



CLIENT:

Company:	ForeverLawn, Inc
Address:	4449 Easton Way
	Columbus, OH 43219

TEST MATERIAL:

Date Material Received:	September 12, 2022
Material Type:	Synthetic Turf
Material Condition:	Excellent, New
Turf Identification:	K9 Grass Elite (FK9N2)
Infill System:	N/A
Sub-Base:	3" #57 Stone

TESTING METHODS REQUESTED:

Testing Services, Inc was instructed by the client to perform the following testing:			
Standard:	ASTM F1951-14	Test Method:	Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment

SAMPLING PLAN:

Sampling Date:	9/12/22
<ul style="list-style-type: none"> Specimen sampling is performed in the sampling department at TSI. The sampling size of specimens is determined by the test method requirements. In the event a specific sampling size is not called for, a determination will be made based on previous testing experience, and approved for use by an authorized manager. All samples are subjected to the outside environmental conditions of temperature and relative humidity. Sample requiring pre-determined exposure to specified environmental conditions based on a specific test method, take place in the departments in which they are tested 	

DEVIATION FROM TEST METHOD:

State reason for any Deviation from, Additions to, or Exclusions from Test Method:
none

REQUIREMENT:

A surface in place shall have average work per foot (work per meter) values for straight propulsion and for turning *less* than the average work per foot (work per meter) values for straight propulsion and for turning, respectively, on a hard, smooth, surface with a grade of 1:14 (7.1 %).

PROCEDURE:

Test Surface Preparation: Tests were conducted on 9/13/22 indoors at TSi Laboratories in an environment of 66°F and 49% R.H. The synthetic turf listed above was positioned over the sub base which was contained in a wooden box (44" W x 117" L). The assembly was slightly compacted using a Brinly 18" X 24" water-filled lawn roller, filled with 28 gallons of water, applying 270 lbs to simulate foot traffic.

Wheelchair/Operator: The wheelchair used in these tests was manufactured by *Invcare*, Model Action Xtra, Serial Number 98J84142. This wheelchair is totally adjustable, a necessity for these tests. The pneumatic tires were inflated to 60 psi on the rear and 32 psi on the front. The weight of the wheelchair was 24.25 pounds and the operator's weight was 165 pounds for a total of 189 pounds. The operator's distribution was adjusted to 60% on the rear wheels and 40 % on the front.

Torque Measuring System: A certified *Mecmesin Advanced Force Gauge*, Model 500N, was used as an interface between a *Dell* Laptop and a calibrated *Smart Torque Wrench*, S/N 97-0085-01. Emperor Lite Software, from *Mecmesin*, logged the load vs. time and integrated the area under the resulting curves. The adapters and accessories needed to attach the instrumentation were fabricated locally. This total package added 10 pounds to the total weight bringing the total to 199 pounds.



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TEST SUMMARY:

TEST METHOD	Maximum Requirements – Average Work/ft-Force	TEST RESULTS – Average Work/ft-Force
ASTM F1951-14	Baseline Straight: 15.47 lbs	9.04 lbs
	Baseline Turning: 10.42 lbs	6.13 lbs

	1	2	3	4	5
Straight Propulsion					
Circumference of Rear Wheel	75.375"	75.375"	75.375"	75.375"	75.375"
Area	31.9922 ft ² lbs*s	32.1718 ft ² lbs*s	30.8722 ft ² lbs*s	33.2156 ft ² lbs*s	32.1208 ft ² lbs*s
Time	7.15 seconds	7.00 seconds	7.00 seconds	7.00 seconds	7.15 seconds
Distance	86.0 inches	86.0 inches	86.0 inches	86.0 inches	86.0 inches
Distance	7.17 ft	7.17 ft	7.17 ft	7.17 ft	7.17 ft
Angular Displacement (radians)	7.17 rad	7.17 rad	7.17 rad	7.17 rad	7.17 rad
Average Torque (energy)	4.47 ft lbs	4.60 ft lbs	4.41 ft lbs	4.75 ft lbs	4.49 ft lbs
Total Work (energy)	64.15 ft lbs	65.90 ft lbs	63.23 ft lbs	68.03 ft lbs	64.41 ft lbs
Work/ft (force)	8.95 lbs	9.19 lbs	8.82 lbs	9.49 lbs	8.99 lbs
Drop Hi/Low Work/ft (force)	8.95 lbs	9.19 lbs			8.99 lbs
Average Work/ft (force)			9.04 lbs		

	1	2	3	4	5
Turning Propulsion					
Circumference of Rear Wheel	75.375"	75.375"	75.375"	75.375"	75.375"
Distance from Pivot Point to Outer Wheel	35.75 inches	35.75 inches	35.75 inches	35.75 inches	35.75 inches
Area	41.2545 ft ² lbs*s	46.4873 ft ² lbs*s	42.7747 ft ² lbs*s	44.3056 ft ² lbs*s	42.6701 ft ² lbs*s
Time	7.00 seconds	7.05 seconds	6.75 seconds	7.20 seconds	7.50 seconds
Angle Traveled (degrees)	93.0°	93.0°	93.0°	93.0°	93.0°
Angle Traveled (radians)	1.62 rad	1.62 rad	1.62 rad	1.62 rad	1.62 rad
Arc Length Traveled by Outer Wheel	58.03 inches	58.03 inches	58.03 inches	58.03 inches	58.03 inches
Arc Length Traveled by Outer Wheel	4.84 ft	4.84 ft	4.84 ft	4.84 ft	4.84 ft
Angular Displacement of Outer Wheel (radians)	4.84 rad	4.84 rad	4.84 rad	4.84 rad	4.84 rad
Average Torque (energy)	5.89 ft lbs	6.59 ft lbs	6.34 ft lbs	6.15 ft lbs	5.69 ft lbs
Total Work (energy)	28.51 ft lbs	31.90 ft lbs	30.65 ft lbs	29.77 ft lbs	27.52 ft lbs
Work/ft (force)	5.90 lbs	6.60 lbs	6.34 lbs	6.16 lbs	5.69 lbs
Drop Hi/Low Work/ft (force)	5.90 lbs		6.34 lbs	6.16 lbs	
Average Work/ft (force)			6.13 lbs		

CONCLUSION:

The above listed material meets/exceeds both the straight line and turning propulsion requirements in accordance with ASTM F1951, where the surface tested average work per foot value was less than the average work per foot value verses a hard, smooth surface with a grade of 7.1%

Uncertainty:

We undertake all assignments for our clients on a best effort basis. Our findings and judgments are based on the information to us using the latest test methods available. TSI can only ensure the test results for the specific items tested. Unless otherwise noted in the deviations sections of this report, all tests are performed in compliance with stated test method.

Test Report Approval:

Erle Miles, III, Lab Director Testing Services (TSI) LLC

TSI Accreditation:

Our laboratory is accredited by the US Dept. of Commerce, National Institute of Standards and Technology: ISO/IEC 17025:2005. Our code # is: NVLAP 100108-0. TSI is an Organizational Member of ASTM (American Society for Testing and Materials). TSI is a certified independent testing laboratory by the STC (Synthetic Turf Council).



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