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HEALTH & SAFETY LABORATORY

Mark Went
Sui Generis International Ltd
Unit B
The Chandlers Centre
Hythe Quay
Colchester
CO2 8JB

1st September 2005

Dear Mark,

Measurement of surface slipperiness – Sui Generis

Non-HSE Contract JC 4600136, PED/LET/05/57

Further to your request for slip testing of various flooring samples, the results of the pendulum tests and surface microroughness measurements undertaken by Miss Anita Scott (HSL) on the 24th and 30th August 2005 are detailed below.

A laboratory slipperiness assessment of four flooring samples was undertaken using standard HSL / HSE techniques. These measurements were taken in accordance with the Guidelines recommended by the United Kingdom Slip Resistance Group, (Issue 2, 2000) where applicable, and due regard was also given to the protocols outlined in BS7976:2. Data generated during the assessment is reproduced in Appendix A; tables allowing simple interpretation are given in Appendix B.

Measurements of the flooring samples' "Slip Resistance Value" (SRV) were made using a calibrated Stanley Pendulum instrument. Measurements were taken in three directions to account for potential surface directionality. Data was generated before and after application of low volumes of potable water to the flooring samples by hand-spray. The test slider material used was *Four-S* rubber (Standard Simulated Shoe Sole, developed by the UKSRG to represent a footwear material of moderate performance). The test sliders were conditioned according to the UKSRG guidelines. Results are presented in Appendix A.

Further tests were undertaken, where possible, using a calibrated Mitutoyo (SJ201P) surface roughness transducer set to the Rz parameter (results are presented in Appendix A). The publication, 'The assessment of pedestrian slip risk: The HSE Approach' (Slips and Trips 1) should be used to interpret the pendulum SRV results and also the surface mircroroughness results (provided in Appendix B).

The test results presented relate only to the flooring samples under study at the time of testing. The performance of installed materials may change

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significantly during their lifetime; slip resistance is critically dependent on the level and type of contamination, application of the surface treatment, wear, maintenance and effective cleaning subsequent to installation.

Don't hesitate to get in touch if you would like to discuss the results.

Yours sincerely,

Miss Anita Scott BSc. (Hons), MSc.

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Appendix A: Test Data

Sample number PED/05/96 – Flat sheet light duty

***Rz Surface Roughness*:** Beyond range of instrument

Pendulum SRV (Four-S Rubber Slider)

Condition	Contamination	Test Direction	SRV
As-found	Dry	Direction I:	70
As-found	Dry	Direction II:	73
As-found	Dry	Direction III:	74

Condition	Contamination	Test Direction	SRV
As-found	Water-wet	Direction I:	65
As-found	Water-wet	Direction II:	68
As-found	Water-wet	Direction III:	68

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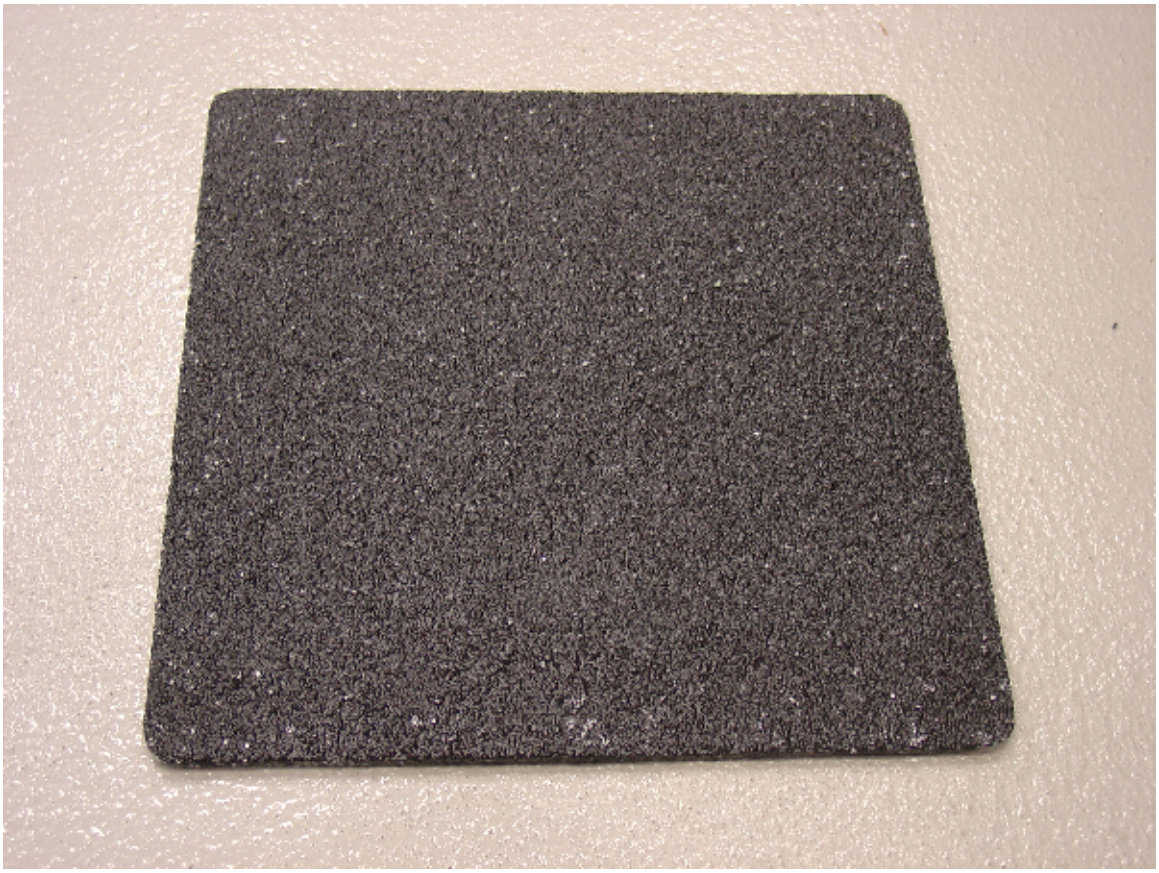
Sample number PED/05/97 – Flat sheet heavy duty



***Rz Surface Roughness*:** Beyond range of instrument

Pendulum SRV (Four-S Rubber Slider)

Condition	Contamination	Test Direction	SRV
As-found	Dry	Direction I:	74
As-found	Dry	Direction II:	71
As-found	Dry	Direction III:	74

Condition	Contamination	Test Direction	SRV
As-found	Water-wet	Direction I:	64
As-found	Water-wet	Direction II:	65
As-found	Water-wet	Direction III:	64

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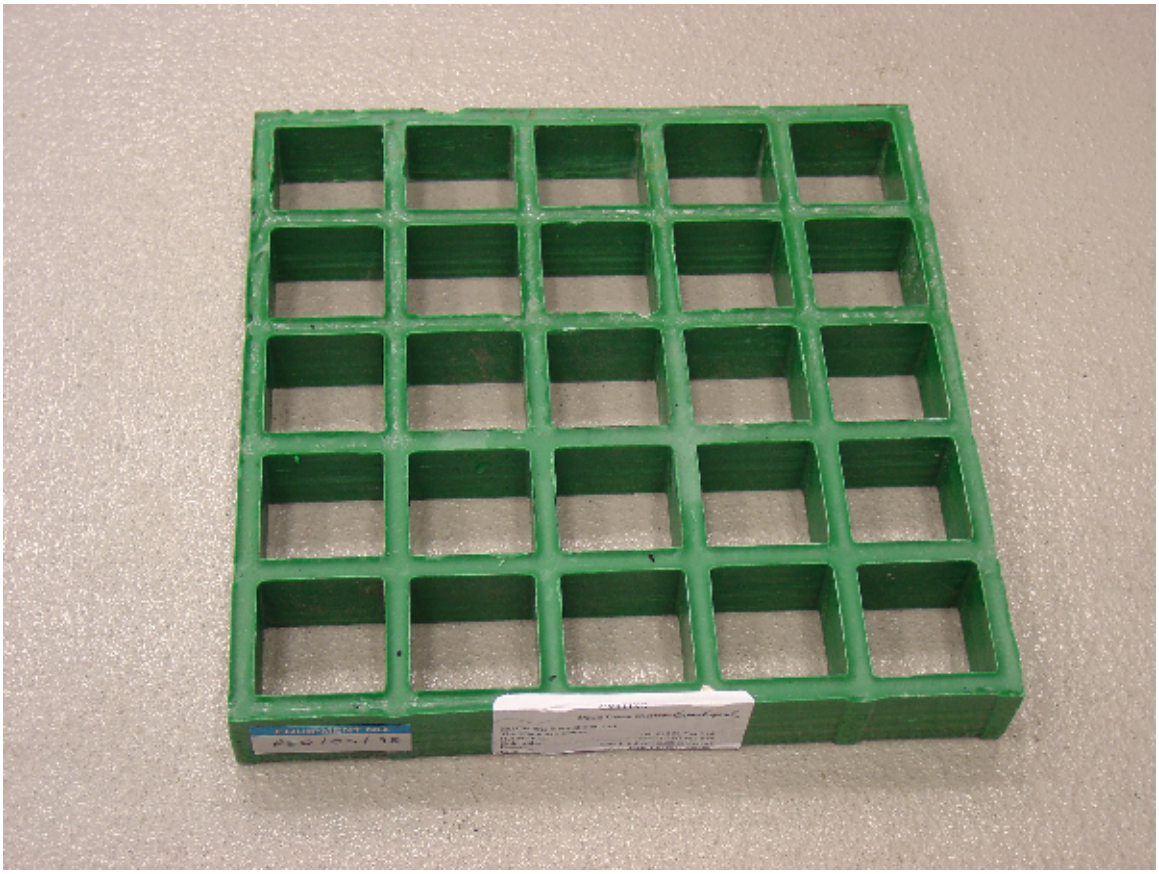
Sample number PED/05/98 – 25mm green concave



Concave surface

***Rz Surface Roughness*:** Not possible to measure edge of ridges

Pendulum SRV (Four-S Rubber Slider)

Condition	Contamination	Test Direction	SRV
As-found	Dry	Direction I:	61
As-found	Dry	Direction II:	60
As-found	Dry	Direction III:	86

Condition	Contamination	Test Direction	SRV
As-found	Water-wet	Direction I:	47
As-found	Water-wet	Direction II:	52
As-found	Water-wet	Direction III:	93

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Flat surface

***Rz Surface Roughness*:** 12.06µm (mean)

Pendulum SRV (Four-S Rubber Slider)

Condition	Contamination	Test Direction	SRV
As-found	Dry	Direction I:	62
As-found	Dry	Direction II:	65
As-found	Dry	Direction III:	68

Condition	Contamination	Test Direction	SRV
As-found	Water-wet	Direction I:	47
As-found	Water-wet	Direction II:	45
As-found	Water-wet	Direction III:	49

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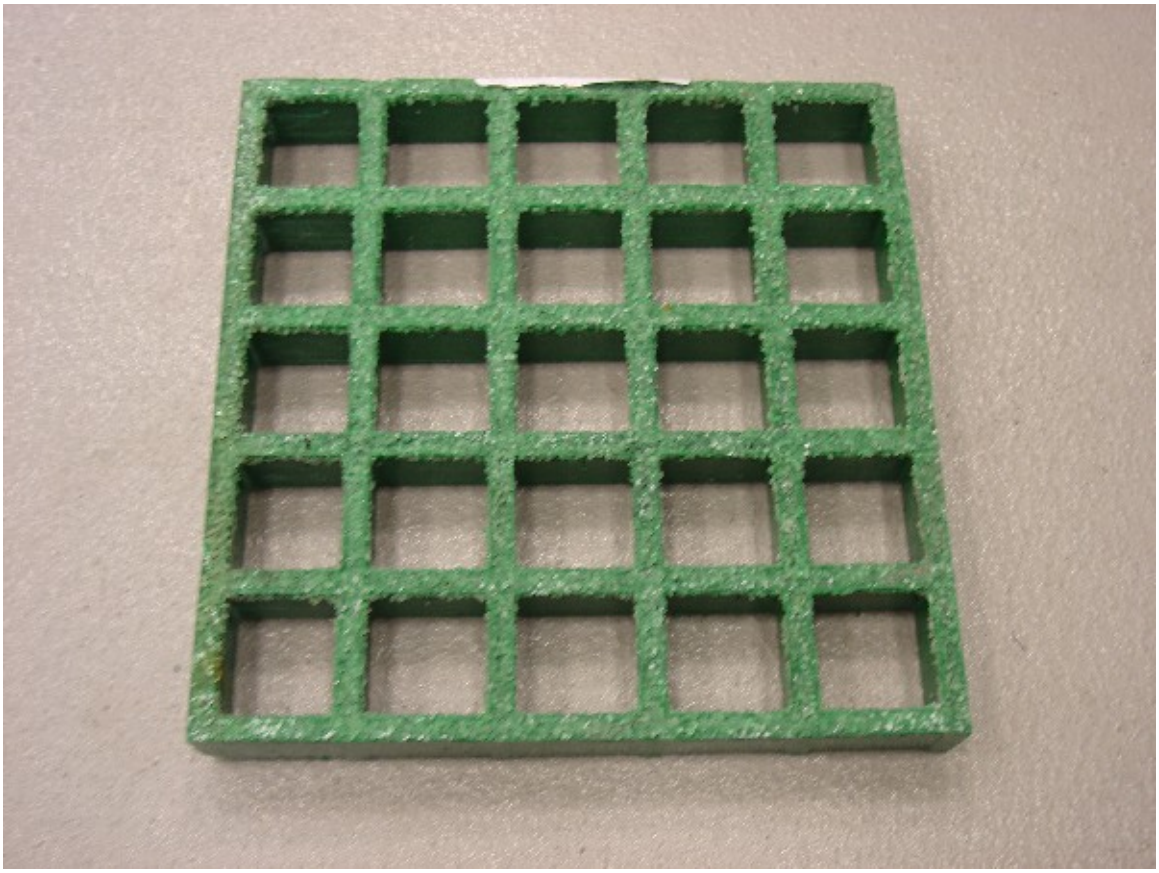
Sample number PED/05/99 – 25mm green gritted



***Rz Surface Roughness*:** Beyond range of instrument

Pendulum SRV (Four-S Rubber Slider)

Condition	Contamination	Test Direction	SRV
As-found	Dry	Direction I:	71
As-found	Dry	Direction II:	79
As-found	Dry	Direction III:	68

Condition	Contamination	Test Direction	SRV
As-found	Water-wet	Direction I:	71
As-found	Water-wet	Direction II:	74
As-found	Water-wet	Direction III:	60

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Discussion

Sample number PED/05/96 – Flat sheet light duty

Microroughness data could not be generated from the sample, due to the level of roughness exceeding the range of the instrument. This suggests that the microroughness measurement would be at least 100µm, and the sample would therefore present a low slip risk in water-wet conditions.

Pendulum data shows the sample to present an extremely low slip risk in both dry and wet conditions.

Sample number PED/05/97 – Flat sheet heavy duty

Microroughness data could not be generated from the sample, due to the level of roughness exceeding the range of the instrument. This suggests that the microroughness measurement would be at least 100µm, and the sample would therefore present a low slip risk in water-wet conditions.

Pendulum data shows the sample to present an extremely low slip risk in dry conditions and a low slip risk in water-wet conditions.

Sample number PED/05/98 – 25mm green concave

Measurements were conducted on both the concave surface and the flat surface. Given the likelihood of significant wear during use of the concave surface, the flat side of the material was tested to give an indication of how the material might perform without the sharp edges to the concave profile.

Concave surface

Microroughness data for the concave surface could not be generated due to the extremely narrow nature of the edges of the profile.

Pendulum data shows the concave surface to present a low slip risk in both wet and dry conditions when the direction of testing is parallel to the lines of the grid. When the direction of testing is at approximately 45 degrees to the lines of the grid, the sample presents an extremely low slip risk in dry and water-wet conditions.

During testing, shards of plastic were broken off due to the brittle nature of the material and the impact of the pendulum on the surface. Due to the degeneration of the surface during testing, it is believed that the surface when in use and subject to wear, might not perform as during testing.

The pendulum numbers for direction iii in wet conditions suggests that the surface has a higher slip resistance in the wet. It is believed that due to the very narrow edges of the plastic profile, it would not be possible for a film of water to form on these edges and this might explain the erroneous result in water-wet conditions.

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Flat surface
Microroughness data for the flat surface suggests that it would present a moderate slip risk in water-wet conditions.

Pendulum data generated suggest that the surface would present a low/ extremely low slip risk in dry conditions and a low slip risk in water-wet conditions. When differences in slip risk classification based on surface roughness and pendulum data occur, precedence should be given to data generated by the pendulum test method. This surface should therefore be considered to pose a low/ extremely low slip risk in dry conditions, and a low slip risk in the water-wet condition.

Sample number PED/05/99 – 25mm green gritted
Microroughness data could not be generated from the sample, due to the level of roughness exceeding the range of the instrument. This suggests that the microroughness measurement would be at least 100µm, and the sample would therefore present a low slip risk in the water-wet condition.

Pendulum data shows the sample to present an extremely low slip risk in dry conditions and a low slip risk in wet conditions.

During testing, areas of grit were dislodged due to the impact of the pendulum on the surface. The slip resistant properties of the surface may therefore change with wear. Close monitoring and maintenance of the surface after installation should therefore be carried out.

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Appendix B – The assessment of pedestrian slip risk: The HSE Approach.