

**Beneficial  
Designs  
Inc.**

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**Surface Testing Report - ASTM F 1951 - 99**

Standard Specification for Determination of Accessibility of  
Surface Systems Under and Around Playground Equipment

**SUMMARY OF RESULTS**

Beneficial Designs, Inc. received a surfacing sample from **Invisible Structures, Inc.** classified as surface stabilizer with the brand name **Gravelpave2**. This sample of Gravelpave2 met the maneuverability performance requirements of ASTM F 1951-99.

Report prepared by:

  
Denise Chesney, Director of Research

21 September 1999

Date

**TEST SPECIMEN**

Manufacturer **Invisible Structures, Inc.**  
Name **Gravelpave2**  
Type surface stabilizer  
Source **Invisible Structures, Inc.**  
Mfr's lot no. unknown  
Date of manufacture unknown  
Thickness **N/A**

**TEST DATE**

25 August 1999

**TESTING CONDITIONS**

Surface water content **N/A**  
Surface temperature **86 deg F**  
Atmospheric temperature **86 deg F**  
Relative humidity **42 %**

**INSTALLATION, LEVELING & COMPACTION**

Gravelpave2 was installed over a 6-inch layer of compacted 3/4 inch road base. Gravelpave2 was installed rings up, and secured to the base material with anchor pins. The rings were filled with 3/16 inch granite screenings such that just the top of the rings were visible.

**TEST WHEELCHAIR & RIDER**

Manufacturer **Sunrise Medical/Quickie**  
ID no. **none**  
Model **Quickie II**  
Weight **33.2 lb.**

Weight of test wheelchair rider **165 lb.**

Front-to-rear weight distribution  
of wheelchair-rider system **41 % - 59 %**

## WHEELCHAIR WORK MEASUREMENT METHOD RESULTS

### Straight Propulsion on Gravelpave2

	Work per meter (N*m)	Trial Time (sec)
Trial 1	26.0	8.0
Trial 2	25.1	7.9
Trial 3	26.8	7.7
Trial 4	30.3	7.6
Trial 5	25.1	7.8

Average work per meter (n=3) = **26.0 N\*m**

### Turning on Gravelpave2

	Work per meter (N*m)	Trial Time (sec)
Trial 1	29.6	6.8
Trial 2	30.4	7.1
Trial 3	32.1	7.0
Trial 4	29.1	7.6
Trial 5	28.6	7.5

Average work per meter (n=3) = **29.7 N\*m**

### Straight Propulsion on 7.1% Ramp\*

	Work per meter (N*m)	Trial Time (sec)
Trial 1	69.6	7.4
Trial 2	70.9	8.0
Trial 3	69.7	7.7
Trial 4	69.2	7.3
Trial 5	67.4	7.6

Average work per meter (n=3) = **69.5 N\*m**

### Turning on 7.1% Ramp\*

	Work per meter (N*m)	Trial Time (sec)
Trial 1	52.8	6.6
Trial 2	50.8	6.6
Trial 3	51.6	6.6
Trial 4	50.6	6.5
Trial 5	52.7	7.1

Average work per meter (n=3) = **51.7 N\*m**

\* Hard smooth surface with grade of 7.1+/-0.2% (1:14)

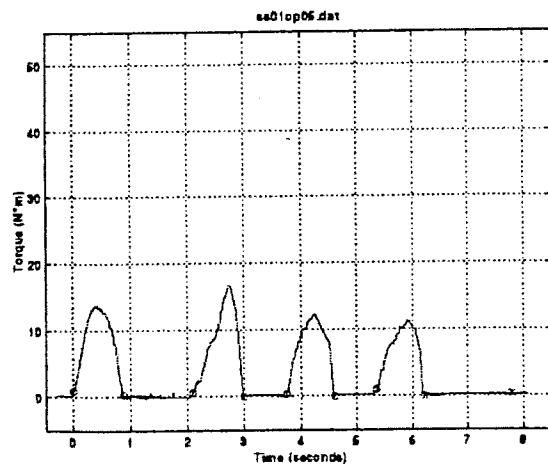
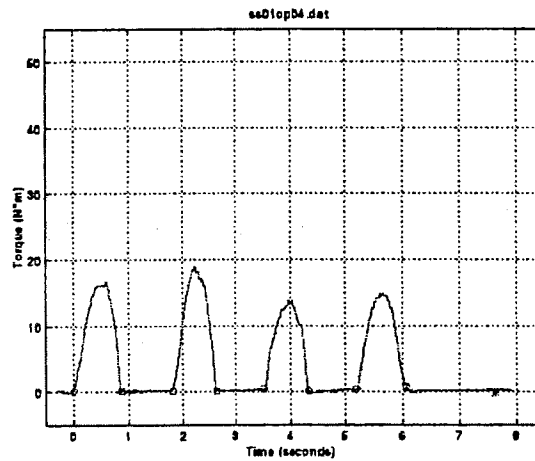
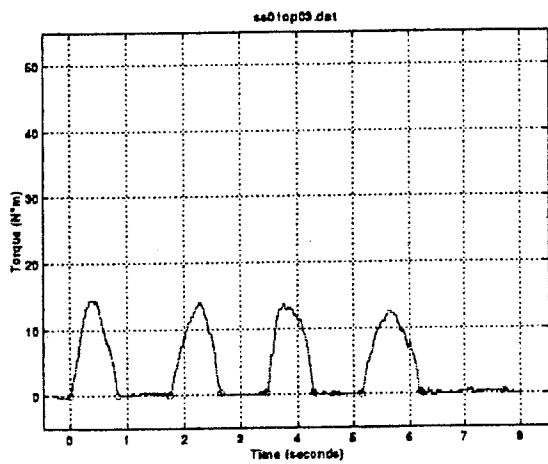
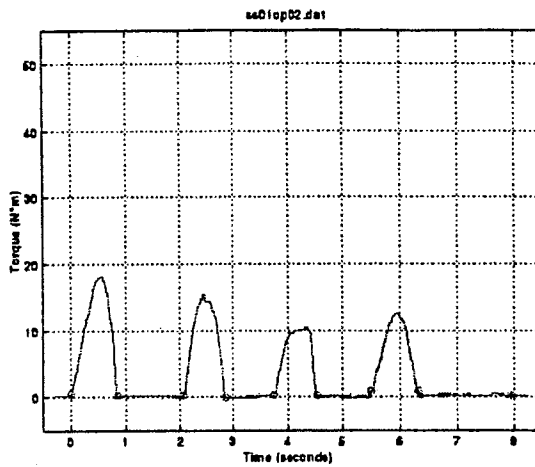
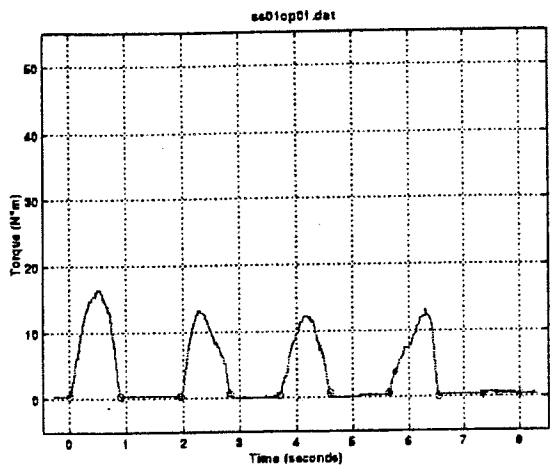
Straight Propulsion Work Ratio **0.374**

Turning Work Ratio **0.574**

Work ratio = Avg work on surface/Avg work on 7.1% ramp. If both the straight propulsion and turning work ratios are less than 1.00, the surface system meets the performance requirements of F 1951-99.

# ASTM F1951 – 99 Part 6: Wheelchair Work Measurement Method – Straight Propulsion

Invisible Structures, Inc. – Gravelpave2



# ASTM F1951 – 99 Part 7: Wheelchair Work Measurement Method – Turning Hard, smooth surface with a grade of $7.1 \pm 0.2\%$ (1:14)

