

M E M O R A N D U M

TO: Boston Conservation Commission

FROM: Marie Rudiman, Sr. Risk Assessor/Toxicologist, Weston & Sampson

DATE: February 24, 2021

SUBJECT: Response to Staff Comments/Recommendations

Comment: When the Commission last reviewed an application proposing artificial turf, the Commission expressed concern with leaching, stormwater contamination, maintenance issues, and the impact on climate change impacts (heat island effect). The NOI did not fully detail the specifications of the artificial turf that was being proposed. Since this was raised as an issue by the Commission, Staff has consulted colleagues in other municipalities regarding artificial turf. Staff is most concerned with the ecological impacts of the chemicals in artificial turf, specifically relating to the chemical levels of Perfluoroalkyl and polyfluoroalkyl substances (PFAS) and Polycyclic aromatic hydrocarbons (PAHs) in the proposed artificial turf fields. Additionally, Staff is concerned about the infill material used which can include lead and zinc.

Response: The proposed synthetic grass system is a carpet with average pile height 3/4" long 100% polyethylene fibers, tufted on a 1/4" tufting machine. The carpet is installed over an elastic performance shock pad system, consisting of a paved in place elastic layer of composite mixture of 1-5mm Styrene-butadiene rubber (SBR) rubber course, average 1/4-inch-high grade outdoor stabilized polyurethane binder. A drainage system consisting of a flat drains and collector piping is in place and shall be protected and retained under the proposed synthetic grass system. While the shock pad is formed from recycled rubber materials, it is formed as a single piece. Since the pad is bound as a single, stable, uniform pad, it is resistant to degrading over time. There is no infill proposed for this project.

Perfluoroalkyl and polyfluoroalkyl substances (PFAS): Weston & Sampson has contacted the synthetic turf vendors that we work with and have asked them to supply documentation indicating their products do not contain and are not manufactured with PFAS compounds. Weston & Sampson requires the vendor to provide a statement indicating they do not use any PFAS compounds within or in the manufacture of their carpets/turf and to provide the appropriate laboratory testing for the 30 PFAS compounds that can be tested. It is our policy not to install any product that contains PFAS compounds.

Synthetic turf meets the following standards of safety:

- ASTM F 3188-16 for Safety of Toys - restricts concentrations of metals, including lead (US)
- EN 71-3 Category III for Safety of Toys - restricts concentrations of metals, including lead (European Union)
- CA Prop 65 - restricts carcinogens and other toxic compounds (California)

- REACH standards of safety - restricts carcinogens and other toxic compounds (European Union)

Therefore, the concentrations of lead and other chemicals in synthetic turf are restricted. Residual lead concentrations in synthetic turf are similar to lead concentrations observed in natural background soils (up to approximately 100 mg/kg) as presented in EPA's Federal Research Action Plan, Part 1 (EPA, 2019). The background concentrations of lead in soil in urban areas that contain anthropogenic fill material, typical of the Massachusetts coastline where filling historically occurred to change the grade of coastal wetland areas, can be 600 mg/kg and higher (MassDEP, 2016). Thus, the concentrations of lead in the existing soil at the park are likely much higher than what is allowed in synthetic turf. Leaching of lead from modern synthetic turf is not a significant health issue (NYDEC, 2009).

Weston & Sampson reviewed studies that are summarized in EPA's Federal Research Action Plan, Part 1 (EPA, 2019). The main conclusion of Part 1 of EPA's FRAP was that "while chemicals are present, human exposure appears to be limited based on what is released into air or simulated biological fluids." This speaks to the bioavailability of chemicals within the synthetic turf and crumb rubber/other infills. While chemicals are present, they are bound within the matrix of the synthetic turf system. The presence of a chemical is not equivalent to a health effect. The chemical first has to be bioavailable and then there has to be exposure to that chemical. In simple terms:

Potential Health Risk = Concentration of a chemical x Exposure x Toxicity of that chemical

It is true that synthetic turf and the various infills do contain chemicals and in a laboratory setting with chemical stress such as treatment with an acid or with physical stress such as heating to a sustained temperature of 70°C (158°F) those chemicals will leach out of the synthetic turf. However, there are numerous studies that show that under natural conditions, the concentrations of constituents that leach from synthetic turf and various infills are at concentrations that below applicable standards and at concentrations that do not pose a significant health risk for human and/or ecological receptors (Zeliber (1991), Groenevelt and Grunthal (1998), Florida Department of Environmental Protection (1999), Sheehan et al. (2006), Johns and Goodlin (2008), Mota et al. (2009), Cheng et al. (2014), Birkholz, et al (2003)). This is likely due to dilution and attenuation that occurs as rain-water flows through the turf under natural, outdoor conditions. While several studies do indicate that crumb rubber infill may increase the concentrations of zinc in leachate, there is evidence that small particle size is a factor in the potential migration of constituents, particularly zinc, into groundwater. However, as the pad is bound as a single, stable, uniform pad, it is likely resistant to break down and leaching into groundwater.

- Researchers "designed a comprehensive hazard assessment to evaluate and address potential human health and environmental concerns associated with the use of tire crumb in playgrounds. Human health concerns were addressed using conventional hazard analyses, mutagenicity assays, and aquatic toxicity tests of extracted tire crumb. Hazard to children appears to be minimal. We conclude that the use of tire crumb in playgrounds results in minimal hazard to children and the receiving environment." Birkholz, et al (2003).
- "Health risk assessment studies suggested that users of artificial turf fields, even professional athletes, were not exposed to elevated risks. Preliminary life cycle assessment suggested that the environmental impacts of artificial turf fields were lower than equivalent grass fields." Cheng, et al. (2014).

- "...crumb rubber may be used as an infill without significant impact on groundwater quality...Analysis of crumb rubber samples digested in acid revealed that the lead concentration in the crumb rubber samples were well below the federal hazard standard for lead in soil...A risk assessment for aquatic life protection...found that for the three types of crumb rubber, aquatic toxicity was found to be unlikely." New York Department of Environmental Conservation (NYDEC, 2009).
- The results of the study concluded that none of the tire and other tire rubber products tested, cured and uncured, exceeded proposed toxicity characteristic leaching procedure (TCLP) regulatory levels or EPA Drinking Water standards. TCLP is a soil sample extraction method for chemical analysis employed as an analytical method to simulate leaching. Most compounds were found at trace levels (near method detection limits) from 10 to 100 times less than proposed TCLP regulatory limits. Zelibor (1991)
- "Except for iron concentrations detected in groundwater samples MW-1, MW-3, and MW-4, all remaining soil, groundwater, rainwater, and surface water runoff concentrations were below State guidance concentrations." Florida Department of Environmental Protection (1999)

This was also the case at the Fenn School in Concord, Massachusetts (an unpublished study by Hailey & Aldrich, Inc.), where 5 years of groundwater monitoring and analysis for semi-volatile organic compounds (SVOCs) and dissolved metals was conducted for a synthetic turf field installed with crumb rubber infill. SVOCs were at non-detectable concentrations or at concentrations that were just above detection limits and well below applicable standards. The concentrations of dissolved metals over the period of monitoring were generally at background concentrations (based on groundwater collected prior to installation of the turf) and did not exceed applicable standards.

SECTION 32 18 13: SYNTHETIC GRASS SYSTEM

PART 1 - GENERAL

1.01 Work Included

A. Provide all labor, materials, equipment, and tools necessary for the complete installation of Synthetic Grass Non-Infilled System over an elastic performance shock pad and graded stone base as outlined in these specifications and in strict accordance with the manufacturer's written specifications.

1. A drainage system consisting of a flat drains and collector piping is in place and shall be protected and retained.
2. A synthetic grass system with average pile height 3/4" long 100% polyethylene fibers, tufted on a 1/4" tufting machine. A minimum of 8,00 denier slit film tape, and 4,400 denier low friction nylon specifically designed to reduce abrasion in AB tufting configuration with a total fiber weight of not less than 94 ounces per square yard. The turf shall be of slit film / nylon thatch tufted together in same needle stitching if 1/4-inch gauge. The system shall include a single, dimensionally stable, backing, and have a minimum of 6 ounces of urethane secondary backing per square yard and a total weight of 20 ounces per square yard. The finished product shall also include perforations (1/4" holes on 4" centers) to ensure maximum drainage. Systems that are tufted on larger than 1/4" gauge tufting machines, are not perforated or include any type of nylon fiber "thatch zone" shall not be acceptable.
3. An elastic performance shock pad system, consisting of a paved in place elastic layer of composite mixture of 1-5mm SBR rubber course, average 1/4-inch-high grade outdoor stabilized polyurethane binder. A total thickness of elastic layer shall be a minimum of 36 mm for base bid. Binder content shall be adjusted to as needed to provide the shock attenuation properties outlined herein.

Shock pad system shall have a permeability of 14-inch per hour rate and shall be tested in the field.

Finished system, including the pad, carpet, and in-fill matric, shall have a shock attenuation property consistent with ASTM F-355, Gmax rating of 95-125.

B. Approved Turf Manufacturers

1. Fieldturf
2. Sprinturf
3. Shaw Sports Turf
4. Act Global
5. Approved Equal

1.02 Qualifications and Submittals

A. Prospective Bidders and / or installers of the turf system shall be required to comply with the following:

1. The successful turf contractor must be a member of the Synthetic Turf Council (STC) and Sports Turf Managers Association (STMA).
2. The turf contractor and / or the turf manufacturer must be experienced in the manufacture and installation of this specific type of non-infill synthetic grass and pad system, for at least five (5) years and provide references of ten (10) specific installations in the last five (5) years.
3. The turf manufacturer shall have a minimum of ten (10) installations in the State of Massachusetts.
4. The turf manufacturer shall have a minimum of ten (10) NCAA Division 1 game and/or

practice fields installed for baseball and or softball.

5. The turf contractor and/or turf manufacturer must provide in-house competent workmen skilled in this specific type of synthetic grass installation with a minimum of 10 fields installed. 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 the gluing/stitching of seams and the proper installation of the elastic performance shock pad system. The manufacturer shall have a representative on site to certify the installation and warranty compliance.
6. All designs, marking, layouts, materials shall conform to current Little League rules and other standards that may be applicable to this type of synthetic grass installation unless there is a specific exception identified. Submit a full color rendering/drawing indicating all field markings for final approval prior to placing turf order. Failure to do so shall be at the contractor's risk and cost.

B. All bidders of the turf contract must submit to the Owner's Representative the following information:

1. All Contractors shall submit to the Owner's Representative, after the bid, prior to award, a 1' x 1' minimum sample of the exact synthetic turf and elastic performance shock pad system that is specified for this project.
2. The turf contractor / manufacturer shall submit with the bid, a sample copy of the material warranty demonstrating compliance with the warranty requirements.
3. The turf contractor shall provide evidence - direct from the turf manufacturer corporate headquarters- that the installer is certified by the manufacturer to install this type of synthetic grass installation.
4. Certified copies of independent (third-party) laboratory reports on ASTM tests as follows:
 - a) Pile Height, Face or Pile Weight & Total Fabric Weight, ASTM D418 or D5848
 - b) Primary & Secondary Backing Weights, ASTM D418 and D5848
 - c) Tuft Bind, ASTM D1335
 - d) Grab Tear Strength, ASTM D1682 or D5034
 - e) Infill Materials, ASTM F3188-16
5. List of Ten (10) similar existing installations that have been installed in Massachusetts including, Owner representative and telephone number(s).
6. The Turf Contractor and Turf Manufacturer (if different from the company) shall provide evidence that their turf system does not violate any other manufacturer's patents, patents allowed or patents pending. Evidence shall be in the form of a written document stating such and signed by the Turf Manufacturers Corporate Headquarters.
7. The Turf Contractor and Turf Manufacturer (if different from the company) shall provide a sample copy of insured, non-pro-rated warranty and NON-CANCELABLE third-party warranty insurance policy with a policy minimum claim limits of at least \$350,000 and annual aggregate limit of at least \$10,000,000 in order to fully cover the full replacement of the turf system in the event of total failure.
8. Letter stating the products anticipated lifespan.
9. A letter and specifications sheet certifying that the products in this section meet or exceed specified requirements including certification from the turf manufacturer that lead or lead chromate are not used in the manufacturing of the specified system.
10. A letter and specifications sheet certifying that the products in this section meet or exceed specified requirements including certification from the turf manufacturer that lead or lead chromate, or PFAS/PFOS are not used in the manufacturing of the specified system. Including test results from the time the material leaves the plant indicating such.
11. Warranty must cover full 100% of replacement value of total square footage installed.

Minimum \$10.00 per square foot.

- C. The General Contractor / Site Contractor shall be defined as the contractor who is responsible for the construction of the site components related to and located beneath the turf product, inclusive of but not limited to all cuts and fills as needed to establish an approved subgrade, the dynamic stone drainage system, the flat drains, the perimeter collection system. The turf supplier / installer is a subcontractor to the general contractor. The General Contractor / Site Contractor shall have installed a minimum of five (5) Turf Fields in the last three (3) years and shall provide documentation and contact information for such.

1.03 Shock Attenuation Evaluation:

- A. Near the completion of the turf, hire an independent testing laboratory to perform ten (10) in place G max tests in compliance with ASTM F1936 and F355. Results shall not exceed 125. If results exceed 125, contractor shall replace elastic performance shock pad system where Gmax rating exceeds 125 at no cost to the Owner. Perform additional testing to verify the results as required by the Owner's Representative.
- B. Guarantee: During the eight (8) year guarantee period, the G max rating shall remain less than 165. The Contractor shall contract with an independent testing laboratory to perform three (3) in place G max tests each on site during the first, third, fifth, seventh and eighth years. If any test results meet or exceed 165, replace elastic performance shock pad as necessary to achieve satisfactory results at no cost to the Owner. Perform additional testing to verify the results as required by the Owner's Representative. If the G max rating exceeds 165 after three attempts to repair the high rating, replace the field within 90 calendar days at no cost to the Owner.

1.04 Pre-Installation Meeting:

- A. Convene One (1) Week After Bid Opening:
 - 1. An interview shall take place at a time and date to be determined by the Engineer at the district office or other location determined by the Engineer and Owner. Present at this meeting shall be the Engineer, Owner's Representative(s), the Project Manager and Site Superintendent for the Prime Contractor and the Project Manager and Project Foreman for the Turf Installer. The purpose of this meeting will be to review turf product and installation means and methods, to interview and ascertain the experience and competence of the Turf Installer, as well as, the onsite Project Foreman for this project and to review the project schedule. The basis of choosing this particular product shall be in part due to the results of this interview process. Contractor shall submit all required submittals before this meeting.
- B. Convene One (1) Week Prior to Stone Base Completion:
 - 1. A second meeting shall take place at a location, time, and date to be determined by the Owner's Representative. Present at this meeting shall be the Owner's Representative(s), and the Project Manager for the Site Contractor. The purpose of this meeting shall be to review and confirm schedule. (with particular attention on the turf installation) and to confirm that the turf product has been ordered by way of notarized copies of the original confirmed Purchase Order and guaranteed delivery date.

1.05 Delivery, Storage, and Protection

- A. Deliver products to project site in wrapped condition.
- B. Store products under cover and elevated above grade.
- C. Protect all products and installation area from vandalism, theft, other construction, etc.

1.06 Warranties

- A. The Turf Manufacturer 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 onsite representative has inspected the installation and that the work conforms to the manufacturer's requirements. The turf fabric shall not lose more than an average 2% per year. The manufacturer shall guarantee the availability of replacement material for the synthetic turf system installed for the life of the warranty.

- B. The Manufacturer's Warranty shall include general wear and damage caused from UV degradation. The warranty shall specifically exclude vandalism and acts of God beyond the control of the Owner or the manufacturer.
- C. The Turf Manufacturer's Warranty must be supported by an insurance policy of the full eight (8) year period.
- D. The Turf Contractor shall provide a Warranty to the Owner that covers defects in the installation workmanship, and further warrant that the installation was done in accordance with both the Manufactures' recommendations and any written directives of the Manufacturer's onsite representative.
- E. The synthetic grass turf must maintain an ASTM F355 and ASTM F1936 G-max between 125-165 for the life of the Warranty.
- F. Any repairs or service to the field requested by the Owner or Owner's representative shall be addressed within 14-days from the date of written notification.
- G. The Turf Manufacturer shall be 100% responsible for and warranty all products installed as part of his system inclusive of the fibers whether the fibers are manufactured by the turf company or by others.

1.07 Maintenance Service

- A. The Turf Contractor will train the Owner's facility maintenance staff in the use of the specified maintenance attachments and equipment to routinely groom and sweep the field. Equipment shall be in good working condition.

1.08 ADA Handicap Accessible

- A. Synthetic turf system shall be approved as ADA compliant as determined by Test-Method ASTM 1951-99.
- B. Proof of passing must be submitted for approval.

PART 2 - PRODUCTS

2.01 Base Stone and Drainage System

Sieves	Base Stone-Type 1	Base Stone-Type 2	Finishing Stone
3"			
2"	100		
1 ½"	90-100		
1"	75-100	100	
¾"	65-95	90-100	
½"	55-85	80-100	100

3/8"	40-75	70-100	85-100
1/4"	25-65	60-90	75-100
US#4	15-60	50-85	60-90
US#8	0-40	30-65	35-75
US#16	0-20	10-50	10-55
US#30	0-10	0-35	0-40
US#60	0-8	0-15	0-15
US#100	0-6	0-8	0-8
US#200	0-5	0-2	0-2

PLEASE NOTE THAT THE BASE STONE AND DRAINAGE STONE SYSTEM IS A SPECIAL MANUFACTURED PRODUCT AND ANY DEVIATION FROM THIS MATERIAL SHALL REQUIRE WRITTEN APPROVAL FROM THE TURF MANUFACTURER'S CORPORATE HEADQUARTERS. THE BASE STONE AND FINISHING STONE PRODUCT IS A 100% CLEANED WASHED QUARRY STONE MIXTURE. GRAVEL AND SAND MIX MATERIAL SHALL NOT BE ALLOWED (NO EXCEPTIONS)

RESTRICTIONS:

- A. To ensure structural stability: $D_{60}/D_{10} > 5$ and $1 < \frac{D_{20}^2}{D_{30}} < 3$
 $D_{10} D_{60}$ Fragmentation must be 100%.
- B. To ensure separation of both stones: $\frac{D_{85} \text{ of finishing stone}}{D_{15} \text{ of base stone}} > 2$
 $3 < \frac{D_{50} \text{ of base stone}}{D_{50} \text{ of finishing stone}} < 6$
- C. To ensure proper drainage: Permeability of base stone > 50 in/hr. (3.5×10^{-2} cm/sec)
Permeability of finishing stone > 10 in/hr. (7.0×10^{-3} cm/sec)
Porosity of both stones $> 25\%$
(When stone is saturated and compacted to 95% Proctor.)

2.02 Perimeter Edge: Concrete Turf Anchor – Refer to details.

2.03 Underdrain System

- A. ADS AdvanEdge
 1. 1 inch by 12-inch flat drain.
 2. ADS AdvanEdge end connector with 4-inch ADS pipe.
 3. 12–18-inch diameter perforated collector drainpipe.
 4. 6-inch diameter solid wall HDPE cleanout with 8 inches by 8 inches by 8-gauge aluminum plate with synthetic surface glued directly to plate.
- B. Approved equivalent.

2.04 Elastic Performance Shock Pad System Materials

- A. Manufacturer: Subject to compliance with all specified requirements,
 1. THE CONTRACTOR SHALL PROVIDE AFTER BID, PRIOR TO AWARD, THE

SYNTHETIC GRASS SYSTEM MANUFACTURER AND SYSTEM HIS/HER BID IS
BASED ON.

- B. The drainage stone layer shall be compacted and approved by the Owner's Representative, turf, and elastic performance shock pad installer (if different from the Contractor). Approved compacted drainage stone base layer shall serve as the base for the elastic shock pad.
- C. Paved in place elastic performance shock pad shall be a composite mixture of SBR rubber 1-5mm, combined with ¼ +/- clean dry aggregate and high grade outdoor stabilized polyurethane binder. A total pad thickness shall be 36 mm minimum. Polyurethane binder content shall be adjusted to provide the required shock attenuation.
- D. Shock pad shall have a permeability rate of not less than 14-inch/hour. Rate shall be tested in the field with Owner's Representative present.
- E. Finish system, including the shock pad and carpet shall have a shock attenuation ranging from 95-125 in accordance with ASTM F-355 Gmax ratings.

Material	LBS/ Square Yard
1-5 mm black rubber SBR rubber granule	46%-47% by weight
¼-inch stone aggregate	46%-47% by weight
Polyurethane binder	6%-8% by weight
Total Weight	42-46 LBS/Square Yard

Mix ratios are for reference only. Adjustments may be required to meet the specifications herein.

- F. The elastic performance shock pad shall consist of virgin SBR crumb rubber. SBR rubber shall conform to all STC regulation standards for safety. The contractor shall submit to the Owner's Representative for approval all SBR product data inclusive of material size and content. Failure to do so shall be at the contractor's risk and cost.
- G. The Synthetic Grass Material shall be in strict accordance with the following:
 1. The slit film fiber shall be an 8,0000 denier 100-micron minimum thickness, and nylon shall be 4,400 deniers 100-micron minimum thickness. Slit film tape and nylon shall be 100% polyethylene, low-friction fiber, measuring not less than an average of ¾-inches high. The low friction fiber shall be specifically designed to virtually eliminate abrasion. The fiber shall be a hybrid fiber combo with multi-structured nylon thatch and slit-film fibers tufted together in same or alternating needle construction per General specification part 1-1.01-A-2.
 2. The tufted fiber weight shall not be less than 74 ounces per square yard. The fiber shall be tufted on a 3/8" to 3/4" tufting machine. The overall product weight must not be less than 94 ounces per square yard. The low friction non-abrasive fiber shall be 100% polyethylene, treated with a UV inhibitor. Systems that use polyethylene/ polypropylene blended fibers.
 3. The carpet shall be delivered in 15' wide rolls. The rolls shall be of sufficient length to go from edge of track to edge of track. Head seams will not be acceptable.
 4. All field lines, numbers and markings indicated on the plans shall be permanently installed or painted as indicated in the plans.
 5. The fiber shall be "Field Green" or approved equal in color to simulate natural grass as closely as possible and treated with UV inhibitor, guaranteed a minimum of eight (8)

years.

2.05 Turf Data

Pile Weight:	Min. 74 oz/sy for 3/4"
Face Yarn Type:	100% Polyethylene
Yarn Size:	
Nylon	4,400 Denier (260-micron minimum thickness)
Slit Film	8,000 Denier (100-micron minimum thickness)
Pile Height (Finished)	3/4"
Color:	Field Green
Construction:	Broadloom Tufted
Stitch Rate:	As needed
Tufting Gauge:	1/4"
Primary Backing:	6 oz/sy
Secondary Backing:	20 oz/sy Urethane
Total Product Weight:	94 oz/sy (± 3 oz) Min.
Finished Roll Width:	15'
Finished Roll Length:	Up to 220'
Perforation (Outdoors):	3/16" Holes on Staggered 4" (approximate)
Center Permeability:	14" ± Per Hour

Turf contractor shall provide independent study data on permeability requirements.

Field Lines & Markings: Tufted, Inlaid and Painted

- H. An Owner's Representative approved equivalent.

PART 3 - INSTALLATION

3.01 Subgrade / Subbase Approvals

- A. Prior to the installation of the Synthetic Grass Infill System, the General/Site Contractor shall provide written certification that all subgrade, subbase, leveling course and slopes and elevations are in compliance with the Contract Documents and meets or exceeds all manufacturer's requirements. This certification shall be prepared by an approved Installer. The finished grade of the subbase shall not vary more than 3/16" in ten (10) feet. A laser grader must be used to meet the requirements.
- B. The General/Site Contractor shall also provide an as-built survey of the finished subgrade and finished leveling course with spot grades every 25 feet on center each way for approval.
- C. The General/Site Contractor shall prepare a minimum 25'x25' (twenty-five foot by twenty-five foot) mock-up of the approved materials for the subbase and leveling course system in order to evaluate porosity and stability prior to installing material over the entire field. If acceptable the mock-up may become part of the finished field.

3.02 Elastic Performance Shock Pad System

- A. Verification of Conditions (by Installer): Examine conditions under which pad surfacing is to be installed in coordination with Installer of materials and components specified in this Section and notify affected Prime Contractors and Owner's Representative in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
1. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to Owner's Representative written confirmation from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.

2. Elastic Performance Shock Pad System: Provide manufacturer's inspection and certification that surface to receive synthetic turf is ready for installation of synthetic turf system, is perfectly clean in accordance with manufacturer's standards, and will be maintained in acceptable clean condition throughout installation.
- B. Installation: Install in strict accordance with manufacturer's written specifications and recommendations.
1. The paved in place elastic layer shall be minimum 36 mm nominal thickness, energy absorbing, elastic layer. Composition of granulated SBR rubber, stone aggregate and polyurethane binder. Elastic layer system shall demonstrate resistance to rot, mildew, free thaw, and compression set associated with normal athletic field use. The installed elastic layer shall conform with the specified testing requirements and performance characteristics set herein.
 2. Material shall not be installed when ambient temperature is below 50 degrees or above 100 degrees F, or if the materials are wet or if rain is falling or anticipated to fall.
 3. Shock pad system shall be installed in two lift at minimum uniform thickness (26 mm layer and 9 mm layer). Joints shall be troweled with compaction by a paving machine operator as the pad material is paved. Seams shall be hand rolled. Cold pad joints shall be primed with a polyurethane primer supplied by the SBR manufacturer.
 4. Surface irregularities which exceed ¼-inch by means of 10-foot straight edge shall be corrected prior to placement of synthetic turf carpet.
 5. Installed contractor shall use SMG Planimetric model # 928-D or approved equal paving machine with fully electronic leveling and steering controls and SMG Mixmatic continuous mixer or approved equal with gravel attachment.
 6. Installing contractor shall only use an experienced superintendent that has prior experience installing this type of system or similar.
- C. Synthetic Turf
1. Unless otherwise recommended by turf and base manufacturer, lay turf loosely across field, stretched, and attached to perimeter edge detail with sufficient length to permit full cross-field installation without head or cross-seams. **(Head and cross-seams shall not be permitted)**
 2. Per the manufacturer's recommendation, the installation of turf field rolls shall be fully glued down, field lines shall be sewn in or cut and glued. All field line installation shall be covered under the warranty.
 3. Field markings: Apply and install fixed markings as indicated herein and in accordance with the Contract Drawings. All markings can be sheared/shaved or cut and glued.
 4. Provide final cleaning of synthetic grass surfacing installations and maintain area clean and free from debris during installation. Clean surfaces, recesses, enclosures, and similar areas as required leaving area of installation in clean, immaculate condition ready for immediate occupancy and using by Owner.
 5. Protect installed synthetic grass from subsequent construction operations. Do not permit traffic over unprotected surfacing.
 6. The turf manufacturer shall provide training for the Owner's facility maintenance staff in use of grooming equipment recommended by the manufacturer.

3.03 Maintenance and Warranty

- A. The turf installer and/or the turf manufacturer must provide the following:

1. The turf manufacturer shall provide a warranty to the Owner that covers defects in materials and workmanship of the turf for a period of eight years from the date of Substantial Completion. The turf manufacturer must verify that their on-site representative has inspected the installation and that the work conforms to the manufacturer's requirements. The polyethylene yarn manufacturer shall provide an eight (8) year "UV stabilization" warranty.
2. The manufacturer's warranty shall include general wear and damage caused from UV degradation. The warranty shall specifically exclude vandalism, acts of War, and acts of God beyond the control of the Owner of the manufacturer.
3. The turf contractor shall provide a warranty to the owner that covers defects in the installation workmanship, and further warrant the installation was done in accordance with both the manufacturer's recommendations and any written directives of the manufacturer's on-site representative.
4. All turf warranties shall be limited to repair or replacement of the affected areas and shall include all necessary materials, labor, transportation costs, etc. to complete said repairs. All warranties are contingent on the full payment by the Owner of all pertinent invoices.

-END OF SECTION 32 18 13-
SYNTHETIC GRASS SYSTEM

// ELEVATE 68

STANDARD COLORS



FIELD GREEN



BLACK

(for line packages only)



WHITE

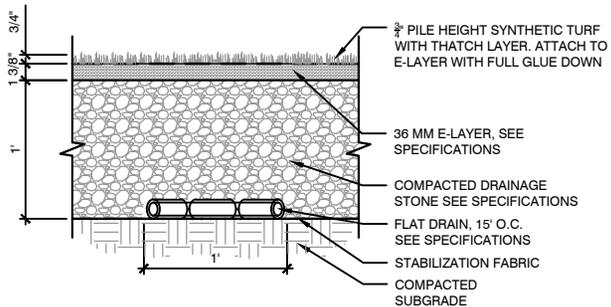
(for line packages only)

The colors shown are not intended for color matching purposes, please refer to actual sample swatches for accurate colors.

YARN DESCRIPTION.....	Slit film/Nylon thatch
MELT POINT (TAPE).....	120° C
MELT POINT (SPIKEZONE).....	220° C
LINEAR DENSITY (DENIER, TAPE)*.....	8,000
LINEAR DENSITY (DENIER, NYLON).....	4,400
SPECIFIC GRAVITY (TAPE).....	0.945 g/cc
SPECIFIC GRAVITY (NYLON).....	1.15 g/cc
THICKNESS (TAPE).....	100 microns
THICKNESS (NYLON).....	100 microns
YARN BREAK STRENGTH (TAPE).....	16 lb-F
YARN BREAK STRENGTH (NYLON).....	20 lb-F
YARN ELONGATION (TAPE).....	50%
YARN ELONGATION (NYLON).....	50%
TOTAL LEAD CONTENT (TAPE).....	< 100 ppm
TOTAL LEAD CONTENT (NYLON).....	< 100 ppm

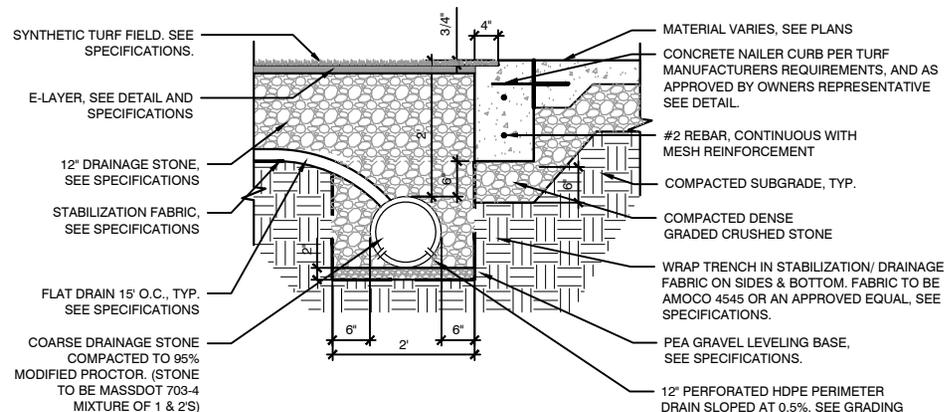
TOTAL WEIGHT*.....	94 oz/yd ²
PILE WEIGHT*.....	68 oz/yd ²
PRIMARY BACKING WEIGHT*.....	6 oz/yd ²
SECONDARY BACKING WEIGHT**.....	20 oz/yd ²
AVERAGE PILE HEIGHT*.....	0.75"
AVERAGE TUFT BIND STRENGTH.....	as required
AVERAGE BREAKING STRENGTH.....	> 150 lb-F
STITCHES PER INCH.....	as needed
GAUGE.....	1/4
PILL FLAMMABILITY.....	8 of 8 pass
ABRASIVE INDEX.....	< 30
INFILTRATION RATE.....	> 14 in / hr
FOOTBALL SHOE TRACTION (DRY).....	Initiate 1.0 Slide 0.8
FOOTBALL SHOE TRACTION (WET).....	Initiate 1.0 Slide 0.8
SOCCER SHOE TRACTION (DRY).....	Initiate 1.0 Slide 0.8
SOCCER SHOE TRACTION (WET).....	Initiate 1.0 Slide 0.8
AVERAGE SOCCER BALL REBOUND.....	> 0.6 m
AVERAGE G-MAX.....	< 200

Except where noted as a minimum or maximum, the above specifications are nominal.
*All values are ± 5% **All values are ± 3 oz/yd²



NOTES:

1. SUBGRADE ELEVATIONS TO FOLLOW SAME SLOPE AS FINISHED SURFACE ELEVATIONS WITHIN TURF LIMITS.
2. ABSOLUTELY NO SUBSTITUTIONS SHALL BE ALLOWED FOR BOTH THE STONE LEVELING COURSE AND DRAINAGE STONE WITHOUT A WRITTEN AND SIGNED DOCUMENT DIRECTLY FROM THE TURF MANUFACTURER. DOCUMENT SHALL STATE: THE MATERIAL IS AN ACCEPTABLE MATERIAL TO BE USED DIRECTLY UNDER THEIR TURF FIELD FABRIC AND THAT THE SUBSTITUTION MATERIAL PROVIDES THE SAME CHARACTERISTICS (DRAINAGE, STRUCTURAL INTEGRITY, PLAYABILITY, ETC.) AS THE MATERIALS SPECIFIED. FAILURE TO PROVIDE SUCH A DOCUMENT SHALL BE AT THE RISK AND COST OF THE CONTRACTOR.



NOTES:

1. FLAT DRAIN TO BE DIRECTLY CONNECTED TO PERIMETER DRAIN. PROVIDE MANUFACTURED FITTINGS TO MAKE THE CONNECTION AS REQUIRED AND APPROVED BY THE OWNER'S REPRESENTATIVE.
2. CONCRETE NAILER CURB TO BE 4,500 PSI AT 28 DAYS, (AIR CONTENT 6% +/- 1%) (COARSE AGGREGATE ASTM C-33 SIZE #57)

1

SYNTHETIC TURF SURFACING

SCALE: N.T.S.

2

COLLECTOR DRAIN AT SYNTHETIC TURF FIELD

SCALE: N.T.S.

Prepared By:



Project Name:

**IMPROVEMENTS TO
McCONNELL PARK**

30 DENNY ST., BOSTON, 02125

Date

FEBRUARY 2021

Scale

N.T.S.

Sheet Name:

SYNTHETIC TURF

PROJECT DESCRIPTION

Background

McConnell Park currently suffers from public safety concerns related to unenforced parking restrictions and emergency access through Springdale Street as well as flood and stormwater inundation during severe storm events and king tides. This project will provide a designated emergency access route to connect Playstead Road and Denny Street via Springdale Street, an orderly striped parking lot with enforcement signage, and will increase site elevations to alleviate current flood pathways that threaten the northerly residential area. The entirety of proposed park upgrades will provide a more resilient open space amenity to serve residents for decades to come.

Site Description

The McConnell Park (~6 acres) parcel is located on Springdale Street in the Dorchester neighborhood of Boston, south of Playstead Road and Denny Street. The property is bordered to the west by I-93, to the south and east by Massachusetts Department of Conservation and Recreation (DCR) owned harborwalk and the Dorchester Bay, and to the north by Springdale Street and a residential neighborhood. Springdale Street is a “paper street” and is a private way. The existing park property consists of three natural turf softball fields on the western portion of the site, an impervious parking area and unofficial emergency access drive near the center of the site, and a lawn area with mature tree canopy to the east. The park is bisected by an impervious access drive which serves the adjacent Dorchester Yacht Club. The park also includes a children’s playground with pervious mulch fiber surfacing near the harborwalk on the southern edge of the parcel. DCR’s signature is included in this submittal only to show they are aware of and approve of the proposed changes.

Scope of Work

This project consists of reconstructing the ball fields to include fully lit natural turf Little League and Softball fields, an accessible synthetic turf challenger league diamond, an expanded and upgraded inclusive playground, an improved parking lot with designated emergency drive, a pedestrian plaza with traffic calming devices, and improved tree canopy to increase shade. Additional site improvements include street lighting and security cameras, paved walkways, spectator seating areas, portable restroom shelter, site furnishings, and planting areas.

This project will also include significant improvements to on-site storm water management. As currently designed, storm water will be captured by deep sump hooded catch basins or curb inlets and treated by planted basins and conveyed to underground storage chambers to minimize peak flows off-site. A number of check valves will be installed at downstream drain pipe locations to mitigate upwelling during severe storm events. Stormwater recharge is not recommended on-site due to the soil classification and state regulations which discourage the practice of infiltration into material containing urban debris. This improved system will alleviate stormwater and floodwater threats on-site and will treat and hold water before directing to the nearby outfall at Morrissey Boulevard.

Environmental Considerations

Sensitive environmental resource areas in, or near, the work area include Coastal Bank, 25-foot Waterfront Area and Land Subject to Coastal Storm Flowage. No work is proposed within the mean high-water limit.

Work will impact approximately 265,800 square feet of Land Subject to Coastal Storm Flowage, 10,600 square feet of 25-foot Waterfront Area, and 68,800 square feet of the 100' Coastal Buffer. This work will occur within previously altered area (the park and playground) and will include construction of new ballfields, playground, paved walkways and parking lot, and new planted areas. Because the first inch of stormwater runoff is being collected from all impervious surfaces and treated, negative environmental impacts to the Land Subject to Coastal Storm Flowage resource area are not anticipated.

The length of Coastal Bank that abuts the park property is 1,020 linear feet and will not be impacted as part of the park improvements.

To protect the resource areas outside the work area (Coastal Bank) during construction, compost tubes and catch basin sediment protection measures will be placed around the perimeter of the work area at the interface with resource areas. The erosion controls will be monitored throughout the project and accumulated sediment will be removed.

Climate Resiliency

The proposed improvements include several considerations for potential effects of projected climate change scenarios. In regard to sea level rise, areas of the site are proposed to be elevated to act as a barrier and enclose key flood pathways that exist on site today. The proposed parking lot layout and elevations will raise the new parking lot, Springdale Street and multiuse plaza up to 5 feet, utilizing lightweight fill material and stabilized with geogrid, to achieve elevations of 17.00 ft to 19.60 ft BCB. This elevation change is intended to increase the resiliency of the parking lot, Springdale Street, and residential abutters. The intent of the project is to transition from existing elevations for the parking lot and access drive up to and above elevation 18.00 ft BCB which is the expected base flood elevation in 2050 for the 100-year storm, while considering existing topographical and private property limitations of surrounding abutters and accessibility requirements. All other areas of the park and the proposed amenities below elevation 18.00 ft BCB are being topographically graded to ensure improved stormwater collection, drainage, and flood recovery time. The proposed contouring and topography throughout the park will range from 0 to 1-foot of fill throughout the athletic fields and transition back to existing grades at the eastern limits of the park. As noted, the project will improve peak discharge rates for stormwater for the 2-year, 10-year, 25-year, and 100-year storms as compared to existing condition.

In consideration of stormwater flooding changes with anticipated storm intensity and frequency, the stormwater design proposal reduces peak flow during several storm events, provides subsurface chambers to store and infiltrate excess stormwater, and adds check-valves to mitigate the risk of upwelling from downstream structures during such scenarios. More specifically, the proposed stormwater design provides for 60% peak discharge reduction for the 2-year storm, 35% reduction for the 10-year storm, 28% reduction for the

25-year, and 20% reduction at the 100-year storm event downstream. Additionally, Low Impact Development (LID) techniques are utilized throughout the park design and include minimizing disturbance to existing trees and shrubs and introducing bioretention basins where feasible with existing soil conditions. The proposed subsurface infiltration chambers located adjacent to the access drive and parking lot will hold stormwater on-site to further reduce the downstream and offsite pressures at the existing outlet culvert that runs parallel to the DCR Harborwalk and services much of the Savin Hill neighborhood.

The proposed finish materials and planting also consider projected climate change scenarios in relation to heat island effect and increased peak air temperatures as they impact visitor comfort. Numerous shade trees will be planted throughout the site and will offer more shade than present conditions, especially over time as the trees mature. Furthermore, low-albedo pavement finishes, and grass and shrub plantings have been selected in areas where park visitors are expected to gather contributing to a cooler microclimate with the tree increased canopy. The proposed planting palette adapts to the increased risk in severe coastal storms by minimizing the effects of erosion and dampening wave action while also tolerating saltwater in the face of inundation.

Synthetic turf fields and their impacts on heat island effect continue to be studied across the country in regard to their performance in extreme heat scenarios. We understand that synthetic turf fields are subject to warmer temperatures at the field surface as compared to natural turf athletic fields, specifically synthetic turf fields with a dark infill material. While most published studies analyze turf temperatures with infill materials with temperature increases of 30-55 degrees depending on a variety of factors, concrete conclusions cannot be drawn for turf fields that do not utilize infill to our knowledge. As noted, the proposed synthetic turf surfacing at the Challenger League¹ field will utilize a turf system that does not require infill but is comprised of a virgin rubber elastic performance shock layer below the 3/4" height fiber turf carpet. The project team selected this synthetic turf system for Challenger League field because it meets the universal and ADA accessible surfacing requirements while eliminating the risk of infill migration during severe coastal flooding events.

While it is difficult to quantify how much this specific turf system reduces the potential for increased surface temperature and inherent heat island effect, we believe the shorter carpet pile height of 3/4" compared to the more typical 2-1/4" or 2-1/2" decreases the surface area and thus reduces the overall volume of material to absorb heat. Furthermore, the overall square footage of this Challenger League field is 16,780 SF compared to a typical 38,550 SF Little League field, further decreasing the surface area to absorb heat by approximately 2.25 times that of a typical field. During the construction material process, the project team will select turf colors that both limit glare associated with the fibers and have low heat absorption to ensure playability and comfort. The Boston Parks and Recreation Department wishes to implement this Challenger League field as it satisfies the community's need for an inclusive, fully accessible athletic field. Additionally, BPRD takes public safety risks into consideration when offering permit use of synthetic turf fields; BPRD will limit use of such fields under extreme heat scenarios. This ball field is anticipated to be used during the spring and fall months or the non-peak ambient air temperature months,

¹Challenger League is an adaptive baseball program for individuals with physical and intellectual disabilities.

thus lessening the risk for adverse heat impacts to players. Additionally, the proposed design strives to provide increased player comfort with shaded dugouts and shade tree planting adjacent to the field.

Land Subject to Coastal Storm Flowage (LSCSF)

There are no performance standards for Land Subject to Coastal Storm Flowage in the WPA regulations however, the Massachusetts Department of Environmental Protection (MassDEP) and the Massachusetts Office of Coastal Zone Management (CZM) have created the Coastal Manual which provides technical guidance on the coastal resource areas identified in the WPA. The Coastal Manual identifies the importance of Land Subject to Coastal Storm Flowage relative to the interests of storm damage prevention and flood control and sets forth three presumptions for Conservation Commissions to Consider when reviewing projects that occur in this resource area. These three presumptions set forth in the Coastal Manual (Page 2-39) have been taken into consideration and are addressed here;

1. Presume that land subject to coastal storm flowage performs functions for the storm damage prevention and flood control interests

The Limit of Work consists of already developed area (playground and park). As stated above, this project will increase site elevations and upgrade the stormwater management system to alleviate current flood pathways that threaten the northerly residential area.

2. Consider whether the project adversely impacts these functions and interests

As noted above, the proposed project intends to enhance the current stormwater management system on site and remove some of the land out of the floodzone.

3. Impose conditions to contribute to the protection of these interests.

Proper sediment and erosion control measures will be utilized on site to protect surrounding resource areas (Dorchester Bay).

The Coastal Manual also recommends that:

“Commissions should consider the impacts of the proposed project on the landform and whether the project increases the elevation or velocity of flood waters or increases flow due to a change in direction or flow characteristics (e.g., change in direction) on the subject site, adjacent properties, or any public or private way”

As noted above, this project will increase site elevations to alleviate current flood pathways that threaten the northerly residential area. The project will ultimately result in improved floodwater characteristics. See Appendix B for a complete stormwater report.

25' Waterfront Area

This project will have approximately 10,600 square feet of impact to the 25' Waterfront Area, a resource protected by the Boston Conservation Commission Wetland Regulations. The Boston Wetland Ordinance states the following regarding buffer zones:

The Buffer Zone is presumed important to the protection of the resource areas because activities undertaken in close proximity to resource areas have a reasonable probability of adverse impact upon the wetland or other resource, either immediately, as a consequence of construction, or over time, as a consequence of daily operation or existence of the activities. These adverse impacts from construction and use can include, without limitation, erosion, siltation, loss of groundwater recharge, degraded water quality, loss of wildlife habitat, degradation of wetland plant habitat, alteration of hydrology, soil contamination, and proliferation of invasive plants.

While the 25' Waterfront Area is in close proximity to coastal bank, it is considered already altered area that consists of manicured lawn, concrete, and bituminous pavement. Work in this area includes installation of concrete paving for portable restroom and field access, manicured lawn, wood guardrail, bituminous concrete at pavement walkways and driveways, vertical granite curb at Dorchester Yacht Club access drive, concrete pavement repairs and bollard relocation at the Harborwalk, and erosion control planting mix at sloped tree bed areas.

Work will also include demolition of existing bituminous and concrete pavement walks and driveways, removal of existing wood guardrail, stripping and stockpiling of topsoil, installation of tree protection for trees to remain, patching and clearing of sloped tree beds, and installation of all items mentioned above.

To avoid erosion and siltation, proper erosion control will be utilized for the duration of the project to protect the waterfront area. No degradation of wetland plant habitat or loss of wildlife habitat is anticipated because as stated above the 25' Waterfront Area is considered already an altered area. Proper tree protection will be applied to protect the trees to remain.



STC Guidelines for Maintenance



of Synthetic Turf Sports Fields

Published January 2013

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Introduction

Purpose

With thousands of sports field installations throughout North America, the Synthetic Turf Council is pleased that so many field owners have enjoyed the appearance, performance, playability and longevity benefits that a synthetic turf surface can provide. In order to maximize the investment and benefits of a synthetic turf surface, maintenance is essential. These voluntary guidelines provide owners with objective maintenance guidance to augment, and not replace, the maintenance requirements and procedures of the company or companies providing the warranty for the field and the installation.

Objectives

There are four key areas that drive the need for objective synthetic turf maintenance guidelines:

- **Maximize the appearance and longevity of your synthetic turf**—Improperly maintained fields will degrade faster and compromise playing conditions.
- **Ensure maximum performance and playability**—The *STC Guidelines for Synthetic Turf Performance*, available at www.syntheticurfCouncil.org, states, “proper maintenance is essential for the performance and quality of any synthetic turf system.” Through a combination of regular maintenance and performance testing, it is possible to track the synthetic sports field’s performance and anticipate the end of its useful life.
- **Address field usage topics and special circumstances**—Factors such as age, hours of use, type of usage, climate, contamination and other situations impact the performance of the synthetic turf.
- **Meet your field’s warranty requirements**—While a maintenance regimen can support the requirements of a warranty, the details of a maintenance plan should be carefully reviewed with the field builder to assure that it complies with and does not void any provisions of the warranty.

Field builder—For purposes of this document, a field builder is defined as the company having primary responsibility for installing the synthetic turf sports field, either directly or indirectly through a subcontractor or distributor, and providing the overall warranty for the installation and the field materials.

Scope

While there are numerous types and uses of synthetic turf, this document focuses on synthetic turf systems designed for sports fields. This document addresses the following topics for a field owner:

- Suggested approach to maintenance
- Routine maintenance
- Comprehensive maintenance
- Field rejuvenation
- Special circumstances
- Usage considerations

Approach to Maintenance

As stated in the Introduction, a solid maintenance program is essential to achieving the appearance, performance, playability and longevity benefits of synthetic turf. A field owner should take the following approach towards maintenance:

Prior to Purchase

Communication

- Understand that no synthetic turf system is “maintenance free”.
- Obtain the field builder’s warranty and maintenance guidelines. Ask questions to understand the implications and requirements of each throughout the useful life of the synthetic turf.
- Discuss the anticipated usage of your field with your field builder. Obtain a maintenance plan that is designed for your field and its planned usage.

Purchase/Design Considerations

- Include in your purchase specific maintenance equipment, repair materials (extra synthetic turf, seaming tape and glue).
- For synthetic turf fields with an irrigation system, consult an irrigation specialist to ensure that the system will not cause the field to become over-saturated when irrigated. Only potable water should be used for irrigation.
- Design and locate the field to avoid contamination from adjacent areas.
 - ⇒ Ensure player walkways to the field are clean, and install a brush mat at the entrance to the field. Where necessary, cross over covers can be used for player entry onto the field.
 - ⇒ Consider installing paved areas around the field to prevent contamination from nearby vegetation, spectators, maintenance vehicle tires, etc.
 - ⇒ If possible, locate the field away from sources of airborne pollutants, flood plains, and other problematic situations.
 - ⇒ Ensure that all surrounding surface water is directed away from the field.

Establish Responsibility

- Understand who will perform the ongoing maintenance, including repairs, and its cost throughout the useful life of the field. The maintenance can be performed by the field owner with its own equipment and personnel, or outsourced to either a qualified maintenance firm or the field builder. If a third-party maintenance firm is to be engaged, make sure it is pre-approved by the field builder and it agrees to maintain your desired performance criteria. The STC maintains on its website, www.syntheticurfCouncil.org, an *Online Buyer’s Guide and Member Directory* that includes a

listing of STC Certified and other maintenance service providers.

- The field builder should confirm in writing before any maintenance work is performed on the field that the ongoing maintenance program, service provider, and maintenance equipment are acceptable, comply with and will not void any warranty provisions.

Accepting Your New Field

- **Training**—Field owner personnel should be trained on the synthetic turf warranty, the field builder's maintenance guidelines and these STC Maintenance Guidelines. Training should include information about the specific components and materials of the installed system, the proper use of the synthetic turf maintenance equipment you will be operating, and the steps to ensure that optimal benefits are obtained while satisfying warranty requirements.
- **Testing**—Conduct any on-site field testing by a recognized third-party lab that may have been specified during the purchase or bid process to determine if the field meets desired performance criteria, e.g., those highlighted in the *STC Guidelines for Synthetic Turf Performance*. This will help benchmark the performance characteristics of the field when it is new against test results taken throughout its useful life.

Protecting Your Field

- Establish signage and local rules for the use of the field to avoid field contamination and damage.
- If the field is in a flood plain, cover it when the threat of flooding exists with a specialized tarp designed to limit silt and debris from contaminating the field surface.
- Encourage coaches and players to rotate activities to different sections of the field to prevent high wear areas.
- Provide trash and litter containers on site and make sure there are enough containers to eliminate overflow.
- Route field access traffic in such a way as to minimize the tracking of mud and dirt onto the field.
- Set up drinks for players during practice breaks off of the field, if possible.
- Do not perform any maintenance or other activity that may invalidate the warranty.
- Report any field damage to the field builder immediately. Damages need to be immediately repaired to avoid an escalating problem.
- Plan to perform the maintenance recommended by your field builder. In terms of time, you should budget one hour of inspection and maintenance for every 10 hours of playing time.

- Ensure a maintenance and activity log is maintained. This is often required by the warranty. It is important that each and every maintenance operation, no matter how minor, be recorded in the log. Please ask your field builder for a form, but in general, the following information should be logged:
 - ⇒ Type of Activity during week
 - ⇒ Estimated number of hours used during week
 - ⇒ Average number of participants per hour
 - ⇒ Type of maintenance activity performed
 - ⇒ Remarks/Notes
 - ⇒ Signature of maintenance supervisor

Routine Maintenance—Ongoing

The basic components of effective, routine maintenance are to:

- Conduct inspections and perform minor repairs to avoid playing hazards.
- Keep the playing surface clean and free of debris and contaminants.
- Brush the surface to preserve appearance, keep grass fibers upright, making sure to use only approved bristles that will not overly abrade the fibers.
- Maintain a maintenance and activity log.

Conduct Inspections and Perform Minor Repairs

A maintenance person should walk the field daily and conduct more detailed inspections according to your field builder's recommended schedule. To avoid permanent damage to your synthetic turf or safety hazards, check regularly for and address such critical items as foreign debris, open seams, etc.

- Look for foreign debris or contamination.
- Check seams and joints where panels or any field markings are joined together. Open joints can create a tripping hazard and should be immediately repaired. An open joint of 12 inches in length or less may not be an indication of seam failure—discuss with your field builder in advance for self-repair techniques and if self-repairs are recommended. Note that open joints of greater than 12 inches in length should be reported to and reviewed with your field builder.
- Note any deteriorating grass fiber conditions, visual or excess wear concerns, drainage concerns, performance concerns, etc. and report them to your field builder.

Keep the Playing Surface Clean

- Remove all waste items on a regular basis. Sweepers can assist in this process. Every loose foreign object, no matter how small, can damage your field by abrading the grass fibers.
- Remove airborne contaminants, such as leaves and other debris. If allowed to remain on the surface for any length of time, they will migrate into the system, inhibiting drainage. Consider covering the field with pre-approved tarp when it is not in use.
- Remove organic material, including animal waste, as soon as possible to impede the growth of algae, weed or moss growth. Leafy trees should not be located next to a field, if possible. Brushing will help

deter organic growth, as will the use of approved fungicides and anti-bacterial treatments.

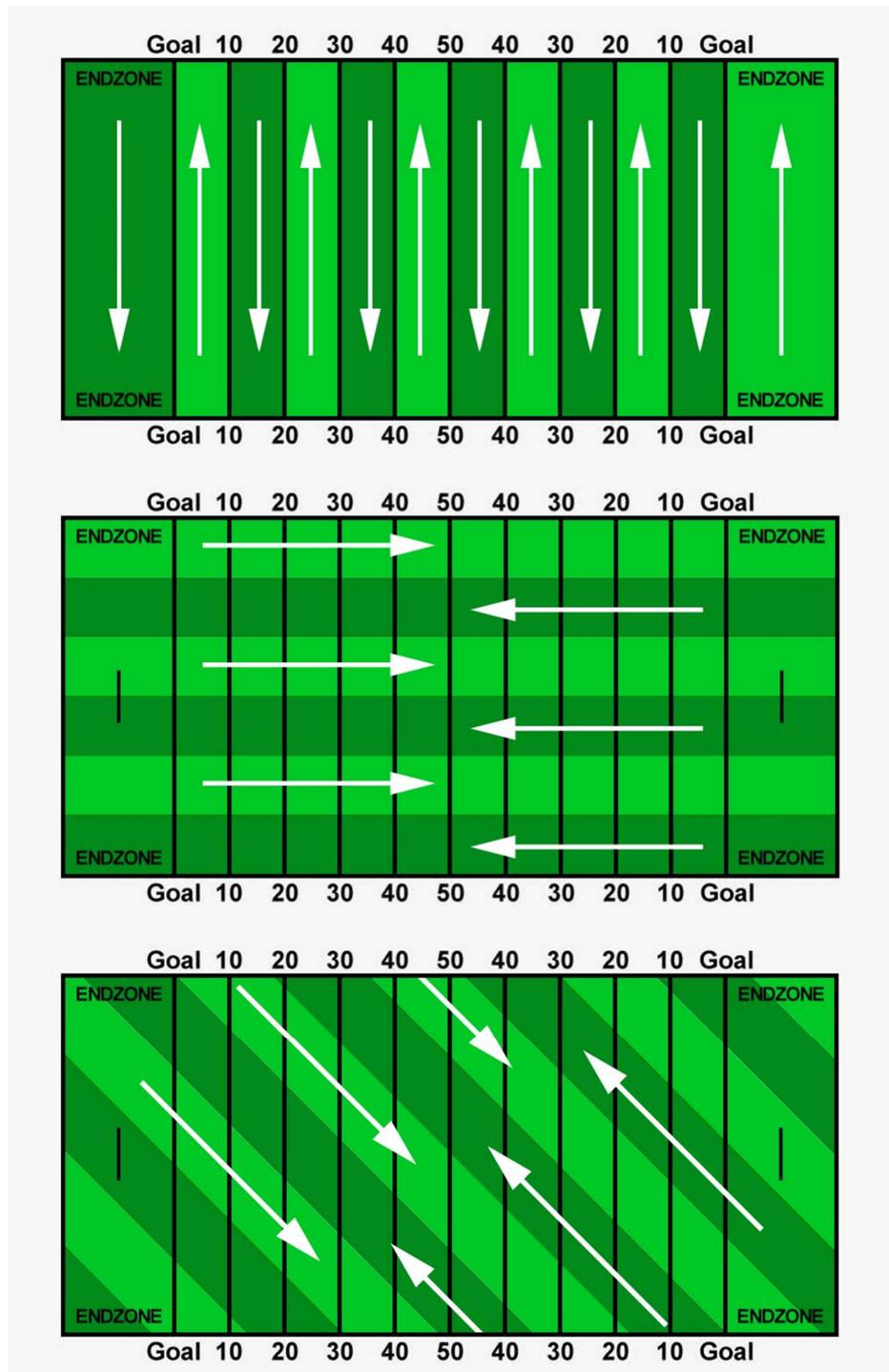
- Don't allow food, sodas, chewing gum, sunflower seeds, chewing tobacco, smoking, etc. on the field.
- Do not use cleaning chemicals containing alcohol or acetone solvents. Chemicals should not be used without consulting with your field builder. Take care to avoid spilling any petroleum-based liquids including fuel onto the surface.

Groom the Surface

Regular brushing is an important function that must not be overlooked or neglected. Brushing helps to keep the grass fibers upright, remove debris, and improve the field appearance. Conversely, the flattening of grass fibers can create a possible acceleration of wear as well as reduced field performance. While grooming, inspect the field for unsafe conditions.

- **Equipment**—Use a static brush to stand up the grass fibers. A mechanical sweeper or other specialty synthetic turf cleaning equipment should be used to remove surface debris. Do not use maintenance equipment before receiving proper use and safety training. Use only equipment and vehicles that are approved by the field builder. Use only synthetic fiber bristles of recommended stiffness. Do not use metal or wire bristles. Do not use 6-wheel vehicles.
- **Method**—Using an average all-purpose vehicle, brushing a standard sized multi-purpose field takes about an hour. The vehicle speed should be low and sharp turns must be avoided. It is most effective to brush the surface when it is dry. The high-wear areas will require additional attention as these zones will obviously have the most disruption and pile flattening due to the intensity of play.
- **Direction**—The surface should be brushed in a number of directions, alternating the direction in consecutive activities, but generally in the direction of the individual panels to avoid crossing over the main seams. On different days, start at different locations so as to alternate the brushing direction for each panel (see graphic on next page).

- **Brush Height Setting**—The optimum brush height setting will depend on the model and type of equipment. Do not set the brush so low that it digs into the turf pile or backing. Too low a setting can damage the turf and the seams.
- **Frequencies**—Ask your field builder for the recommended grooming frequency. In general, the frequency will be related to the intensity of use; however, excessive brushing can cause fiber damage which over time will compromise the field's performance characteristics and longevity.



Comprehensive Maintenance—Semi-Annual to Annual

Situations Requiring Comprehensive Maintenance

Over a period of time, the following situations may arise which will require the need for more comprehensive maintenance:

- Grass fibers become significantly bent, creased and flat.
- Dirt, debris and metal accumulate on or within the system despite routine maintenance.
- Seams become loose or panels shift creating a safety hazard.

When these situations or other concerns arise, contact the field builder and/or a third-party maintenance contractor approved by the field builder.

Comprehensive Maintenance Options

Comprehensive maintenance generally includes the use of specialty maintenance equipment by trained maintenance professionals. Depending upon the situation, the following actions may be performed:

- **Professional field inspection and corrective action**—Assess the field surface, especially heavy wear areas, identify weak or loose seams and inlays, and repair the damage. Sport performance testing may also be desirable.
- **Deep Cleaning**—Use special equipment that combines mechanical brushing and suction to remove surface debris and embedded contaminants.
- **Metal removal**—Use a magnet attached to your maintenance equipment to remove ferrous metal objects from the field.
- **Weed and pest treatment**—Treat with herbicides or pesticides, as required.

Field Rejuvenation—As Needed Maintenance

As fields mature, the accumulation of unwanted or foreign contaminants is inevitable. Events, such as flooding or dust storms, may introduce extreme levels of contamination. This may cause surface hardening and water permeability issues, and compromise field performance.

When a field begins to show signs of deep compaction, such as *g*-max readings that exceed desired levels or significant drainage issues, full field rejuvenation may be desired. These maintenance services are performed using specialized field rejuvenation equipment and personnel and may include:

- Untangling matted and compacted fibers;
- Removal of dust, debris and application of a disinfectant to treat for bacteria.

Special Circumstances—As Needed Maintenance

While not intended as a complete list, the Synthetic Turf Council wishes to provide guidance on certain special circumstances which may require solutions on an “as needed” basis.

Field Markings

- Temporary paints can be used if formulated specifically for *synthetic* turf. Ideally, paint should be applied only to the turf fibers. Remove and reapply paint after a maximum of four applications to avoid hard-to-remove build-up.
- Service companies with specialized equipment are available that can paint and remove lines, logos, end zones, graphics, etc.
- Permanent lines, logos, etc. can age differently than the playing field turf. They may harden or shrink at different rates that will affect *g*-max. Special grooming or other techniques may be required.

Heavy Rain

- If significant ponding occurs after heavy rainfall, it may be an indication of a variety of factors, such as clogged or damaged underground drain pipes or discharge outlets, or base unevenness.

Snow and Ice

Generally snow and ice should be left to melt and drain off the system without assistance. At times, however, it is necessary to remove snow or ice to make the field playable for a scheduled event. The working principle for removing snow is to do so as near to game time as possible. This reduces the likelihood of new snow build-up and will reduce the risk of ice from cold winds whipping across a damp, newly cleared surface. Because ice and wet snow removal is particularly difficult, it is important that you take measures to prevent the build-up of ice and wet snow. Use only pneumatic tires on equipment used for the removal of snow and ice. If a snowplow is used, make sure the blade is guarded with PVC pipe and corner elbows or rubber tips, and the height is adjusted to leave ¼-½” inch of snow on the surface. This is to avoid surface damage. The remaining snow should be left to melt in the sunlight. Avoid using a tarp on the field during freezing weather. Tarps, unless vinyl or poly-coated, can freeze to the surface, and will be very difficult to remove.

In some cases it may be necessary to use a weighted lawn roller over the field to break up ice. The broken ice can then be swept off the field. Generally, if the sun is out and the ice or frost is not excessive, it tends to melt rapidly, especially when players are on the field.

Lightning

Lightning strikes, although rare, can happen. Metal spikes should not be used on the field to reduce the chance of lightning strikes. If your field is struck by lightning, damages beneath the surface are typically greater than the damage to the surface.

Static Electricity

Surfactants like liquid laundry fabric softeners can reduce static electricity.

Stain Removal

Most stains can be removed easily with a solution of hot, but not boiling, water and a field builder's approved household detergent. Brush the stain with a stiff bristle brush, scrub the area with soap and water, rinse with clean water, and pat dry.

Equipment Leaks or Spills

- Prevent leaks or spills by checking equipment and its components thoroughly before use on turf; do not fill fuels, oils, fluids while equipment is on the field. Wipe any excess grease from any/all fittings. Petroleum-based spills can damage the synthetic turf.

Hydraulic fluid—Use only the newer biodegradable fluids, if available for your equipment—don't use petroleum-based fluids. Check with the equipment manufacturer to verify the biodegradable fluid is compatible with the equipment and its warranty. If a leak occurs when using petroleum-based fluids it is important to minimize the damage by stopping and capturing as much fluid as possible. If it gets on the turf, use spill leak towels to soak up the majority of the fluid. Use a solution of household dishwashing liquid and water to break down and clean any remaining fluid from the turf.

- **Motor oil**—See above.
- **Gasoline and diesel**—Don't fill equipment while it is on the turf. Do not overfill. Newer equipment has an overflow tube that drains directly under the equipment and onto the ground. Use a catch pan while filling to prevent accidental spillage.
- **Grease**—Use grease sparingly and wipe any excess off of all fittings, bearings, chains, etc.

Removal of Certain Foreign Objects and Contaminants

- **Chewing gum** can best be removed by using either ice or an aerosol to freeze the gum, which can then be chipped or broken off the turf fibers. If gum has been smeared across fibers, peanut butter will soften and breakdown the gum so that it can be wiped off.
- **Sunflower seeds, peanut shells, pistachio shells**, etc. should be removed as soon as possible by using a handheld or backpack blower. Use minimal throttle to decrease the volume of air.
- **Metal objects** should be picked up by a magnet that is attached to grooming and brushing equipment.
- **Moss, mold, or algae** may appear in underutilized areas of the synthetic turf, particularly if it is in shade and damp. Specialty products are available to treat these organisms and fungi—consult your field builder. If moss, mold, or algae are allowed to harvest and spread, the field may need to be rejuvenated (see *Field Rejuvenation*).
- **Weeds** are easily removed by hand if the infestation has not become too excessive. Treatments are also available.

Synthetic Turf Usage Considerations

It is very important for a field owner to understand that certain activities, usage and other circumstances may impact the field quality, wear and tear, appearance, warranty and performance of a synthetic turf field. If any doubt exists, the field builder should be consulted. The following are some of the suggested considerations for the field owner:

- **Make sure in advance** any maintenance equipment, personnel, techniques, repairs and materials comply with the field builder's specifications and warranty.
- **Verify** that the design, synthetic turf system and maintenance specifications will result in the desired performance outcomes prior to selecting your provider. The *STC Guidelines for Synthetic Turf Performance* are available by visiting www.syntheticturfcouncil.org. The STC also maintains a list of STC Certified consultants, manufacturers, field builders, testing labs, and service providers on its website.
- **Monitor the performance** of your field throughout its useful life with periodic field testing and frequent inspections.
- The following **may damage** the synthetic turf: accidents, vandalism, spiked shoes, animals, wire brushes, fires, fireworks, floods, chemical reactions, acts of God, the use of dry-cleaning fluids or improper cleaning methods, high pressure sprays exceeding 500 psi, storage of heavy materials on the field, and non-approved artificial lights.
- **Certain activities** may damage the synthetic turf such as bicycle traffic, track and field events, golf activities, concerts, etc. Special events and activities should be reviewed with the field builder before the event occurs to ensure that damage is not done. You should also consider consulting with a company that sells field protection.
- The **quality of the sub-base** will directly affect the appearance and performance of the synthetic turf system. Select a base contractor only after carefully checking synthetic turf experience and capabilities. Significant importance should be assigned to grade, stone quality, drainage, etc. If the base is compromised, then the surface will be compromised.
- **Footwear**—Suitable footwear should always be used. Metal spikes should be prohibited and cleats are preferred. Flat-soled rubber shoes greatly intensify the wear and tear on the synthetic turf.
- **Use patterns**—It is very important to spread the field use to various locations on the field to prevent uneven or accelerated wear in certain areas.
- **Vehicles**
 - ⇒ Do not park vehicles on the field, especially in the heat of the day, or leave vehicles on a wet or hot field for long periods of time.
 - ⇒ Engine exhausts should not be faced down toward the playing field, and a hot muffler or exhaust pipe should not touch the surface.

- ⇒ Use lighter vehicles with LGP (Low Ground Pressure) tires with round edges to prevent rutting. Do not use cleated or traction tires.
- ⇒ Heavy vehicles (over 300 pounds) should have a maximum tire pressure of 35 psi.
- ⇒ Make wide, not sharp, turfs, and only when the vehicle is in motion. All vehicles should move at slow speeds. Avoid abrupt and sudden braking, as well as sudden acceleration or spinning of the wheels, especially on wet surfaces. Consult the equipment manufacturer to learn load limits.
- ⇒ All vehicles must be checked before use on the field to determine if they are leaking oil or gas. If so, they should be repaired before entry onto the field.

- **Concentrated heavy use protection**

- ⇒ Stage or other set-ups for special events or activities, such as graduations, are normal. Proper field protection of the synthetic turf must be provided to prevent damaging it. Use plywood, interlocking plastic panels or similar weight distributing materials under all chairs and tables—consult the field builder or a field protection company. Use field protection that does not have a dimensional profile, e.g., corrugation, because the profile will transfer onto the turf and require heavy grooming to remove. It is imperative that no anchoring spikes, posts or footing be driven into the turf. Once the field protection is removed, the area should be groomed and swept with a magnet to remove any misplaced or dropped nails, screws, etc.
- ⇒ Helicopter landings may be necessary to remove an injured player. As soon as possible evaluate the area and groom or brush as needed.
- ⇒ Protect the synthetic turf as needed with approved tarps when nearby renovations, e.g., running track recoats or installations, cleaning or painting of bleachers, construction or repairs to lighting, renovations of adjacent natural turf fields, etc., may cause harm to the synthetic turf. Contact the field builder for a protection recommendation. Improper plastic protection will cause heat damage.
- ⇒ Prevent heavy equipment from accessing the field or, if necessary, cover the field with appropriate protection to distribute the weight of the equipment.

Disclaimer

Due to the unique situation of each synthetic turf installation, other considerations may arise that are not addressed by these guidelines. Such considerations should not be ignored or minimized, but should be addressed by your field builder or industry specialists. This document does not in any way, imply, suggest or guarantee that a warranty, environmental, or performance issue could not arise if these guidelines are followed. These voluntary guidelines are not standards, and are not to be used as the basis for warranty or other claims.

The Synthetic Turf Council and its members invite you to visit www.SyntheticTurfCouncil.org for additional information.

We hope you enjoy your field!



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