Synthetic Turf Council

Guidelines for Synthetic Turf Performance

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Background

Introduction

The purpose of these voluntary guidelines is to enable owners, buyers and specifiers of multi-purpose sports fields to better understand the quality and performance of their system during design, selection, after installation and throughout its useful life.

Objectives

The STC and its members understand that performance and quality of a synthetic turf sports field are critical factors.

By establishing objective guidelines, the STC is providing an essential guidance to synthetic turf owners, buyers and specifiers at all levels which has been unavailable until now.

These voluntary STC Performance Guidelines help answer many user questions about the surfaces and industry. They provide:

- More objective measurements when selecting a provider
- An evaluation method to determine the quality of a sports field
- A method for understanding the type of maintenance required for improving field performance and playability
- Information as to when maintenance no longer can enable the desired performance – i.e. an indication that the field is nearing the end of its useful life, and will need to be replaced

STC Approach

The STC spent months gathering information. It received input from its members' experiences and technical knowledge, ASTM standards, and input from two managers of FIFA.

The STC determined that the ASTM standards provide useful information regarding product identification, turf fabric testing and *g*-max testing, but identified opportunities for greater attention to sport performance testing.

The STC reviewed guidelines researched and established by international governing bodies.

Fédération Internationale de Football Association (FIFA)

FIFA, the world's governing body of soccer, established the FIFA Quality Concept for Football Turf in 2001 – millions of dollars has been invested by FIFA in research, testing, medical and player feedback.

The FIFA Quality Concept is based upon natural grass benchmarks for sport performance plus a wide range of durability and quality assurance guidelines. Since 2001, the FIFA Quality Concept has been proven to provide user benefits:

- F-MARC study of 10,000 injuries—no notable differences in type and number of injuries between "football turf" and natural turf
- Player study on fatigue—no noticeable change in heart rates and blood lactate levels between "football turf" and natural turf
- The benchmarks in both studies were "football turf" systems that would pass FIFA Quality guidelines for durability and performance
- FIFA is supportive of the STC's use of the FIFA Quality Concept, provided the STC maintains the label of FIFA test methods and communicates the entire array of proper testing and quality assurance protocols.

The International Rugby Board (IRB)

IRB shares similar concerns with the North American market with high impact plus lower extremity issues and elected to combine high impact shock absorption (HIC) testing with FIFA testing.

Conclusion

As a result of its analysis and consultation with industry experts, the STC published its Performance Guidelines to include the following components:

- **Product identification—**to ensure the supplied system is the same as proposed
- **Quality and Durability testing—**to reflect certain ASTM testing plus the FIFA UV and Lisport Testing
- **Sport Performance testing—**to include *g*-max plus the FIFA performance testing
- **Frequency of testing—**to provide clients with the information needed at certain intervals to make proper decisions.
- **Future developments—**to allow for gains in synthetic turf system and testing technologies, feedback from users and industry stakeholders, follow-up evaluation and inclusion of maintenance guidelines. It is noted that proper maintenance is essential for the performance and quality of any synthetic turf system.

Guidelines for Synthetic Turf Performance

The Synthetic Turf Council hereby recommends the following guidelines as a desired range for multi-purpose sport surfaces. Soccer-specific users including clients that wish to obtain FIFA certification for their playing surfaces should refer to the FIFA Quality Concept, www.fifa.com/footballturf, for further information and guidelines.

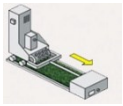
Test Method(s)	Property	Community Field	Stadium Field
Identification Guidelines			
ASTM D1907	Fiber Denier	+/- 10% of Specification	+/- 10% of Specification
ASTM D3218	Fiber Microns	+/- 10% of Specification	+/- 10% of Specification
ASTM D5823	Pile Height	+/- 1/8" of Specification	+/- 1/8" of Specification
ASTM D5793	Stitch Gauge	Same as Specification	Same as Specification
ASTM D5848 or FIFA/ISO 8543	Pile Weight	+/- 10% and no more than minus 2 oz./sq. yd. of Specification	+/- 10% and no more than minus 2 oz./sq. yd. of Specification
ASTM D5848 or FIFA/ISO 8543	Primary Backing	+/- 10% of Specification	+/- 10% of Specification
ASTM D5848 or FIFA/ISO 8543	Secondary Backing	+/- 10% and no more than minus 2 oz./sq. yd. of Specification	+/- 10% and no more than minus 2 oz./sq. yd. of Specification
ASTM D5848 or FIFA/ISO 8543	Total Weight	+/- 10% of Specification	+/- 10% of Specification
FIFA/EN 1969	Infill Depth	+/- 15% of Specification	+/- 15% of Specification
FIFA/EN 13041	Infill Bulk Density	+/- 15% of Specification	+/- 15% of Specification
ASTM F2765-09	Lead Content	Below 100ppm	Below 100ppm
Quality Guidelines			
ASTM D1335 or ISO 4919	Tuft Bind (without infill)	> 6.8 lbs. or 30N	> 6.8 lbs. or 30N
FIFA 09/EN 13672	Simulated Wear/Abrasion Resistance	Shock Absorption, Vertical Deformation, Ball Rebound and Rotational Resistance—pass after **20,200** Lisport cycles	Shock Absorption, Vertical Deformation, Ball Rebound and Rotational Resistance—pass after **5,200** Lisport cycles
FIFA/EN ISO 20105-A02	Artificial Weathering (3,000 hours UVA) Turf Color Change	> Gray Scale 3	> Gray Scale 3
FIFA/EN 13864	Artificial Weathering (3,000 hours UVA) Pile Yarn Tensile Strength	Reduction of no more than 50%	Reduction of no more than 50%
FIFA/EN ISO 20105-A02	Artificial Weathering (3,000 hours UVA) Infill Color Change	> Gray Scale 3	> Gray Scale 3
FIFA/EN 13036	Surface Regularity	<10mm difference over 3m straight edge	<10mm difference over 3m straight edge
Surveyor's level	Slope	< 1%	< 1%
ASTM F1551 or FIFA/EN 12616	Water Permeability (after install)	> 10 inches per hour	> 10 inches per hour

Guidelines for Synthetic Turf Performance (*continued*)

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
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

Selected Test Descriptions

Durability testing (ASTM and/or FIFA)

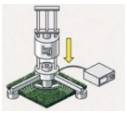


Heavy Wear and Abrasion Resistance—The surface is artificially abraded (simulation of multiple years of wear) and tested for the following: Shock Absorption, Vertical Deformation, Vertical Ball Rebound, and Rotational Resistance.

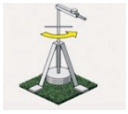
Climatic Resistance (Yarn and Infill)—UV / Water / Heat—Measures the colour change, appearance change and yarn tensile strength changes (infill properties change after UV exposure).

Sport Performance

ASTM F1936 (*g*-max)—Gives an indication of high impact shock absorption.

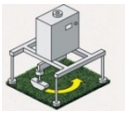


Shock Absorption and Vertical Deformation—Measures the impact absorption provided by synthetic turf to a player running (lower extremity impact) or falling on as well as the foot stability of the surface as a player runs across it. Excess deformation of a surface could lead to over strained joints and fatigue.



Rotational Resistance (Traction)—Measures the interaction between the shoe sole and the surface of artificial grass relating to the ability of a player to change direction.

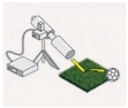
Slip Resistance Scale and Deceleration—Measures the ability of studs to slide through the surface without causing the player to slip over. Slip resistance deceleration measures the deceleration experienced by the players shoe as it makes contact with the surface. If the deceleration is too high, damages to joints and ligaments may occur.



Skin Abrasion/ Skin Friction—Measures the abrasiveness and friction of artificial turf on the skin of the player when sliding.

Vertical Ball Rebound—Measures how high the ball bounces when falling vertically onto a synthetic turf field. (Although a method for soccer, this also gives an indication of consistent infill levels throughout the playing surface in a low cost tool).

Ball Roll—Measures how far the ball rolls onto synthetic grass compared to natural grass. (Although a method for soccer, this also gives an indication whether or not grass piles are standing up in a low cost tool).



Angled Ball Behavior—(Soccer-specific) Measures how the ball rebounds from an artificial turf surface when striking it at a shallow angle under dry and wet conditions.

Test methods should be performed according to the applicable standards. The FIFA test methods and FIFA Quality Concept are the intellectual property of FIFA and should only be used within this framework.

Disclaimer

The STC Guidelines for Synthetic Turf Performance are voluntary. This document does not, in any way, imply, suggest or guarantee that a warranty, environmental, or performance issue could not arise if the system, product or component meets the suggested guidelines; nor does it imply or suggest that if any of the guidelines are not met that the product will fail to perform. These guidelines are not standards and are not to be used as the basis for warranty or other claims. The performance guidelines have been suggested to enhance the physical use of synthetic turf multi-purpose sports surfaces; however, they are not intended to be, and are not, safety standards and this document does not imply that an injury is less likely to occur if the synthetic sports surface meets the conditions and guidelines contained herein.

About the Synthetic Turf Council

Based in Atlanta, the Synthetic Turf Council was founded in 2003 to promote the industry and to assist buyers and end users with the selection, use and maintenance of synthetic turf systems in sports field, golf, municipal parks, airports, landscape and residential applications. The organization is also a resource for current, credible, and independent research on the safety and environmental impact of synthetic turf. Membership includes builders, landscape architects, testing labs, maintenance providers, manufacturers, suppliers, installation contractors, infill material suppliers and other specialty service companies. For more information, visit the STC's Online Buyers' Guide and Member Directory at www.syntheticturfcouncil.org.

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