Tighe&Bond

DOVER HIGH SCHOOL ATHLETIC FACILITY

A Comparison of Natural Turf and Synthetic Turf

Presenter: Ryan Morrison, PE

SUMMARY OF TOPICS

- Comparison with other schools
- Natural Turf design elements, considerations, and options
- Synthetic Turf Construction and Components
- Maintenance requirements
- Number of uses on field
- Cost for Construction

REGIONAL FIELD COMPARISON- STADIUM FIELDS

- Portsmouth – Synthetic Turf
- Oyster River – Synthetic Turf
- Exeter – Synthetic Turf
- Spaulding – Natural Grass
- St. Thomas High School – Synthetic Turf
- Timberlane – Natural Grass
- Manchester Memorial – Synthetic Turf
- Winnacunnet – Natural Grass

NATURAL GRASS

- Key design elements
  - Irrigated?
  - Drainage (Catch basins / Underdrains)
  - Quality control of topsoil and sand layer
  - Desired turf playing height

- Considerations
  - Will uses on field be managed
  - Will field be managed organically
  - Are lights recommended for the field

- Grow in period
  - One growing season – Sod
  - Three growing seasons – Seed

NATURAL GRASS OPTIONS

- Non-Organic
  - Most common field type in northeast
- Organic
  - More popular at recreation level fields
- Hybrid System (Synthetic & Natural)
  - Lambeau Field
- Considerations
  - Level of Athlete
  - Yearly maintenance costs
  - Inconsistent impact attenuation (Testing and Aeration required)
  - Rest periods / Shutdown/ Weather

SYNTHETIC TURF HISTORY

The evolution of synthetic turf

GEN 1: 1960s	GEN 2: 1970s	GEN 3: 2000s	GEN 3.5: 2010s	GEN 4: present
- Nylon fibers (abrasive) - Short pile heights - Glued over concrete or ashpalt - Soft cushion used beneath the turf	- Polypropylene fibers (less abrasive) - Short pile heights - Sand infill - Soft cushion used beneath the turf	- Introduction of soft, grass-like polyethylene fibers - Sand & rubber infill used to improve traction, impact safety and softness underfoot - Tall pile height: 2.0" - 2.5"	- Continued use of polyethylene fibers - Sand & rubber infill - Tall pile heights: 2.0" 2.5" - Introduction of shock pads for improved impact safety	- Continued use of polyethylene fibers - Sand & natural infill - Tall pile heights: 1.75" 2.0" - Use of a performance pad for safety & fine tune systems based on field & biometric data

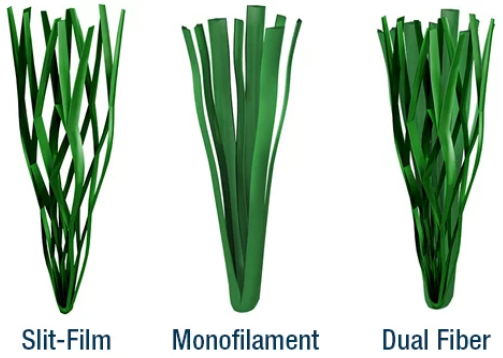
Think Houston Astros

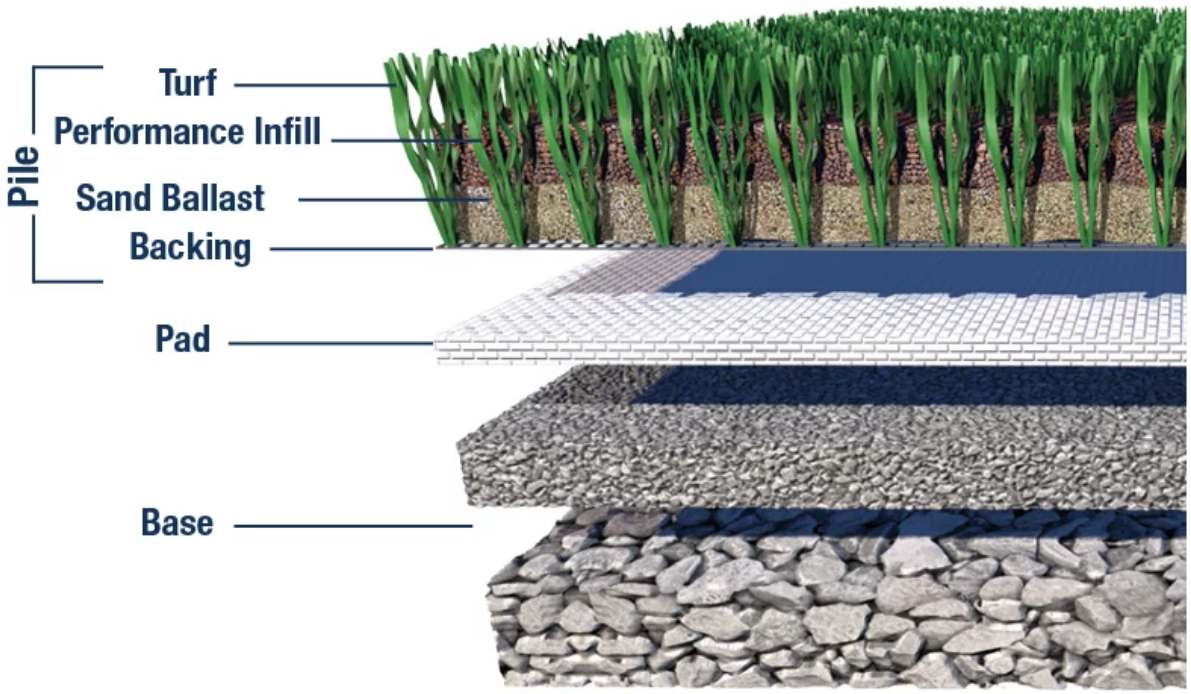
Typical AstoTurf Products

SOURCE: Shaw Sports Turf

SYNTHETIC TURF- MATERIALS/COMPONENTS

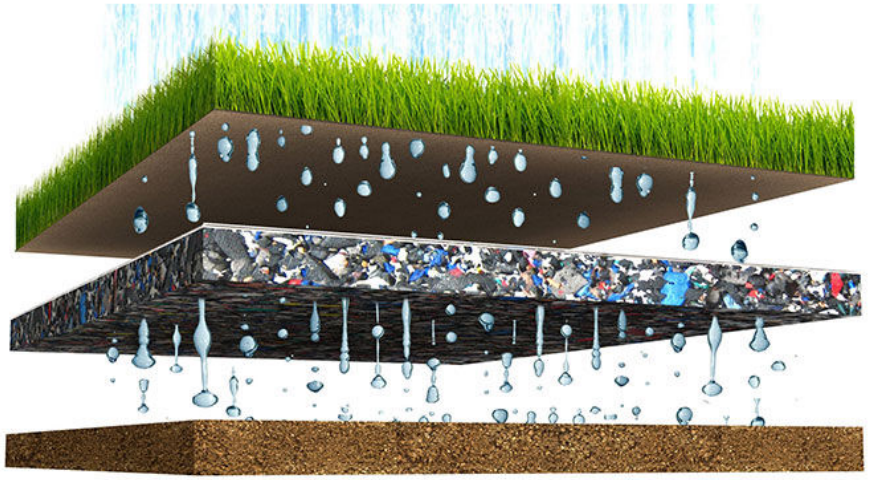
- **Turf Fiber Options**
  - Slit Film: trap infill in place and mitigate infill “splash” for sports with quick ball rotation (ie. Lacrosse / Baseball)
  - Monofilament: rigid allowing grass to stand upright and improve ball roll
  - Dual Fiber: blend of silt film and monofilament fibers





SYNTHETIC TURF- MATERIALS/COMPONENTS

- **Shock Pads**
  - Purpose: Used to make synthetic turf fields uniform in condition regardless of weather or temperature.
  - Reduces the quantity of fibers and infill required.



Product	Warrantee	Safety and Sustainability Considerations
Shaw Sports Turf NXTPLAY	25 Years	Made with 80 % Recycled content from previously deconstructed synthetic turf fields. Cradle to Cradle Certified.
Brock USA PowerBase YSR	25 Years	Made with Virgin Material and/or recycled pads only Cradle to Cradle Certified.
Brock USA SP Series	16 Years	1/2" to 3/4" pad height – Made with up to 30% recycled material
Schmitz Foam Products – ProPlay Sport 20D	25 Years	Fully Recyclable / Made from Recycled product Guaranteed that it can be returned to Schmitz Foam at end of life cycle

SYNTHETIC TURF- MATERIALS/COMPONENTS

- **Infill**
  - Material that hold the fibers up and that the athlete and ball plays on
  - Considerations
    - Impact resistance
    - Playability for athletes
    - Ability for infill material to stay in place
    - Durability of Infill
    - Heat considerations / Freeze Considerations
    - Environmental Considerations
      - What materials is it made of
      - Is it a recycled material or can it be recycled

INFILLS

Recommended Infill Materials

Product	Pros	Cons
Crumb Rubber / Sand (For Comparison)	Most commonly infill system Recycled material for crumb rubber	Black rubber can cause heat island effect. Potential for heavy metals in stormwater effluent
Envirofill (Acrylic coated round Sand)	16-year warranty Less likely to compact Reusable for multiple life cycles	Non-biodegradable, doesn't significantly reduce heat island effect.
Brockfill (Conditioned Yellow Pine Particles)	Sustainable harvested 10-year warranty More durable than cork More stable than crumb rubber Semi Organic (Sand) Lower Heat Island Effect	Added maintenance to replace breakdown of material. Prone to freezing
Safeshell (Walnut shells)	High-Bulk density less likely to float Lower Heat Island Effect Less Prone to Freezing than other Organics Semi-Organic (Sand)	Added maintenance to replace breakdown of material (Lower than other organics).
GreenPlay Pure Cork Performance Infill (Cork)	Safely harvested from trees Lowers Heat Island Effect Fully Organic System	Added maintenance to replace breakdown of material. Buoyancy of material causes migration. Quicker than other alternatives to break down.
NaturalPlay (Coconut Fibers and Safe Shell)	Lowers Heat Island Effect Semi-Organic (Sand) Less Prone to Freezing Better traction than Safeshell alone	Added maintenance to replace breakdown of material (Lower than other organics).

NATURAL GRASS MAINTENANCE STRATEGY HIGH SCHOOL STADIUM LEVEL FIELD

- Soil sampling and Spring Inspection
- Service irrigation
- Weed and Pest Control
- Fertilizer
- Cut-Grass / Re-stripe / – Weekly
- Aeration/ Top Dressing / Overseeding (1 – 2 times per season)
- Rest Field – 30 days in growing season
- Lime Application
- Inclement weather policy very important

- **Total Labor 80 hours – 150 hours per year**

NATURAL GRASS (ORGANIC) MAINTENANCE HIGH SCHOOL STADIUM LEVEL FIELD

- Soil sampling and Spring Inspection (Additional metrics required organic and bacterial biomass)
- Service irrigation
- Weed Control – Organic options available
- Pest Control – Beneficial nematodes (dependability)
- Fertilizer – Organic nitrogen (Slow release)
- Cut-Grass / Re-stripe / – Bi-Weekly (3.5 – 3 inches)
- Aeration/ Top Dressing / Overseeding (2–3 times per year)
- Rest Field – 30 days in growing season (Maybe more)
- Lime Application
- Incelement weather policy very important

- **Total Labor 120 hours – 180 hours per year**

SYNTHETIC TURF MAINTENANCE REQUIREMENTS

1. **Clean Debris from field regularly – Frequency will depend on setting**
2. **Drag field monthly to weekly – Depends on use and type of infill**
3. **Rake field to redistribute infill material**
4. **Supplement infill as necessary – typically required at high use areas (Goal mouth and/or batter box)**
5. **Remove any gum or seeds from field**
   - (Typically recommend a sign of prohibited activities field)

- **No inclement weather policy needed**
- **Typically, can get on field earlier in spring and stay on longer in fall**
- **Winter use possible**

TOTAL POTENTIAL PLAYING TIME FOR FIELD AT HIGH SCHOOL

- Playing season – Mid March to Mid November
- 6 months (Accounting for Summer Months off)
- Available play time 5 hours (No lights) = 2 uses
- Use defined as a team or teams for approximately 2 hours
- Yearly available uses = 6 months x 4 weeks x 7 days per week x 2 uses per day = 330 uses per season
- With lights = 4 uses per day = 700 uses per year

- Physical education and some youth sports are not an equivalent use

TYPICAL NUMBER OF USES SUPPORTED BY NATURAL GRASS FIELD

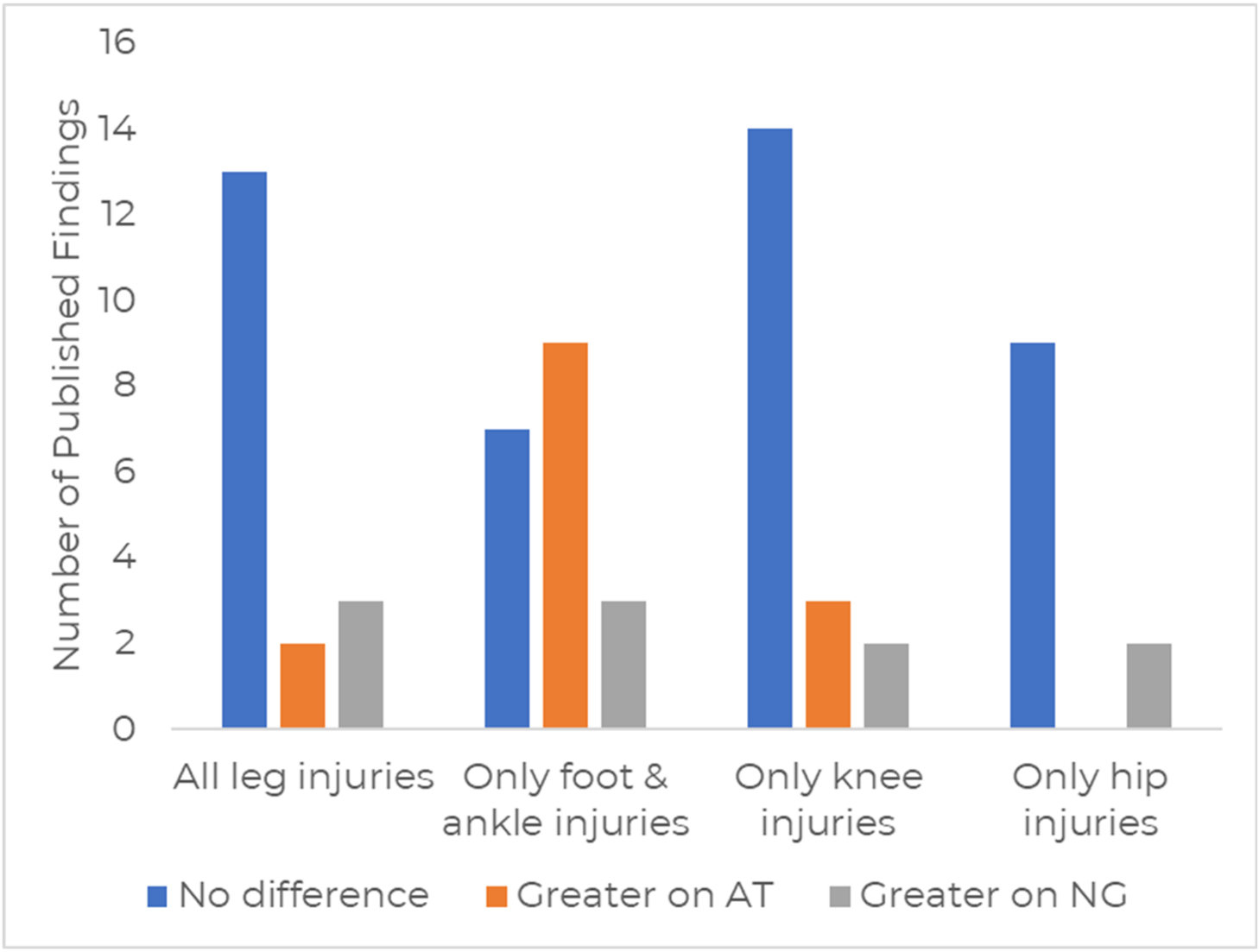
- Typical number of uses supported range from 200 – 250 uses per year
- Consider 30-day rest period in growing season
- Rainy days (Rain outs – can last longer than a day)
- Field opens later and closes earlier in season
- Because of additional aeration and lawnmowing techniques organic field tend to support on lower end of spectrum
- Overuse results in over compaction and unsafe fields

TYPICAL NUMBER OF USES SUPPORTED BY SYNTHETIC TURF FIELD

- Turf fibers will not degrade from use
- Overuse may require additional infill maintenance
- Capet warranty is for 8 years
- Pad warranty is ranges from 16 -25 years
- Infill warranty varies
- Warranty covers annual testing Gmax vs HIC

SYNTHETIC TURF - PFAS CONCERNS

- **Polyfluoroalkyl substances (PFAS)**
  - EPA estimates that there are nearly 15,000 types of PFAS
- **PFAS found in number of household items**
  - Non-stick cookware
  - Shampoo
  - Furniture
  - Make-up
  - Dental Floss
  - Pizza boxes
  - Soccer Balls
- **Turf suppliers can provide certification that no PFAS was used in the manufacturing of synthetic turf carpet**



LEG INJURY COMPARISON

On Artificial Turf vs. Natural Grass

Gould HP, Lostetter SJ, Samuelson ER, Guyton GP. Lower Extremity Injury Rates on Artificial Turf Versus Natural Grass Playing Surfaces: A Systematic Review. Am J Sports Med. 2023 May;51(6):1615-1621. DOI: 10.1177/03635465211069562.

SYNTHETIC TURF – OTHER HEALTH TOPICS

- **Chemical Exposure**
  - Per 2019 US EPA CDC Study
    - Exposures to chemicals and metals in crumb rubber is expected to be low
    - Exposure to VOCs and SVOC's is limited due to low amount of emission
  - Other Studies completed by New York and Massachusetts
    - Potential for chemical exposure from crumb rubber is low

- **Heat Stress**
  - Depending on infill temperature differential can vary
  - Typically, not of concern for high school in Northeast
  - Most schools not opting for watering field

- **Infill Allergy**
  - Walnut
  - Latex

SYNTHETIC TURF - SUSTAINABILITY

- **Carpet – Fully Recyclable**
  - Currently always a newly manufactured product
  - Old fields recycled as other products
- **Infill – Typically non-recyclable**
  - (Envirofill – one reuse)
  - Crumb rubber is a recycled product
- **Shock Pad**
  - Recyclable and or reusable (Cradle to Cradle)
  - Can buy as a recycled product

COST – SYNTHETIC TURF

- **Natural Grass**
  - Assume sand cap and drainage
  - Irrigation
  - Import top-soil
  - Irrigations
  - $4.50 - $5.00 per square foot
  - $350,000 - $400,000
  - Maintenance Cost
    - $20,000 - $50,000 Per Year

- **Synthetic Turf**
  - Crumb Rubber – $6.9 SF - $600K
  - Envirofill - $8.2 SF - $700 K
  - Brockfill - $7.5 SF - $650 K
  - Safeshell – $8.2 SF - $700 K
  - Greenplay – $8.8 SF - $760 K
  - Natural Play – $8.8 SF - $760K
  - Maintenance Cost
    - $5,000 - $10,000 Per Year

QUESTIONS ?