediation created as a result of removal and replacement and full clean-up, disposal and finish work associated with any Warranty remediation effort.

8. The Warranty shall also cover fiber breakdown due to defects, poor quality components, premature wear, and fiber loss. Fibers specified herein shall be capable of providing useful service throughout the full period of the Warranty.

a. At the end of the Warranty period the fiber shall retain a minimum of 70% of the original fiber weight, fiber strength, and fiber height. Periods between the start of warranty coverage to the end of the warranty period shall be covered based on a relative prorated percentage of these values.

b. At the end of the Warranty period the exposed fiber above the infill shall have less than 50% fiber damage for spinneret and tape type fibers associated with wear. Wear shall include shortening of fiber due to breakage, shredding (excessive fibrillation), loss of fiber due to fiber pull-out, internal fiber separation along cross-sectional seams or edges, failure or fracture seams perpendicular to the length of the fiber, fiber threading

(change in cross-section to thread or hair like section), and UV degradation. Periods between the start of warranty coverage to the end of the warranty period shall be covered based on a relative prorated percentage of these values.

c. At the end of the Warranty period the exposed fiber above the infill shall have less than 50% fiber damage for slit-film type fibers associated with wear. Wear shall include shortening of fiber due to breakage, shredding (excessive fibrillation), loss of fiber due to fiber pull-out, internal fiber separation along cross-sectional seams or edges, failure or fracture seams perpendicular to the length of the fiber, fiber threading (change in cross-section to thread or hair like section), and UV degradation. Periods between the start of warranty coverage to the end of the warranty period shall be covered based on a relative prorated percentage of these values.

9. The warranty shall cover the backing system against non-wear related breakdown.

10. The warranty shall cover the infill materials against excessive breakdown of granulate material due to normal use. Over the life of the system the infill material shall retain 70% of its shape, size and resiliency. Periods between the start of warranty coverage to the end of the warranty period shall be covered based on a relative prorated percentage of these values. At no time during the life of the system shall the infill material exhibit cohesive or agglomerate behavior or shall it become permanently deformed.

11. This warranty shall include all components of the system in its coverage. The warranty shall not limit the types of sports and recreation activities or uses that would be typical of similar installations. Use such as band or other marching activities shall not limit the Warranty.

12. The field system shall be suitable for small vehicle loads and shall be covered by the Warranty for vehicle use methods as approved and directed by the manufacturer. The manufacturer shall provide instructional information for driving on the synthetic surface and include vehicle size and weight limitations.

C. Warranty repairs associated with meeting the ASTM F1936 g-max performance requirements shall be for full coverage of the repair necessary to bring the system into compliance regardless of the age of the installation.

D. Field Performance Testing:

1. G-max Testing: Starting with the completion of construction, CONTRACTOR shall retain a third-party certified testing laboratory and shall perform g-max testing and provide reports during each year of the life of the Warranty. The testing and reporting procedures for this testing shall meet the requirements of ASTM F1936 except that the number of tests and the locations shall comply with the requirements herein. Testing shall be performed locations as required under ASTM F1936 plus at the center field, at the goal locations for all sports, and at 10 yards inside the corners. This results in a total of 19 test locations per year. Testing shall consist of shock attenuation per ASTM F355 procedure A. Initial g-max shall be between 80 and 110. The g-max shall not change more than 10% at any one location per year over the life of the Warranty, however, at no time during the life of the warranty shall the g-max shall be 165 or greater. In cases where the results of the above testing exceed the specified values on the per year and maximum value, the condition shall be corrected by the synthetic surface manufacturer. The

synthetic surface manufacturer shall provide adequate confirmation testing to confirm that the mitigative measures were effective. At no time in the life of the Warranty shall the g-max be 165or greater at any one point on the field. Results of this testing shall be provided to the OWNER, ARCHITECT and other assigns each year after testing.

2. Surface Ball and Surface Player Performance Testing: During the first month of the year of use the field shall be tested for the following to assure that the delivered field meets industry accepted player surface and ball surface performance characteristics as defined in paragraph 1.04.C.3. Results of this testing shall be provided to the OWNER and ARCHITECT in the form of a post installation submittal. Where deviation from these values exists, the field shall be brought into compliance. Testing shall be completed at the ten (10) ASTM F1936 test points plus at the center field, at the goal locations for all sports, and at the 10 yards inside the corners. For performance values refer to Article 1.04 "System Description", paragraph, "Performance Requirements".

3. Infill Depth Measurements for Uniformity and Consistency: Prior to acceptance of the field by the ARCHITECT and OWNER, the infill depth shall be field measured by an independent testing's agency and recorded. The measurements shall be made at 5 yard intervals along the length of the field with five measurement points even spaced across the field. Measurements shall be made by depth gauge method and be to an accuracy of +/- 1 mm. The test point data shall be summarized in a report listing average depth and range. In cases where the average depth is outside of the indicted range the field shall be brought into compliance by the Manufacturer.

E. If non-compliant areas are located as part of the yearly assessment, the extent of these areas shall be determined by performing the above test towards each end zone and each sideline until tests meeting requirements are obtained. The point at which the results meet the requirements of this specification shall represent the limit of non-compliant turf and shall be remedied to be in-compliance with the requirements.

F. Testing shall be performed by a certified independent lab approved by the OWNER.

G. Provide a copy of the complete Policy for all warrantees, assigned to the OWNER, and insurances for the turf system. Letters from the CONTRACTOR or manufacturer are not adequate. The Policy shall clearly indicate type of policy and policy rating for the full eight years. The insured warranty shall fully cover the cost of turf replacement.

1.10 PATENT RIGHTS AND INFRINGEMENTS

A. Certain systems, materials, cross-sections, and installations methods may be protected by the U.S. Patent Office Law based on patents filed and obtained by manufacturers or vendors listed or not listed in this document. It is the responsibility of manufacturers to assure that the materials, cross-sections, and installations methods proposed for use on this project are not protected by existing patents or rights of others or licenses. It is the intent of these documents to promote the use of systems that fall within framework of non-patented or expired patents. It is the intent of the technical documents to specify a product not 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.

B. Manufacturers providing pricing of the Turf System as well as the Selected Manufacturer of the Turf System shall hold the OWNER and ARCHITECT 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 Others associated with any patents or infringement thereof.

C. Manufacturers providing pricing of the Turf System as well as the selected Manufacturer of the Turf System shall notify the OWNER and ARCHITECT in writing as to any knowledge relating to the infringement of existing patents or rights of others prior to the date of bidding. Such notice shall be specific, and directly and clearly outline the infringement and further outline the steps necessary to avoid any such infringement. Once any such infringement of existing patents, licenses or rights of others is brought to the attention of the ARCHITECT and OWNER, addendum documents will be issued to allow bidding to proceed without out conflict.

1.11 TRAINING

A. Training Instruction: Provide a four hour on-site training instructional program for the OWNER's maintenance staff for proper use of field maintenance equipment and proper long-term maintenance of synthetic turf system for warranty compliance. The training instruction shall be filmed and summarized on a flash drive included in the Close-out Documents. Training session shall be coordinated through the OAR.

a. Sweeper: Provide one SMG TCA 1400 Groomer-Sweeper with patented brush/sweeper/loosening tine design. Deliver to job site.

1.12 OWNER'S TEST AND INSPECTION

A. OWNER reserves the right to retain a third-party certified testing laboratory to perform CAM 17 testing of the synthetic turf, pre-molded resilient drainage pad and infill, as it is being manufactured and or prior to shipment to the Project Site. Products not passing the CAM 17 test will be rejected and shall not be shipped to the Project Site and shall be replaced with new products meeting the specifications at no cost to OWNER.

B. Upon delivery of synthetic turf surfacing materials, pre-molded resilient drainage pad and infill to the project site, the OWNER's representative will take samples for CAM 17 testing for assessment for Hazardous Waste Criteria and Human Health Screening Levels. Materials not meeting the levels established by the OWNER will be rejected and shall be removed from the site by the CONTRACTOR and replaced with new products meeting the specifications at no cost to OWNER.

C. Upon delivery of synthetic turf materials to the project site the project inspector or the OAR will inspect materials for conformance to Contract Documents. Inspection will include measuring of turf pile height, face weight, yarn thickness, thickness of rolls, tuft binds and turf row spacing. Products not meeting the specified physical properties will be rejected and shall be removed from the site by the CONTRACTOR and replaced with new products meeting the specifications at no cost to OWNER.

D. CONTRACTOR shall pay testing and inspecting costs of products found to be noncompliant.

E. CONTRACTOR shall be responsible for the delay associated with non-conforming materials and the related schedule impacts of his Work and adjacent Work of others.

PART 2 – PRODUCTS

2.1 GEOTEXTILE LINER

Addendum A

A. Geotextile liner for use above the compacted base and below the pre-molded resilient drainage pad shall be scrim reinforced high strength polyethylene film consisting of four-layer reinforced laminate. Outer layers shall consist of high-strength, polyethylene film manufactured using virgin grade resins and formulated with thermal and UV stabilizers, reinforced with 1000 denier scrim reinforcement laid in a diagonal 3/8" grid with an additional scrim at 3" on center in the machine direction with high strength polyethylene film laminated together with two molten layers of polyethylene.

| | | | |
|---|---|---|---|
| 1. | Profile thickness meeting all other performance characteristics | | 20 mil min |
| 2. | Color | | gray/black |
| 3. | Weight | | 74 pounds MSF |
| 4. | Tensile Strength (scrim break) | ASTM D7003 | 75lbf/in |
| 5. | Tensile Elongation at Break (scrim) | ASTM D7003 | 20% |
| 6. | Tensile Elongation at Break (film) | ASTM D7003 | 700% |
| 7. | Tensile Grab | ASTM D7004 | 114lbs. |
| 8. | Trapezoid Tear (diagonal) | ASTM D4566 | 70lbs. |
| 9. | Mullen Burst, | ASTM D751 | 120 psi |
| 10. | Puncture Resistance (CBR) | ASTM D6241 | 300 lb. |

B. Edge Adhesive: The liner system shall include edge and perforation adhesive material to properly adhere liner to the surrounding concrete shelves and concrete encasement.

C. Manufactured rolled goods of reinforced polyethylene shall be prefabricated into custom size panels specific to this project using thermal fusion seam welding. Factory seams shall be fully bonded across the scrim-to-scrim lapped area and shall be made so that the fusion bond extends to the top edge of the sheet. No flaps or loose edges shall be present on the top or bottom of the finished panel.

D. Manufacturers and Products:

1. DURA SKRIM.
2. Western Environmental Liner.
3. Hercutex.
4. Equal.

2.2 GEOTEXTILE DRAINAGE FABRIC

A. Geotextile Fabric: For use above the compacted base and below the pre-molded resilient drainage pad shall be needle-punched nonwoven fabric composed of polypropylene or polyester fibers and formed into a stable network. Fabric shall be resistant to biological degradation, chemicals, alkalis and acids naturally found in soils, and shall meet the requirements of AASHTO M 288, Class 3. Roll size shall be 15 feet by 360 feet.

1. Geotextile fabric shall meet the following Minimum Average Roll Values (MARV):
   a. Weight: 4.0 Oz/SY per ASTM D5261.

b. Grab Tensile Strength: Not less than 120 pounds per ASTM D4632.

c. CBR Puncture: 250 lbs. per ASTM D3786.

d. Trapezoidal Tear: 45 lbs. per ASTM D4533.

e. Flow Rate: Not less than 120 gal/min/ft2 per ASTM D4491.

f. Elongation: Not less than 50% per ASTM D6241.

g. UV Resistance after 500 hours: Not less than 70% per ASTM D4355.

h. Permittivity: 1.70 Sec-1 per ASTM D4491.

i. Apparent Opening Size: 70 US Sieve, per ASTM D4751.

2. Manufacturers and Products:

a. TenCate Geosynthetics Americas, Mirafi 140N.

b. US Fabrics, Inc., 120NW.

c. Propex Fabrics, Inc., Geotex 451.

d. Equal.

## 2.3 PREMOLDED RESILIENT DRAINAGE PAD

A. Premolded resilient drainage pad system (PRDP) shall be approved by OWNER and manufactured specifically for the intended use, made from fully recycled and or recyclable materials, with a minimum permeability rate of 30 to 60 inches per hour, and have a full 25 year minimum system warranty. PRDP shall be interlocking tile only. Rolled goods without expansion capabilities are not acceptable.

B. Required Performance Values for approved products:

| PROPERTY | STANDARD | UNIT | Brock Powerbase YSR |
|---|---|---|---|
| Material | | | Expanded Polypropylene |
| Interlocking Method | | | Interlocking Panels |
| Length x Width x Thickness | | | 73.5”x 49.0”x 1.0” |
| Thermal Expansion Control | | | Interlocking System |
| Vertical Drainage | ASTM F1551 | in/hr | >500 |
| Lateral Transmissivity | ASTM D4716 | gpm/ft | 0.50 |
| Impact attenuation (Gmax) | ASTM F355 | | 80 <90 |
| Shock absorption | EN 14808 | % | 70 |

| | | | |
|---|---|---|---|
| Vertical deformation | EN 14809 | mm(in) | 7.2 |
| Compression Set @ 25% deflection | ASTM D395 | in | After 24 hrs remaining deflection was 0.09in. (90.1%) |
| Compression Set @ 50% deflection | ASTM D395 | in | |
| Recycle or Reuse | | | |

C. Tiles shall be fully interlocking and fabricated from fully repurposed, recycled or virgin materials:

1. Brock Power Base YSR: Lightweight injection-molded plastic units usually supplied as tiles in palette format; minimum size shall be 73.5”X49” units with hollow clover shaped cups rising from a strong open grid allowing maximum water infiltration and conveyance. Tiles shall have interlocking hooks to allow easy assembly. Hooks shall allow for temperature movement.

2. Equal products approved by the OWNER.

2.4 SYNTHETIC FIELD (CARPET) MATERIALS

A. The Turf Carpet System shall be an OWNER preapproved hybrid synthetic turf system comprised of both slit film and monofilament fibers tufted into a backing system and be one of the following systems meeting the requirements outlined within this Section.

1. Manufacturer: TenCate

a. Product Name: TenCate Tigerturf Championship Plus

b. Fiber Height: 2 inch.

2. Equal products approved by the OWNER.

B. Synthetic field surfacing materials and components must be approved by the OWNER.

C. Approved Manufacturers and Turf Components. Lists below show the basic field colors: green, white and yellow. For OWNER approved colors for centerfield logo and end zones refer to Appendix ‘E’. Refer to Paragraph 1.06.C for turf yarn color chemical evaluation and approval procedures.

1. Tencate:

a. Turf Yarn: Polyethelene Fibers monofilament and slit film by Synthetic Turf Resources Corporation (STR).

b. Primary Backing: Polyester by Carpet & Rug Backing (CRB).

c. Primary Backing: Polypropylene by Carpet & Rug Backing (CRB).

d. Secondary Backing: Polyurethane backing by Universal Textile Technologies (UTT).

e. OWNER Approved Colors:

1) Field Green: Pantone 575C
2) Lime Green: Pantone 7496C
3) Field Green / Lime Green
4) White: Pantone 000
5) Yellow: Pantone 136C

D. Yarn shall be a hybrid monofilament and slit film tape polyethylene grass-like fibers with a texturized rootzone. Polyethylene yarn shall be proven athletic caliber designed and fabricated specifically for outdoor use and stabilized to resist the effect of ultraviolet degradation, heat, foot traffic, water and airborne pollutants. Fiber shall possess the following physical characteristics:

1. Synthetic Turf Fibers:

| ASTM: | Component: | Performance Value: |
|---|---|---|
| D1577 | Fiber Denier Monofilament | 10,000/1 (XPS); 12,000/1 (XWRD) |
| D1577 | Fiber Denier Thatch Layer | 5,000/8 |
| D1577 | Fiber Denier Slit film | 5,000 – 10,000 |
| D2256 | Breaking Load Strength | 24 lbs. (XPS/XWRD)<br>17.8 lbs (Thatch) |
| D3218 | Monofilaments - Thickness | Monofilament:<br>(XPS) 120 microns,<br>(XWRD) 365 microns<br>Thatch: 100 microns |
| D7138 | Melting Temperature Nylon | 210°C Min |
| D7138 | Melting Temperature Polypropylene | 120°C Min |
| F2765 | All Yarn | Less than 40 ppm |

2. Primary Backing:

| ASTM: | Component: | Performance Value: |
|---|---|---|
| D4491 | Geotextiles by Permittivity | 50 inch/hour |
| D4533 | Tearing Strength of Geotextiles | 250 lbs. |
| D4632 | Breaking Load and Elongation | 200 lbs. |
| D5034 | Breaking Strength and Elongation | 200 lbs. |
| D5848 | Total Wight | 89.5 oz/yd² |

3. Secondary Backing: 20 oz/yd² Polyurethane coating with drainage holes. Latex is not permitted.

E. Seaming Tape: Polyethylene terephthalate (PET) based, spun-bonded, nonwoven fabric tape designed specifically to work with turf adhesives for seaming synthetic turf; 12 inches wide. Seaming tape shall be compatible with the secondary backing system and adhesive.

PET Spunbonded Nonwoven by Oxco Incorporated, Ultrabond Turf Tape by Mapei, or OWNER's approved equal.

F. Adhesives for bonding tufted synthetic turf and seaming tape:

1. One-component polyurethane resin based, moisture-curing adhesive. Ultrabond Turf PU 1K by Mapei, or OWNER approved equal.

2. Two-component, solvent and water-free polyurethane adhesive. The two-part component consisting of component A, a thick paste, and component B, a fluid hardener. Ultrabond Turf PU 2K, Parts A and B, by Mapei, or OWNER's approved equal.

## 2.5 SYNTHETIC TURF FABRICATION

A. Synthetic turf systems shall only be fabricated of turf and backing components approved by the OWNER. Turf system shall be a Hybrid Turf with Thatch Zone System.

B. Synthetic Turf System Performance:

| | | | |
|---|---|---|---|
| 1. | ASTM D1335 | Tuft Bind | > 8 pounds |
| 2. | ASTM D2859 | Ignition | PASS 8 Times |
| 3. | ASTM D5793 | Binding Sites | 2.66 to 3.00 per inch<br>0.375 – 0.500 inch |
| 4. | ASTM D5823 | Pile Height | 2.00 inch |
| | | Pile Height Thatch | Match infill depth |
| 5. | ASTM D5848 | Mass Per Unit Area of Pile Yarn | 62 oz/yd² |

C. Synthetic turf systems shall meet the technical requirements for binding sites and fiber configuration indicated below.

1. All products shall have row spacing less than or equal to 0.50 inch.

2. System using A-B needle tufting shall be tufted on a 3/8 inch row spacing.

3. Systems using A-B needle tufting shall divide the thatch zone yarn approximately equally between both the A and B needles.

4. Systems using common needle tufting shall include hybrid fiber and thatch fiber on the common needle.

D. Fibers shall be tufted to a finished pile height of 2.00 inches. Turf systems using yarn or ribbon that shrinks during the manufacturing process shall oversize pile height so that the finish product including any process related shrinkage meets these requirements. Height shall be measured after heating processes that would shrink the fibers. Process related fiber shrinkage shall not relieve the manufacturer from providing a full 1.75 to 2.00 inch product.

E. Ends Needle: Minimum of six ends per needle. Where fibers are bundled in two colors a minimum of three ends per color per needle.

F. Binding Sites: Stiches per inch shall be greater than or equal to 2.66 inches and less than or equal to 3.00 inches. Gauge shall be greater than or equal to 0.375 inches and less than or equal to 0.500 inches.

G. Perforation shall be made at a minimum rate of one 3/16 inch perforation on a 3" inches

by 4" grid over the full surface area of the carpet.

1. Perforations shall be punched to true size or burned to a dimension that allows for proper size after any shrinkage that may take place.
2. Feed rates shall be adjusted to assure that perforations meet the 3/16 inch dimension after fabrication.
3. Under sized perforations will not be accepted.
4. Non-perforated systems shall not be accepted except for patented finger drainage systems.
5. Perforations shall be uniform such that 85% of the perforations shall meet or exceed the above minimum dimension.
6. Perforations not meeting the minimum size noted above shall not be clustered or grouped on the backing.
7. Where sections or areas of backing exceeding 4 square feet have no perforations, that entire carpet roll shall be rejected by plant quality control.

H. Perforation size shall be confirmed in the factory as part of the manufacturing quality control process. Rolls where sections do not meet the requirements shall be rejected. Rolls that contain perforations where perforations with a dimension of less than 3/16 inch diameter shall be rejected. Carpet rolls that have less than 85% full size perforations shall be rejected.

I. Finished Turf System:

| | | |
|---|---|---|
| 1. | Fabric Width | 182 inch (other manufacturing widths are not acceptable) |
| 2. | Tuft Bind Strength w/o infill: | >8.0 lbs. |
| 3. | Tufting Configuration of Fibers | Where row spacing is greater than 0.5 inch Monofilament (spinneret, extruded) and Silt Film Tape fibers shall be bundled into a single tufting needle to avoid streaking associated with alternating fiber type rows. |
| 4. | Grab Tear Strength (length): | >250 lbs. |
| 5. | Pill Burn Test | Pass (with filling) |
| 6. | Permeability | 50" per/hr for the full system cross-section |
| 7. | Depth of Infill | 1.30" infill depth for 1.75" systems and 1.50" infill depth for 2.00" systems (at completion of installation) Infill depths shall represents substantially 74% to 78% of the fiber height when initially installed. |
| 8. | Colors (standard) | Standard manufacturer's colors<br>See below for inlays. |
| 9. | Tufted/Inlaid Lines | |
| | Tufted/Inlaid Full Local Requirements | Full markings for the project specific sports |
| 10. | Tufted/Inlaid goal location marks | Match color of sports identified above. Goal marks shall be 4" square. |
| 11. | Logos | |

| | | |
|---|---|---|
| 12. | Colored Endzones | |
| 13. | Painted Markings | None. All Markings shall be inlaid |

J. Tuft lines in the factory to the maximum extent practical. Keep field inlaid lines to a minimum. The intent is to maximize the factory work to the extent practical. Where rules require dashes such as hash marks or media lines they shall be cut in as dashes and not continuous cuts. Tufted in lines shall be tufted with the line located at least 4" from the edge of the panel wherever practical.

1. Logo shall be tufted with two wire wide ghost lines at all locations where the logo interrupts game lines. Method of logo development shall be approved by the ARCHITECT.

K. Adhesives for bonding tufted synthetic turf and drainage pad shall be as recommended by the synthetic turf manufacturer and be a one-part moisture cured polyurethane. Adhesives must be appropriate for weather and climatic conditions. Submit separate adhesives suitable for use in cold weather, warm weather and wet weather. Seaming of underlayment pad must be done with less than a 6" wide spray adhesive width. Excessive coverage of the padding with adhesive is unacceptable. Adhesives shall be OWNER approved products of Synthetic Surfaces Inc., or other OWNER approved equal products.

L. Cord for sewing seams of both the pad and turf shall be as recommended by the synthetic turf manufacturer.

M. Rolls shall be arranged to minimize seams at high wear areas of the field and to maximize factory tufted markings.

N. The finished playing surface shall appear as mowed grass with no irregularities and shall afford excellent traction for conventional athletic shoes of all types. The finished surface shall resist abrasion and cutting from normal use. The system shall be ideal for soccer, lacrosse, field hockey, football, intramural and recreational use.

O. The turf shall be tufted in a manner to provide alternating colors when indicated on the project.

## 2.6 INFILL MATERIAL

A. Synthetic Infill and Mineral Material shall be approved by the OWNER and be free of hazardous materials as defined by current Local, State and Federal regulations. Infill shall conform to the Standard Consumer Safety Specification for Toy Safety. Synthetic surfacing manufacturer shall select infill materials that will assure their warranty of the synthetic turf system.

B. Sand:

1. Mineral Infill Material: Sand shall be rounded to sub-rounded quartz mineral sand which is free of silts, clays and other contaminants. 100 percent of the sand shall be smaller than 1.18 millimeters (#16 sieve) and 98 percent shall be greater than 0.425 millimeters (#40 sieve). Testing shall be per ASTM F1632.

| MINERAL INFILL GRADATION | |
|---|---|
| Sieve Size U.S. No. | Typical Percent of Total within Range |
| 16 | 0 |
| 18 | <5% |
| 20 | 10.0 to 40.0 |
| 25 | 20.0 to 50.0 |
| 30 | 20.0 to 60.0 |
| 35 | 20.0 to 50.0 |
| 40 | 10.0 to 40.0 |
| 50 | <5% |
| Pan | <2% |

2. Infill Layers:

a) Infill material shall consist of a layer of synthetic material and a layer of sand granule. Sand component shall not be less than 60% or more than 80% by weight. The percentage of sand in the turf system may be adjusted as required to meet required performance criteria and avoid patent infringement. If infill ratios require modification the Manufacturer shall advise the OWNER in writing for OWNER Approval of system modification.

1) Total settled infill depth shall be averaged over the entire field and shall be 1.30 inch depth for 1.75 inch fiber and 1.50 inch depth for 2.00 inch fiber.

2) Theoretical exposed fiber face weight shall represent the face weight of fiber located above the estimated settled infill depth of 74% of fiber height Regardless of any requirements set forth herein no system shall have a theoretical exposed fiber face weight which is less than 12 ounces per square yard minimum.

3) Refer to page 2 of Appendix “B” for Sand/Infill Depth Calculation submittal sheet.

b) Sand shall comply with the requirements of Section 01 4524, Environmental Import/Export Materials Testing, 2.01.A.3.

| SYNTHETIC INFILL / SAND RATIO | |
|---|---|
| Infill Composition by Weight | Based on manufacturer’s requirements to meet require performance characteristics. |
| Infill System Depth | 1.30 inch depth for 1.75 inch fiber and 1.50 inch depth for 2.00 inch fiber after initial installation of infill material. This depth represents substantially 74% full. |

C. System 1: Acrylic Coated Sand Systems.

1. Acrylic coated sand infill materials shall be USGreentech Envirofill and meet the following requirements.
2. Dimensions 98.6% retained 12-20 mesh sieves.
3. Materials 99.6% Silicon Dioxide, Pigment and Acrylic.
4. Hardness Mohs Scale 6-8.
5. Roundness .6+.
6. Density lbs/cf ASTM F1815 110.
7. Flammability ASTM E648 Non-flammable.
8. Dust Negligible.
9. Angle of Repose ASTM C1444 ±30 degrees.
10. TCLP Metals Content mg/kg ASTM D6010 <Min Detectable Levels.
11. Abrasiveness Index ASTM F1015 26+/-2.
12. Coefficient of Friction Direct ASTM F1551 0.80 dynamic.
13. Color: Black, Green, To be selected by OWNER.

D. System 2: Cool Infill System 1

1. Coated Silica Sand Infill shall be T°Cool and meet the following requirements.
2. Flammability ASTM E648 Non-flammable.
3. Evaporative Cooling up to 50 Degrees.
4. Mesh Size: 16/30
5. Hardness: 6-8 Mohs
6. Angle of Repose: +/- 30 degrees
7. Dust: Negligible

E. System 3: Equal product approved by the OWNER.

## PART 3 – EXECUTION

### 3.1 BASE APPROVAL

A. For excavation and fill refer to Section 31 2333, Excavation and Fill for Synthetic Play Fields.

B. Prior to installation of geotextile liner or geotextile drainage fabric installation, and the manufacturer shall:

1. Review the record as-built drawings provided by the Base Contractor/Subcontractor for the finish grade of the compacted base and the survey provided under Section 31 2333. As-built elevations shall be with 0.02 feet plus or minus of design grades.

2. Review the base for approval and acceptance. The Manufacturer shall provide the final surface planarity test using EN 22768 for Base Evenness base and coordinate and confirm the necessary compliance adjustments with the base installer.

3. Provide string-line inspection and evaluation of finish grade of the base and coordinate and confirm the necessary compliance adjustments with the base provider. Check the planarity of the base using string lines at 7.5 foot intervals in both directions and at all field marking locations prior to installation of the geotextile liner (or geotextile drainage fabric) and pre-molded resilient drainage pad. Check the uniformity of the base using a 10 foot straight edge and a tolerance of plus or minus 1/4" and mark in the field the locations of any grade deviation that exceeds the specified tolerances.

4. Coordinate and confirm the necessary compliance adjustments with the base installer as each of the above review points.

5. Review compaction test results for conformance to specified values indicated on Section 31 2333.

6. Perform review final permeability compliance testing using ASTM F2898 at five locations determined by the ARCHITECT.

7. Review and confirm the vertical and horizontal location of conduit risers, access box hand holes, equipment, yard boxes, and drainage structures. These shall be set precisely to line and grade to meet intended finish relationship with surface and base and coordinated with turf access cover systems.

8. Notify OWNER and ARCHTIECT of deviations from Contract Documents and issues that will adversely affect the installation of drainage layer and synthetic turf or the manufacturer's warranty.

9. Upon corrections of the base provide an updated as-built survey depicting compliance for submittal to the ARCHITECT. Once approved provide a letter indicating that the base meets the requirements of the turf system manufacturer, and that the base as installed will allow the synthetic turf system to function properly and as intended without jeopardizing the warranty of the turf system. Include in the letter the compaction and percolation test results.

## 3.2 PROJECT CONDITIONS

A. Weather and Climate: If weather and climatic conditions are having or will have an adverse effect on installation, work shall be delayed until the adverse condition has passed. No work shall be performed during periods in which the temperature is below 40 degrees F and rising or during wet or rainy days. Material shall be applied only when dry.

B. Infill shall be installed at a rate and manner that avoids burying of fibers due to high temperature fiber laydown.

C. Adjacent and Concurrent Construction: Installation shall not take place until the completion of the adjacent or concurrent construction operations which generate dust, airborne abrasives, or any other by-product that would be harmful to the turf material.

D. Provide ballast/weighing as required to prevent wind impacts to materials during installation.

## 3.3 INSTALLATION OF GEOTEXTILE LINER

A. Base surface shall be uniform and free of rocks, depressions, voids, and irregularities that might damage liner. Install liner in accordance with liner manufacturer's written recommendations.

1. Liner shall be placed in the perimeter trench first. Trench liner shall be separate from the liner on the field. Overlap field and trench liners a minimum of 18" in the direction of the water flow. Liner shall completely line the perimeter trench.

2. Overlap ends of liners a minimum of 8 inches. Laps shall be overlapped in direction the water flows.

3. Panels shall run side to side with excess material for connection to anchoring curbs and to accommodate expansion, and for side to side panel overlap. Where side anchor curbing includes an integral drain and where liner must interface with an open graded stone trench provide a minimum of 8 feet in additional length to account for side to side contraction and expansion and attachment. Provide adequate panel width to allow for 4 feet of panel overlap on each side and 4 additional feet of width at ends to account for contraction and expansion and attachment.

4. Liner shall be attached to the perimeter concrete curb using 20-gauge coiled straps with a staggered nail pattern and concrete nails at 12 inches on center.

5. Place a suitable amount of ballast on the liner to prevent displacement by wind. The ballast shall be of a type that will not damage the liner.

6. Direct loading over the fabric by traffic is not allowed. A minimum of 6 inches of material cover must be placed prior to traffic.

7. Repair punctured or torn liner by overlapping additional fabric and joining in accordance with manufacturer's recommendations.

## 3.4 INSTALLATION OF GEOTEXTILE DRAINAGE FABRIC

A. Install the geotextile drainage fabric on a clean compacted surface after as-built and surface are approved by the ARCHITECT. Wrinkles shall be stretched out and sections installed over the subgrade and into the full extent of the collector trenches. Lap sections per manufacturer's recommendation and follow with manufacturer's instructions . The fabric shall not be seamed such that seam edges are in close proximity to excavated trenches. Seams shall be installed in a manner which follows typical roofing style overlap with higher elevation sheets above low elevation sheets.

B. The geotextile drainage fabric shall be installed over the full subgrade and side walls and line the collector pipe trenches. Edges shall be brought up along the face of the anchor curbing to create a bathtub effect at the collector.

C. The geotextile drainage fabric shall be pulled tight to remove any wrinkles that could impact the planarity of the premolded drainage board.

## 3.5 INSTALLATION OF PRE-MOLDED RESILIENT DRAINAGE PAD

A. Surfaces to receive the pre-molded resilient drainage pad shall be cleaned before installation commences and shall be maintained in that condition throughout the process.

B. The pre-molded resilient pad shall be installed by the turf manufacturer or under their direct supervision of the synthetic turf installer, and the turf manufacturer's representative.

C. Synthetic turf installer and manufacturer representative shall inspect and certify in writing acceptance of the drainage layer prior to installation of the turf.

D. Areas where the finish stone surface is impacted by the process shall be corrected to acceptable tolerances.

E. Provide 1.0 inch gap at turf anchor curb shelf to allow for thermal movement of PRDP.

3.6 INSTALLATION OF SYNTHETIC TURF

A. Synthetic field surfacing shall be installed in accordance with manufacturer's recommendations and written instructions.

1. Handling of materials shall be performed in a manner that does not damage rolls. Damage to rolls during the handling or installation process may require that the full roll be replaced at no cost to OWNER.

2. Installer shall inspect the backing of all carpet rolls as the carpet is rolled out to assure that the perforations meet the specifications.

B. Lay rolls across the field over the drainage layer, following installation sequence shown on the shop drawings.

C. Areas where the finish stone surface is impacted by the process shall be corrected to acceptable tolerances. Geotextile shall be removed and reinstalled to facilitate this process.

D. Firmly secure perimeter of the field to curbs with stainless steel anchors in accordance with Contract Documents.

E. Back inlaid lines using seaming tape with a width of 18", adhered to the pad prior to installation of the inlaid line or logo. Inlaid lines in which the backing is extended 6" beyond the edge of the line on both sides can be used in lieu of seaming tape. In no case shall lines be shaved into the system.

3.7 INSTALLATION OF INFILL MATERIAL

A. Broadcast infill in a manner that prevents uneven distribution. Keep overlap between passes to a minimum. Passes must have a limited amount of overlap to prevent shallow infill depth areas.

1. Maintain a clean staging area to prevent contamination of the infill material with on-site materials. If a clean area cannot be provided, manufacturer shall provide a reinforced protection membrane beneath the material to prevent contamination during storage and blending.

2. Keep the path from the staging area to the field clean to prevent tracking of contaminants onto the playing field.

3. Keep equipment such as Bobcats, hoppers, sweepers, and rakes, clean and free of contaminants.

B. The rate of infilling shall be such that fibers are not trapped beneath infill material. All trapped fibers shall be groomed raked free of trapping infill material to the satisfaction of OWNER.

1. Inspect infill material coverage as progress advances to assure fibers are not trapped. If trapped fibers are observed correct conditions by static grooming.

3.8 SIGNAGE

A. Install OWNER furnished signs at pedestrian and vehicular entry points to the field. Sign provides rules to be followed to maintain safety and operational conditions of synthetic turf field. Coordinate locations with OAR. Fasten signs to chain link fence fabric using hard rings or fence clips at each corner of sign.

3.9 INSPECTION

A. Once installation is complete, the entire surface shall be inspected by the manufacturer, Project Inspector, OAR, and ARCHITECT, with particular attention to seams and edge attachments. Corrections shall be noted and rectified prior to Substantial Completion. Lines shall be checked for straightness, correctness and installation. Each sport lines and correct dimensions shall be verified. Entire area shall be checked for wrinkles, evenness of field infill and planarity deficiencies.

3.10 FIELD PERFORMANCE TESTING

A. The Manufacturer is responsible for delivering a project the meets all required testing and for providing all test results to the ARCHITECT for review and approval.

B. G-max Testing: Shall be performed at construction completion and during each year of the life of the Warranty. Initial g-max testing for shock attenuation on completed field shall be a maximum average of 80-110 per ASTM F1936.

1. Testing shall be performed at the locations required by ASTM F1936, and in addition testing shall be performed at the center field, at the goal locations for all sports, and at ten yards inside the corners, resulting in a total of 19 test locations.

2. Testing shall consist of shock attenuation per ASTM F1936 and testing equipment shall conform to ASTM Standard F355 – Procedure A. G-max shall not change more than 10% at any one location per year over the life of the Warranty, however, at no time during the life of the warranty shall the g-max be less than 165. In cases where the results of the g-max testing exceeds the specified values, the condition shall be corrected by the manufacturer. The manufacturer shall provide adequate information to confirm that the mitigation measures were effective. At no time in the life of the Warranty shall the g-max be 165 or greater at any one point on the field. Results of this testing shall be provided to the OWNER and ARCHITECT each year after testing.

3. If non-compliant areas are located as part of the yearly assessment, the extent of these areas shall be determined by performing the g-max test towards each end zone and each sideline until tests meeting requirements are obtained. The point at which the results meet the requirements of this specification shall represent the limit of non-compliant turf and shall be remedied to be in-compliance with the requirements.

C. Surface Ball and Surface Player Performance Testing: During the first year of installation the field will be tested to the Surface Ball and Surface Player Performance Testing FIFA standards indicated on Article 1.04, “System Description”, paragraph “Performance Requirements”. Testing shall be performed at the same ten designated test points for the ASTM F1936 tests. Where deviation from these values exists, the field shall be brought into compliance. This is not intended to require FIFA Certification. Testing shall be completed after infill settlements which may impact performance of the system.

D. Infill Depth Measurements for Uniformity and Consistency: Prior to acceptance of the field by the OWNER the infill depth will be field measured by an independent testing's agency and recorded. The measurements shall be made at five yard intervals along the length of the field with five measurement points even spaced across the field. Measurements shall be made by depth gauge method and be to an accuracy of +/- 1 mm. The test point data shall be summarized in a report listing average depth and range. In cases where the average depth is outside of the indicated range the field shall be brought into compliance by the CONTRACTOR.

3.11 PROTECTION OF SURFACING

A. Protect the Work of this section from traffic until Substantial Completion.

3.12 FINAL GROOMING

A. The manufacturer shall perform a final grooming of the synthetic turf field in conjunction with the maintenance training session to bring the field to a game ready condition.

3.13 CLEAN UP

A. Remove rubbish and waste materials and legally dispose of off Project site. Leave the work area in condition ready for immediate occupancy and use by the OWNER.

B. Usable remnants of the turf fabric shall become property of the OWNER. Store as directed by the OAR.

END OF SECTION 321825

APPENDIX 'A"

SYNTHETIC TURF PRODUCT AND PERFORMANCE GUARANTEES

A. Keep work in repair without expense to OWNER as far as it concerns defects in workmanship or materials for a period of not less than eight (8) years from date of Substantial Completion.

1. The Warranties covered under this Article shall be issued under the following structure:

a. In all cases the synthetic turf system Product Warranty shall be provided by the Manufacturer.

b. In cases in which the synthetic turf system is provided by a synthetic turf system Reseller/Rebrander or other similar business relationship, the Reseller or Rebrander Warranty shall be provided by the Reseller/Rebrander. In this case the Reseller/Rebrander shall carry a Warranty from the Manufacturer of the white label product responsible for the manufacture of their systems.

c. Separate installation companies shall not serve as the manufacturer.

d. The Warrantees shall be assigned to the Owner and delivered to the Owner as part of the Closeout Manual

B. Eight Year Synthetic Turf Manufacturer's Product and System Warranty:

1. Provide a manufacturer's 8 year product warranty for the synthetic turf system including carpet and infill materials and their installation.

2. The Premolded Resilient Drainage Pad Manufacture shall provide a separate Manufacturer's 20 year Product Warranty. The Synthetic Turf Manufacturer shall include the Premolded Resilient Drainage Pad Manufacturer's Warranty as part of their closeout documents.

3. Where the Infill Manufacture provides a separate Manufacturer's Product Warranty the Synthetic Turf Manufacturer shall include the Infill Manufacturer's Warranty as part of their closeout documents. If not, the infill warranty shall be the responsibility of the manufacturer.

4. Where the Geotextile/Liner Manufacture provides a separate Manufacturer's Product Warranty the Synthetic Turf Manufacturer shall include the Geotextile/Liner Manufacturer's Warranty as part of their closeout documents. If not the Geotextile/Liner warranty shall be the responsibility of the manufacturer.

5. This warranty shall include all materials and components of the finished system including but the assembly of the carpet system, and components including yarn, fibers, backing materials, seaming tape, adhesives, sewing yarn, infill products, anchoring method.

6. The warranty shall be in writing and shall be signed by the synthetic turf field manufacturer.

7. Warranty shall include removal and replacement of materials as required to repair the synthetic field surfacing and or system at no cost to the OWNER. This includes any base system remediation created as a result of removal and replacement and

full clean-up, disposal and finish work associated with any Warranty remediation effort.

8. The Warranty shall also cover fiber breakdown due to defects, poor quality components, premature wear, and fiber loss. Fibers specified herein shall be capable of providing useful service throughout the full period of the Warranty.

   a. At the end of the Warranty period the fiber shall retain a minimum of 70% of the original fiber weight, fiber strength, and fiber height. Periods between the start of warranty coverage to the end of the warranty period shall be covered based on a relative prorated percentage of these values.

   b. At the end of the Warranty period the exposed fiber above the infill shall have less than 50% fiber damage for spinneret and tape type fibers associated with wear. Wear shall include shortening of fiber due to breakage, shredding (excessive fibrillation), loss of fiber due to fiber pull-out, internal fiber separation along cross-sectional seams or edges, failure or fracture seams perpendicular to the length of the fiber, fiber threading (change in cross-section to thread or hair like section), and UV degradation. Periods between the start of warranty coverage to the end of the warranty period shall be covered based on a relative prorated percentage of these values.

   c. At the end of the Warranty period the exposed fiber above the infill shall have less than 50% fiber damage for slit-film type fibers associated with wear. Wear shall include shortening of fiber due to breakage, shredding (excessive fibrillation), loss of fiber due to fiber pull-out, internal fiber separation along cross-sectional seams or edges, failure or fracture seams perpendicular to the length of the fiber, fiber threading (change in cross-section to thread or hair like section), and UV degradation. Periods between the start of warranty coverage to the end of the warranty period shall be covered based on a relative prorated percentage of these values.

9. The warranty shall cover the backing system against non-wear related breakdown.

10. The warranty shall cover the infill materials against excessive breakdown of granulate material due to normal use. Over the life of the system the infill material shall retain 70% of its shape, size and resiliency. Periods between the start of warranty coverage to the end of the warranty period shall be covered based on a relative prorated percentage of these values. At no time during the life of the system shall the infill material exhibit cohesive or agglomerate behavior or shall it become permanently deformed.

11. This warranty shall include all components of the system in its coverage. The warranty shall not limit the types of sports and recreation activities or uses that would be typical of similar installations. Use such as band or other marching activities shall not limit the Warranty.

12. The field system shall be suitable for small vehicle loads and shall be covered by the Warranty for vehicle use methods as approved and directed by the manufacturer. The manufacturer shall provide instructional information for driving on the synthetic surface and include vehicle size and weight limitations.

C. Warranty repairs associated with meeting the ASTM F1936 g-max performance requirements shall be for full coverage of the repair necessary to bring the system into compliance regardless of the age of the installation.

D. Field Performance Testing:

1. G-max Testing: Starting with the completion of construction, CONTRACTOR shall retain a third party certified testing laboratory and shall perform g-max testing locations and report during each year of the life of the Warranty. The testing and reporting procedures for this testing shall meet the requirements of ASTM F1936 except that the number of tests and the locations shall comply with the requirements here in. Testing shall be performed locations as required under ASTM F1936 plus at the center field, at the goal locations for all sports, and at 10 yards inside the corners. This results in a total of 19 test locations per year. Testing shall consist of shock attenuation per ASTM F355 procedure A. Initial g-max shall be between 80 and 110. The g-max shall not change more than 10% at any one location per year over the life of the Warranty, however, at no time during the life of the warranty shall the g-max shall be 165 or greater. In cases where the results of the above testing exceed the specified values on the per year and maximum value, the condition shall be corrected by the synthetic surface manufacturer. The synthetic surface manufacturer shall provide adequate confirmation testing to confirm that the mitigative measures were effective. At no time in the life of the Warranty shall the g-max be 165or greater at any one point on the field. Results of this testing shall be provided to the OWNER, ARCHITECT and other assigns each year after testing.

2. Surface Ball and Surface Player Performance Testing: During the first month of the year of use the field shall be tested for the following to assure that the delivered field meets industry accepted player surface and ball surface performance characteristics as defined in paragraph 1.04.C.3. Results of this testing shall be provided to the OWNER and ARCHITECT in the form of a post installation submittal. Where deviation from these values exists, the field shall be brought into compliance. Testing shall be completed at the ten (10) ASTM F1936 test points plus at the center field, at the goal locations for all sports, and at the 10 yards inside the corners. For performance values refer to Article 1.04 “System Description”, paragraph, “Performance Requirements”.

3. Infill Depth Measurements for Uniformity and Consistency: Prior to acceptance of the field by the ARCHITECT and OWNER, the infill depth shall be field measured by an independent testing’s agency and recorded. The measurements shall be made at 5 yard intervals along the length of the field with five measurement points even spaced across the field. Measurements shall be made by depth gauge method and be to an accuracy of +/- 1 mm. The test point data shall be summarized in a report listing average depth and range. In cases where the average depth is outside of the indicted range the field shall be brought into compliance by the Manufacturer.

E. If non-compliant areas are located as part of the yearly assessment, the extent of these areas shall be determined by performing the above test towards each end zone and each sideline until tests meeting requirements are obtained. The point at which the results meet the requirements of this specification shall represent the limit of non-compliant turf and shall be remedied to be in-compliance with the requirements.

Addendum A

F. Testing shall be performed by a certified independent lab approved by the OWNER.

G. Provide a copy of the complete Policy for all warrantees, assigned to the OWNER, and insurances for the turf system. Letters from the CONTRACTOR or manufacturer are not adequate. The Policy shall clearly indicate type of policy and policy rating for the full eight years. The insured warranty shall fully cover the cost of turf replacement.

Addendum A

Warranty commences on: _____

Warranty expires on: _____

CONTRACTOR: _____

Address: _____

Telephone: _____

Signature: _____

Name & Title: _____

Date: _____ Telephone: _____

TURF MANUFACTURER: _____

Address: _____

Telephone: _____

Signature: _____

Name & Title: _____

Date: _____ Telephone: _____

TURF INSTALLER : _____

Address: _____

Telephone: _____

Signature: _____

Name & Title: _____

Date: _____ Telephone: _____

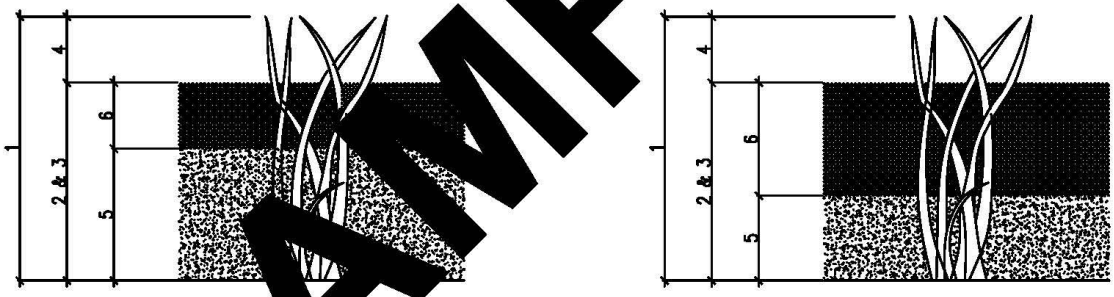
END OF APPENDIX 'A'

APPENDIX 'B'
SAND/INFILL DEPTH CALCULATION

## SAMPLES OF SAND/EPDM DEPTH CALCULATION



| | | 2" & 1.75" FIBER HEIGHT WITH 80% TO 20% SAND TO EPDM RATIO | 2" & 1.75" FIBER HEIGHT WITH 60% TO 40% SAND TO EPDM RATIO |
|---|---|---|---|
| A. | TURF MANUFACTURER / SYSTEM NAME: | | |
| B. | INFILL MANUFACTURER AND NAME: | | |
| C. | SAND SOURCE: | | |
| D. | WEIGHT OF ONE CF OF SAND: | 91.86 lbs. | 91.86 lbs. |
| D. | SPECIFIC DENSITY OF SAND: | 91.86 / 62.4 = 1.47 | 91.86 / 62.4 = 1.47 |
| E. | WEIGHT OF ONE CF OF EPDM INFILL: | 45.59 lbs. | 45.59 lbs. |
| E. | SPECIFIC DENSITY OF EPDM INFILL: | 45.59 / 62.4 = 0.73 | 45.59 / 62.4 = 0.73 |
| F. | RATIO SAND / INFILL BY WEIGHT: | 80 % TO 20 % | 60 % TO 40 % |
| G. | SPECIFIC VOLUME OF SAND: | 1 / 1.47 = 0.68 | 1 / 1.47 = 0.68 |
| H. | SPECIFIC VOLUME OF EPDM INFILL: | 1 / 0.73 = 1.37 | 1 / 0.73 = 1.37 |
| | RATIO BY VOLUME CALCULATION: | SAND: 0.68 X 80 % = 0.544<br>EPDM: 1.37 X 20 % = 0.274<br>SAND / EPDM RATIO: 0.544 / 0.274 = 1.985 | RATIO BY VOLUME CALCULATION:<br>SAND: 0.68 X 60 % = 0.408<br>EPDM: 1.37 X 40 % = 0.548<br>SAND / EPDM RATIO: 0.408 / 0.548 = 0.744 |
| I. | SAND / EPDM RATIO BY VOLUME: | 2 TO 1 | 3 TO 4 |




| | | | |
|---|---|---|---|
| 1. | FIBER HEIGHT: | 2" / 1.75" | 2" / 1.75" |
| 2. | TOTAL DEPTH: | 1.5" / 1.3" | 1.5" / 1.3" |
| 3. | % FIBER DEPTH / FIBER HEIGHT: | 75% / 74.2% | 75% / 74.2% |
| 4. | EXPOSED FIBER DEPTH: | 0.5" / 0.45" | 0.5" / 0.45" |

SAND & EPDM DEPTH CALCULATION:
SAND + EPDM = 1.5"
SAND / EPDM RATIO IS 2:1, 2X + 1X = 1.5"
SAND = 1", EPDM – 0.5"

| | | | |
|---|---|---|---|
| 5. | DEPTH OF SAND INFILL: | 1" / 0.87" | 0.64" / 0.56" |
| 6. | DEPTH OF EPDM INFILL: | 0.5" / 0.43" | 0.86" / 0.74" |

SPECIFIC DENSITY OR SPECIFIC GRAVITY: RATIO OF DENSITY OF A MATERIAL TO THE DENSITY OF WATER: $SG = \rho / \rho W$
WHERE SG = SPECIFIC GRAVITY, $\rho$ = DENSITY OF THE MATERIAL (lbs/CF), $\rho W$ = DENSITY OF WATER (62.4 lbs/CF).

SPECIFIC VOLUME: IS THE TOTAL VOLUME (V) OF A SUBSTANCE DIVIDED BY ITS TOTAL MASS (M). IS THE RECIPROCAL OF THE SPECIFIC DENSITY.

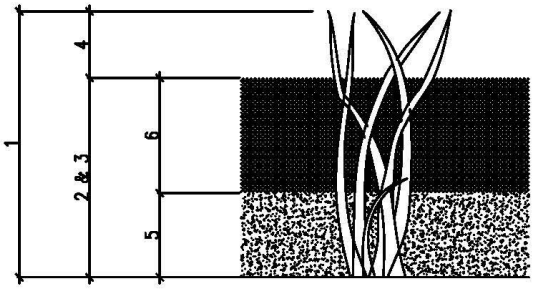
APPENDIX 'B' – PAGE 1 OF 2

## SAND/EPDM DEPTH CALCULATION

A. TURF MANUFACTURER / SYSTEM NAME: _____
B. INFILL MANUFACTURER AND NAME: _____
C. SAND SOURCE: _____
D. WEIGHT OF ONE CF OF SAND: _____
D. SPECIFIC DENSITY OF SAND: _____
E. WEIGHT OF ONE CF OF INFILL: _____
E. SPECIFIC DENSITY OF INFILL: _____
F. RATIO SAND / INFILL BY WEIGHT: _____
G. SPECIFIC VOLUME OF SAND: _____
H. SPECIFIC VOLUME OF INFILL: _____

RATIO BY VOLUME CALCULATION:
SAND:
INFILL:
SAND / INFILL RATIO:

I. SAND / INFILL RATIO BY VOLUME: _____




1. FIBER HEIGHT: _____
2. TOTAL DEPTH OF SAND–INFILL: _____
3. % FIBER DEPTH / FIBER HEIGHT: _____
4. EXPOSED FIBER DEPTH: _____

SAND & INFILL DEPTH CALCULATION:

5. DEPTH OF SAND: _____
6. DEPTH OF INFILL: _____

SPECIFIC DENSITY OR SPECIFIC GRAVITY: RATIO OF DENSITY OF A MATERIAL TO THE DENSITY OF WATER: $SG = \rho / \rho W$
WHERE SG = SPECIFIC GRAVITY, $\rho$ = DENSITY OF THE MATERIAL (lbs/CF), $\rho W$ = DENSITY OF WATER (62.4 lbs/CF).

SPECIFIC VOLUME: IS THE TOTAL VOLUME (V) OF A SUBSTANCE DIVIDED BY ITS TOTAL MASS (M). IS THE RECIPROCAL OF THE SPECIFIC DENSITY.

APPENDIX 'B' – PAGE 2 OF 2

END OF APPENDIX 'B'

APPENDIX 'C'
LIST OF OWNER APPROVED SYNTHETIC TURF COMPONENTS

PROJECT NAME: _____

CONTRACTOR: _____

Provide the exact name of each of the turf system components approved by the OWNER. Add products to the list if needed.

1. TURF:
   - Manufacturer: _____
   - Brand Name: _____
   - a. Monofilament: _____
     - Green: _____
     - White: _____
     - Yellow: _____
   - b. Slit Film: _____
     - Green: _____
     - White: _____
     - Yellow: _____
   - c. Rootzone: _____
     - Green: _____
     - White: _____
     - Yellow: _____
   - d. Primary Backing: _____
   - e. Secondary Backing: _____

2. PREMOLDED RESILIENT DRAINAGE PAD:
   - Manufacturer: _____
   - Brand Name: _____

3. INFILL:
   - Manufacturer: _____
   - Brand Name: _____

4. SAND:
   - Source: _____

END OF APPENDIX 'C'

APPENDIX 'D'

| SYNTHETIC TURF PROPERTIES COMPARISON | | | |
|---|---|---|---|
| **Synthetic Turf Fibers** | | | |
| **Test Method** | **Definition of test** | **LAUSD Spec Requirement** | **Proposed Turf System** |
| D1577 | Fiber Denier Monofilament | 7200 – 12,000 (4 to 8 ends) | |
| D1577 | Fiber Denier Thatch Layer | 4400 – 6500 (4 to 8 ends) | |
| D1577 | Fiber Denier Slit film | 5,000 – 10,000 | |
| D1682/D5034 | Grab Tear | 200 lbs. Min (width and length) | |
| D2256 | Breaking Load Strength | 8 lbs. | |
| D3218 | Thickness | Monofilament: 200 to 360 microns | |
| D3218 | Thickness | Thatch: 100 to 150 microns | |
| D3218 | Thickness | Silt film 100 to 120 microns | |
| D7138 | Melting Temperature Nylon | 210 °C Min | |
| D7138 | Melting Temperat. Polypropylene | 120°C Min | |
| **Primary Backing** | | | |
| D4491 | Geotextiles by Permittivity | 60 gpm | |
| D4533 | Tearing Strength of Geotextiles | 250 lbs. | |
| D4632 | Breaking Load and Elongation | 200 lbs. | |
| D5034 | Breaking Strength and Elongation | 200 lbs. | |
| D5848 | Mass Per Unit Area of Pile Yarn | 8 Oz/SY min. | |
| D5848 | Woven Polypropylene | 5-10 Oz/SY. | |
| D5848 | Non-woven polypropylene | 0.5 -1.0 Oz/SY. | |
| **Secondary Backing:** | | | |
| D5848 | Mass Per Unit Area of Pile Yarn | 23 Oz/SY | |
| D5848 | Urethane Coating | 24 - 28 Oz/SY | |
| **Synthetic Turf System Performance** | | | |
| D1335 | Tuft Bind | > 12 pounds | |
| D2859 | Ignition | PASS 8 Times | |
| D5793 | Binding Sites | 2.66 to 3.00 per inch | |
| D5793 | Binding Sites | 0.375 – 0.500 inch | |
| D5823 | Pile Height | 1.75 to 2.00 inch | |
| D5823 | Pile Height Thatch | Match infill depth | |
| D5848 | Mass Per Unit Area of Pile Yarn | 48 to 58 oz./$yd^2$ | |
| | | | |
| | | | |

END OF APPENDIX 'D'

APPENDIX 'E'
Comparison Table of RBSLs, HHSL, School-Based RBCs 05/04/21

| Table 2: Recommended RBSLs for Synthetic Turf Aug 2020 | | | | | |
|---|---|---|---|---|---|
| **Analyte Class** | **CAS Number** | **Chemical of Potential Concern** | **RBSL (mg/kg)** | **HHSL 2019*** | **School-based RBCs*** |
| Metal | 7440-36-0 | Antimony | 890 | 31 | 680 |
| Metal | 7440-38-2 | Arsenic | 12 | 12 | 12 |
| Metal | 7440-39-3 | Barium | 22,000 | 15,000 | 290,000 |
| Metal | 7440-41-7 | Beryllium | 130 | 160 | 330 |
| Metal | 7440-43-9 | Cadmium | 73 | 71 | 11 |
| Metal | 7440-47-3 | Chromium | 3,300,000 | 36,000 | 2,500,000 |
| Metal | 7440-48-4 | Cobalt | 34 | 23 | 500 |
| Metal | 7440-50-8 | Copper | 89,000 | 3,100 | 68,000 |
| Metal | 7439-92-1 | Lead | 80 | 40 | 40 |
| Metal | 7439-97-6 | Mercury | 340 | 23 | 0.11 |
| Metal | 7439-98-7 | Molybdenum | 11,000 | 390 | 8,500 |
| Metal | 7440-02-0 | Nickel | 610 | 820 | 20,000 |
| Metal | 7782-49-2 | Selenium | 11,000 | 390 | 8,500 |
| Metal | 7440-22-4 | Silver | 11,000 | 390 | 8,500 |
| Metal | 7440-28-0 | Thallium | 22 | 0.78 | 17 |
| Metal | 7440-62-2 | Vanadium | 3,700 | 390 | 8,300 |
| Metal | 7440-66-6 | Zinc | 660,000 | 23,000 | 470,000 |
| PAH | 90-12-0 | 1-Methylnaphthalene | 3,000 | | |
| PAH | 91-57-6 | 2-Methylnaphthalene | 19,000 | | |
| PAH | 83-32-9 | Acenaphthene | 290,000 | | |
| PAH | 120-12-7 | Anthracene | 1,400,000 | | |
| PAH | 191-24-2 | Benzo(g,h,i)perylene | 1,400,000 | | |
| PAH | 206-44-0 | Fluoranthene | 190,000 | | |
| PAH | 86-73-7 | Fluorene | 190,000 | | |
| PAH | 91-20-3 | Naphthalene | 730 | | |
| PAH | 85-01-8 | Phenanthrene | 1,400,000 | | |
| PAH | 129-00-0 | Pyrene | 14,0000 | | |
| cPAH | 50-32-8 | Benzo(a)pyrene Equivalent | 32 | | |
| Phthalates | 117-81-7 | Bis(2-Ethylhexyl) phthalate | 6,400 | | |
| Phthalates | 85-68-7 | Butyl benzyl phthalate | 48,000 | | |
| Phthalates | 84-74-2 | Dibutyl phthalate | 430,000 | | |
| Phthalates | 84-66-2 | Diethyl phthalate | 3,500,000 | | |
| Phthalates | 131-11-3 | Dimethyl phthalate | 3,500,000 | | |
| Phthalates | 117-84-0 | Di-n-octyl phthalate | 43,000 | | |
| CAS= Chemical Abstracts Service | | | | | |

mg/kg Milligrams per kilogram

HHSL Human Health Screening Level (residential land use)

RBC Risk-based Concentration (lowest age-based concentration listed)

* Value for arsenic is based on Southern California soils (CalEPA, 2009).

*Reference:*

CalEPA, 2009. Arsenic Strategies. Determination of Arsenic Remediation, Development of Arsenic

USEPA, 2019. Region 9 Regional Screening Levels (RSLs). Updated November 2019. https://www.epa.gov/risk/regional-screening-levels-rsls-gene

| | |
|---|---|
| | Geosyntec, 2015. Human Health Risk Assessment of Chemicals Detected in Synthetic Turf Athletic Fields. April 29. |

END OF APPENDIX 'E'