Alternative infills and Maintenance of Synthetic Turf

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CAFS Facts

- 25 current sports turf research projects
- 5+ acres of athletic turf research
- Cool- and warm-season turf and synthetic surfaces

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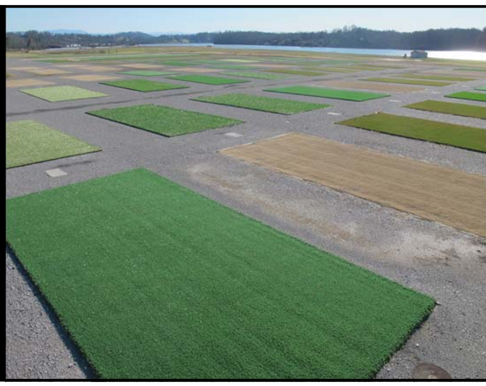

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Why does synthetic turf need maintenance?

- Maintain appearance and increase the longevity of the turf
- Performance and playability
- MEET YOUR FIELD'S WARRANTY REQUIREMENTS

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Synthetic turf systems tested

Treatments
- Apply traffic at 10 simulated football games per week
- Brush/groom half of each plot every 20 games
- Add infill as needed to maintenance side

Data collection
- F355 A missile (3 drops x 3 locations)
- F355 E missile (3 drops x 3 locations x 2 heights)
- Infill depth (9 locations)
- Fiber reveal

Synthetic turf	Shock pad	Infill
52 ounce 2 inch pile height	Extruded rubber	Crumb rubber (SBR)
52 ounce 2 inch pile height	Beaded polypropylene	Crumb rubber (SBR)
52 ounce 1.5 inch pile height	Extruded rubber	Coconut/cork
52 ounce 1.5 inch pile height	Extruded rubber	Recycled rubber
80 ounce 1.25 inch pile height	Beaded polypropylene	Coconut/cork

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Recycled rubber

Coconut fiber / cork

Crumb rubber (standard)

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TORO
PROCORE
Simulating Foot Traffic

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ASTM F355 E
0.6 m drop on synthetic turf

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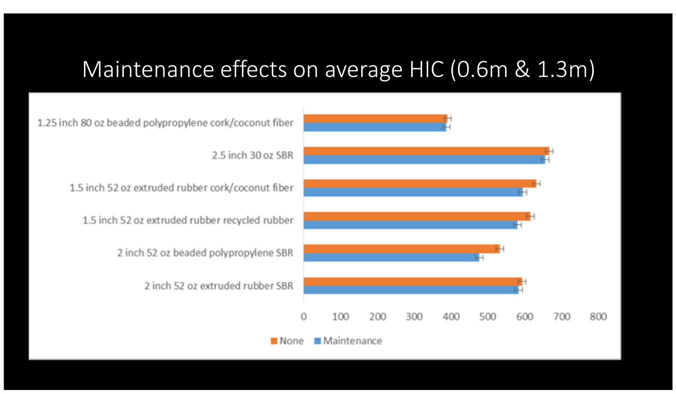
Maintenance effects on average HIC (0.6m & 1.3m)
1.25 inch 80 oz beaded polypropylene cork/coconut fiber
2.5 inch 30 oz SBR
1.5 inch 52 oz extruded rubber cork/coconut fiber
1.5 inch 52 oz extruded rubber recycled rubber
2 inch 52 oz beaded polypropylene SBR
2 inch 52 oz extruded rubber SBR
0 100 200 300 400 500 600 700 800
None Maintenance

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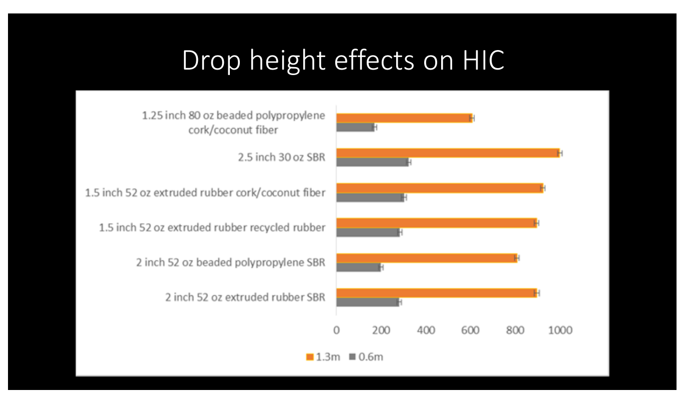
Drop height effects on HIC
1.25 inch 80 oz beaded polypropylene cork/coconut fiber
2.5 inch 30 oz SBR
1.5 inch 52 oz extruded rubber cork/coconut fiber
1.5 inch 52 oz extruded rubber recycled rubber
2 inch 52 oz beaded polypropylene SBR
2 inch 52 oz extruded rubber SBR
0 200 400 600 800 1000
1.3m 0.6m

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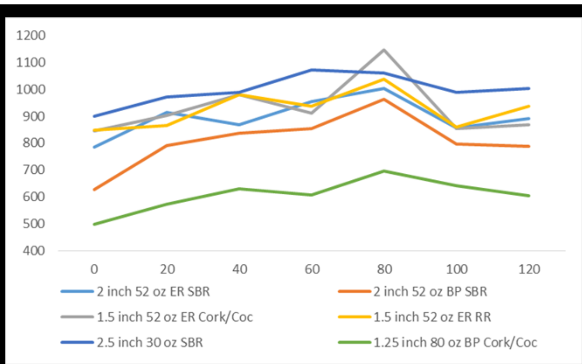

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F355 Synthetic Turf Surface Hardness Device

(ASTM 1936)

9.1 kg (20 lbs) flat missile
61 cm (24") drop height
Flat surface on projectile

Used to measure high level body impacts

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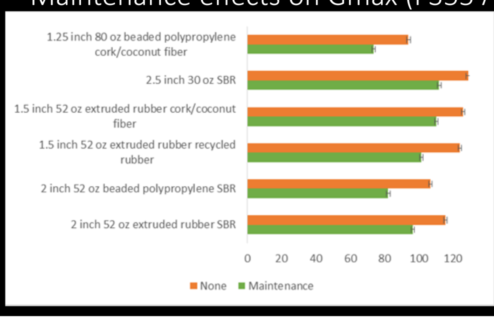
Maintenance effects on Gmax (F355 A)



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Summary: effects of maintenance on surface hardness

- No maintenance equated to 20.2 G harder
- Maintenance decreased the variability of the surface
  - Maintenance plots deviated 3.2 G
  - Non-maintenance plots deviated 8.2 G
- All systems tested required maintenance to approximately same degree

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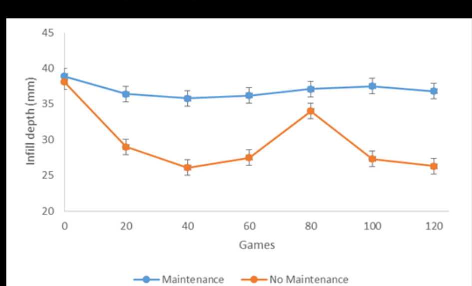
Infill depth: system x maintenance



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Recycled rubber
Added infill at 60-120

Coconut fiber / cork)
Added infill every 20 games

Crumb rubber (standard)
Added infill at 40-120

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Summary: maintenance effects on infill depth

- Applied traffic resulted in significant loss of infill
- Maintenance reduced variability and infill depths consistently measured above minimum requirement

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Fiber Reveal

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Summary: maintenance effects on fiber reveal

- Additional exposed fiber has been linked (Dr. Richard Kent, STC 2016) to cleat lock
- Maintenance reduced the amount of exposed fiber

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Zeolite

Thermoplastic elastomer

Fine mesh recycled rubber

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So maintenance is important…
What type of maintenance should I do?
How Often?

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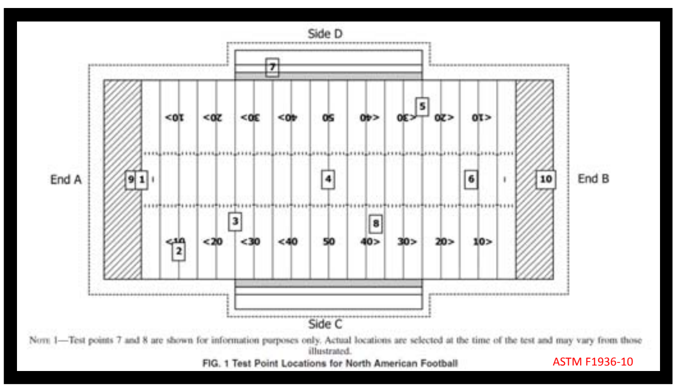

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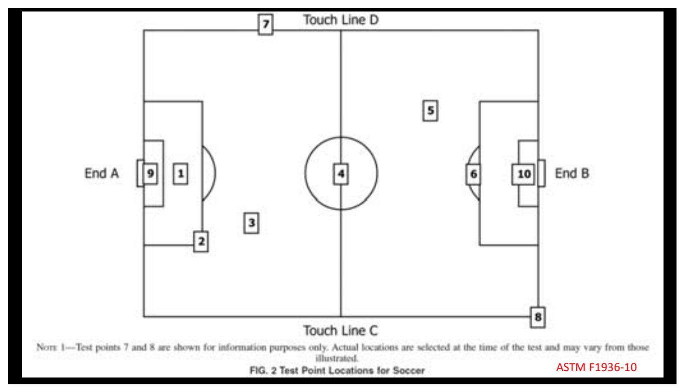

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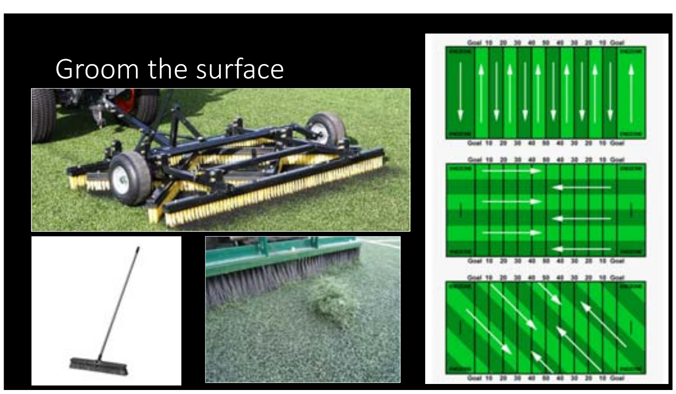

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Signs you need more than routine maintenance

- Fibers are excessively trapped, bent, or creased
- Surface is firmer than normal
- Excessive amount of dirt, debris, and/or foreign material
- Infill levels inconsistent

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Comprehensive maintenance

- Decompaction of infill
- Redistribution / removal / reinstallation of infill
- Deep cleaning
- Metal removal

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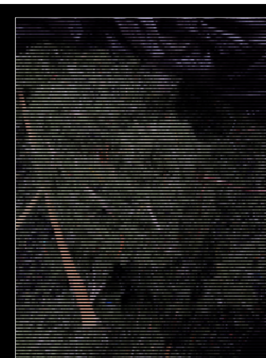

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Have your field tested

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Synthetic Turf Council's Guidelines for Synthetic Turf Performance (syntheticturfcouncil.org)

Test Method(s)	Property	Community Field	Stadium Field
Performance Guidelines			
ASTM F1936	Impact Attenuation (g-max)	Below 165	Below 165
FIFA 04 and FIFA 09	Shock Absorption	55% to 70%	60% to 70%
FIFA 05 and FIFA 09	Vertical Deformation (foot stability)	4mm to 9mm	4mm to 8mm
FIFA 06 and FIFA 09	Rotational Resistance (traction)	25n to 50n	30n to 45n
FIFA 07	Linear Friction—Deceleration	3.0g to 6.0g	3.0g to 5.5g
FIFA 07	Linear Friction—Slide	120 to 220	130 to 210
FIFA 08	Skin Abrasion (dry)	< 30%	< 30%
FIFA 08	Skin/Surface Friction (dry)	0.35 to 0.75	0.35 to 0.75
FIFA 01 and FIFA 09	Vertical Ball Rebound (soccer)	60cm to 100cm	60cm to 85cm
FIFA 02	Angled Ball Behavior (soccer)	45% to 70%	45% to 60%
FIFA 03	Ball Roll (soccer-specific)	4m to 10m	4m to 8m

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Synthetic Turf Council's Guidelines for Synthetic Turf Performance (syntheticturfcouncil.org)

Test Method(s)	Property	Community Field	Stadium Field
Testing Frequency Guidelines (according to Client requirements and budget)			
Client Requirements	Laboratory Testing	Pre-purchase and as QC Measure	Pre-purchase and as QC Measure
Client Requirements	Field Testing	After Installation	After Installation
Client Requirements	Field Testing (follow-up)	Every Four Years	Every Year

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F1292 at 1.3 M						F355		
Peak			HIC			Gmax		
1	2	Average	1	2	Average	1	2	Average
317	332	325	2326	2497	2412	155	164	160
314	336	325	2321	2594	2458	180	181	181
317	328	323	2347	2499	2423	135	148	142
305	333	319	2226	2571	2399	136	141	139
318	345	332	2335	2678	2507	129	141	135
317	322	320	2374	2429	2402	179	183	181
		324			**2433**			**156**

F1292: Head injury criteria (HIC) should be less than 1000 at 1.3m drop according to World Rugby

F355: G_{max} should be less than 165 according to Synthetic Turf Council

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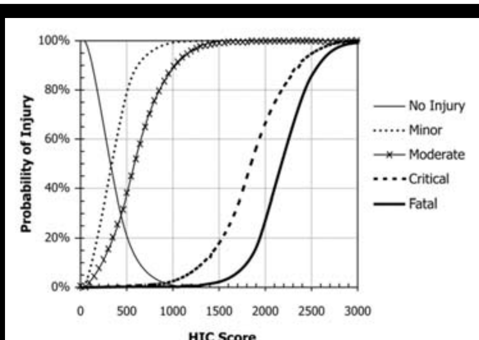

FIG. X1.1 Probability of Specific Head Injury Level for a Given HIC Score

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Summary

- Synthetic turf requires maintenance
- Maintain consistent infill depths throughout the field of at least manufacturer's minimum requirement
  - Promotes playability and "safety"
  - Protects fibers and may aid in the longevity of the system
- Follow installer/manufacturer guidelines for maintenance

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ASTM International. 2013. F1292-13 Standard specification for impact attenuation of surfacing materials within the use zone of playground equipment. www.astm.org
ASTM International. 2015. F1936-10 Standard specification for impact attenuation of turf playing systems as measured in the field. www.astm.org
Synthetic Turf Council. 2011. Guidelines for synthetic turf performance. www.syntheticturfcouncil.org

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