

Confidential Technical Report Draft

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TECHNICAL REPORT BEING ISSUED.**

Date: 28th April 1999

PROJECT NO: F0593

SLIP RESISTANCE EVALUATION OF FIVE FLOORING MATERIALS

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SLIP RESISTANCE EVALUATION OF FIVE FLOORING MATERIALS

1. INTRODUCTION

Rapra Technology Limited were requested by Mr. Robert Marsden of Civil & Industrial Products Ltd to evaluate five flooring materials at CIP Ltd, Bickton Industrial Estate, Kimbolton, Cambridgeshire.

The author, Zillen Wong BSc (Hons), a Product Test Engineer and member of the UK Slip Resistance Group carried out the evaluation.

Material Designations:

- * Test site 1 – Densiphalt Standard
- Test site 2 – Densiphalt Quartz Stone
- Test site 3 – Densiphalt Quartz Sand (7)
- Test site 4 – Densiphalt Quartz Sand (5)
- Test site 5 – Densiphalt Quartz Sand (3)

Supplied under Order Number: BKHM3045

Date of Evaluation: 21st April 1999

Tests Requested: Slip resistance determination

2. LIMITATIONS

This report has been prepared solely on the basis of information supplied up to the point of its completion and has been accepted in good faith.

The results relate only to the condition of the floor at the time of testing, interpreted in the context of the guidelines provisionally accepted by the Health and Safety Executive and the UK Slip Resistance Group.

3. EXPERIMENTAL DETAILS

3.1 Pendulum Test

Determination of the slip resistance of the flooring materials was made by means of the TRL pendulum using the Four S and TRRL rubber sliders. Conducted in general accordance with BS6677: Part 1: 1986 specification for pavers and The Measurement of Floor Slip Resistance: Guidelines Recommended by the UK Slip Resistance Group. The tests were carried out on the flooring materials as found under wet (distilled water) conditions. Test direction A and B were at approximately right angles to each other, test direction C was at approximately 45° to A and B. In each case the first three readings were disregarded and the median of the next five readings reported.

The presently accepted limits for flooring are set out below. The TRRL figures are those established by the Greater London Council and the Four S figures are those set provisionally by Rapra Technology Ltd. and reproduced in The Measurement of Floor Slip Resistance: Guidelines Recommended by the UK Slip Resistance Group: Issue 1 - June 1996.

Condition of Flooring	Four S Rubber	TRRL Rubber
Dangerous	24 and below	Below 19
Marginal	25 to 34	20 to 39
Satisfactory	35 to 64	40 to 74
Excellent	65 and above	75 and above

3.2 Surface Roughness

The surface roughness was determined using a Surtronic 10 Rtm roughness meter. The instrument records the mean peak to trough roughness in micrometers over a 5mm length. Ten readings were taken and the mean readings reported. The Health and Safety Executive have established that a surface roughness of less than 10µm indicates that the flooring material is potentially dangerous in wet conditions.

4. RESULTS

4.1 Test site 1 – Densiphalt Standard



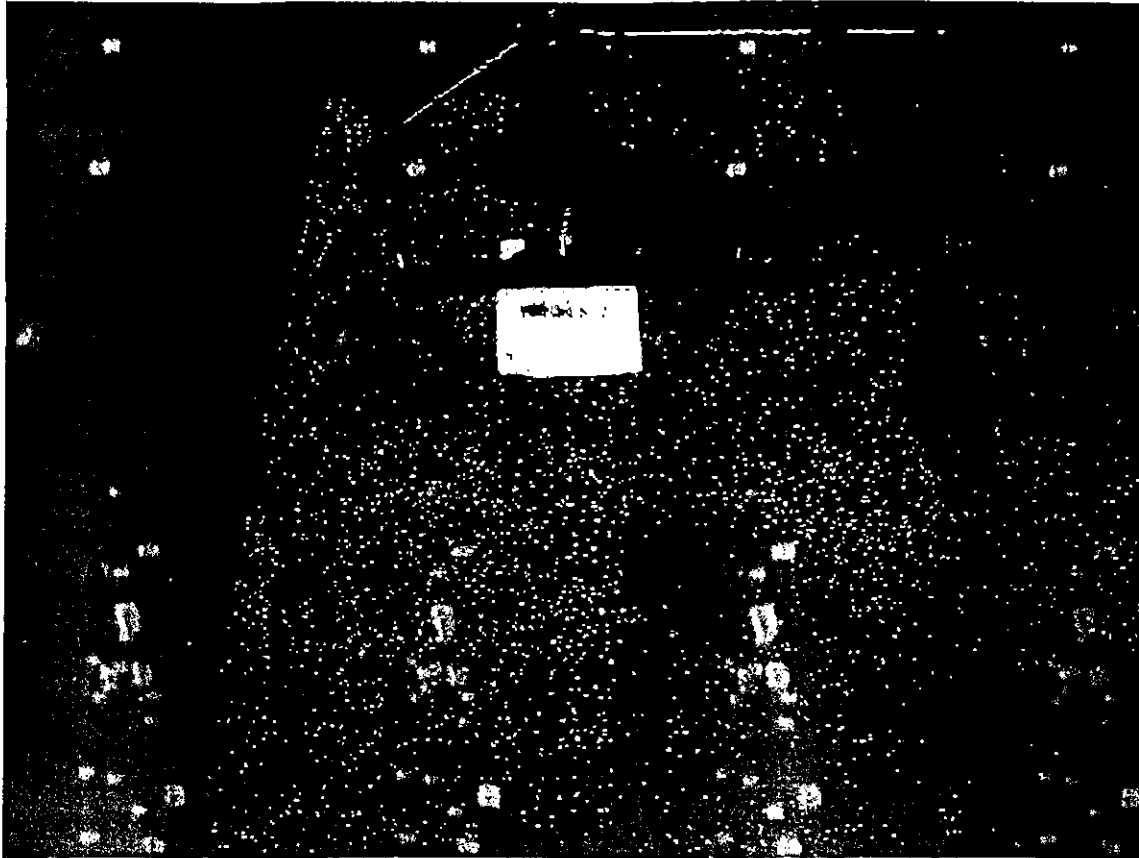
Pendulum Test

Slider/Direction	Condition										Median
Four S / A	Wet	61	60	60	60	60	60	60	60	60	60
TRRL / A	Wet	69	74	79	80	80	81	81	81	81	81
Four S / B	Wet	66	65	65	64	64	64	64	64	64	64
TRRL / B	Wet	79	79	80	82	82	81	81	81	81	81
Four S / C	Wet	62	62	63	64	64	64	64	64	64	64
TRRL / C	Wet	75	80	82	83	83	82	82	82	82	82
Mean Four S / Wet		63									
Mean TRRL / Wet		81									

Surface Roughness of test area (Random direction)

11.5	11.9	32.5	39.7	23.8	18.2	13.8	18.6	19.7	24.6
Mean									21.4 μm

4.2 Test site 2 – Densihalt Quartz Stone



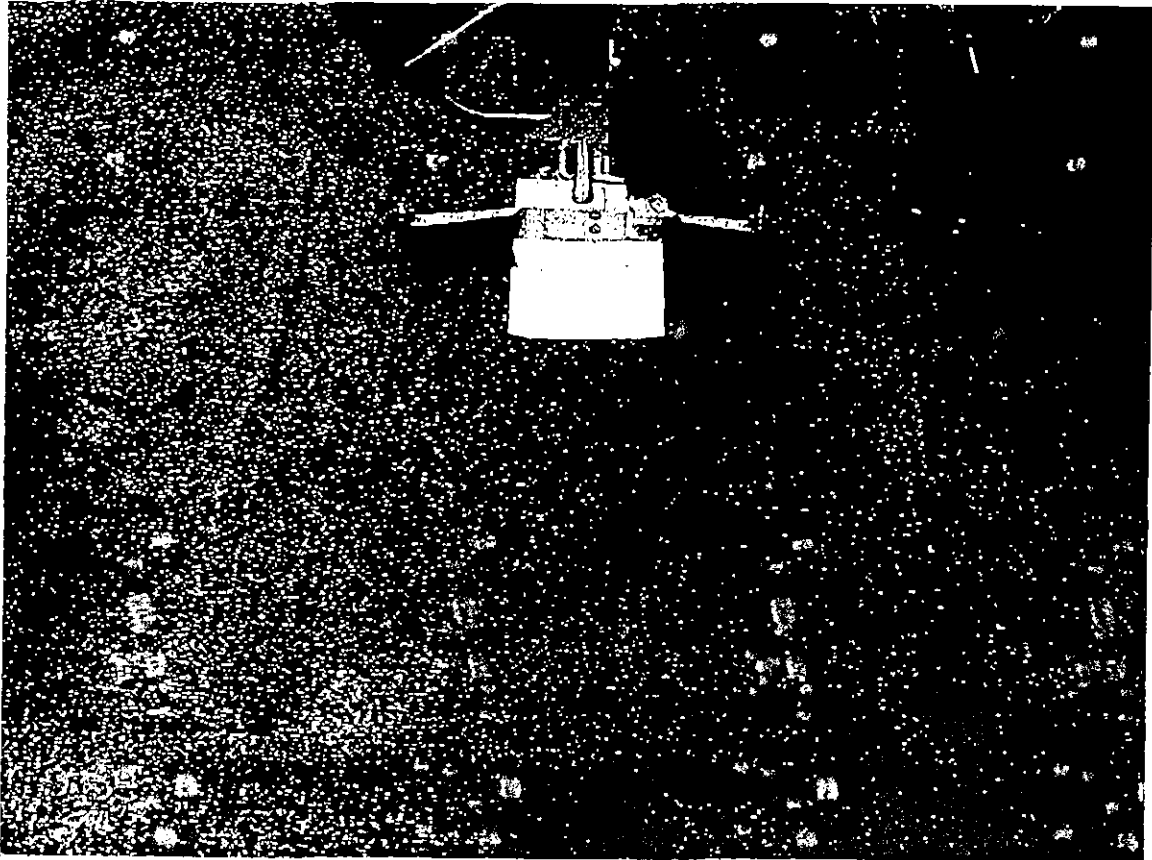
Pendulum Test

Slider/Direction	Condition										Median
Four S / A	Wet	43	42	40	39	38	37	36	36	36	37
Four S / B	Wet	40	39	39	38	37	36	36	36	36	36
Four S / C	Wet	40	39	39	38	37	36	36	36	37	37
Mean Four S / Wet		37									

Surface Roughness of test area (Random direction)

4.8	13.4	8.3	8.7	12.7	14.1	2.8	2.6	22.6	9.8
Mean									10.0 μm

4.3 Test site 3 – Densiphalt Quartz Sand (7)



Pendulum Test

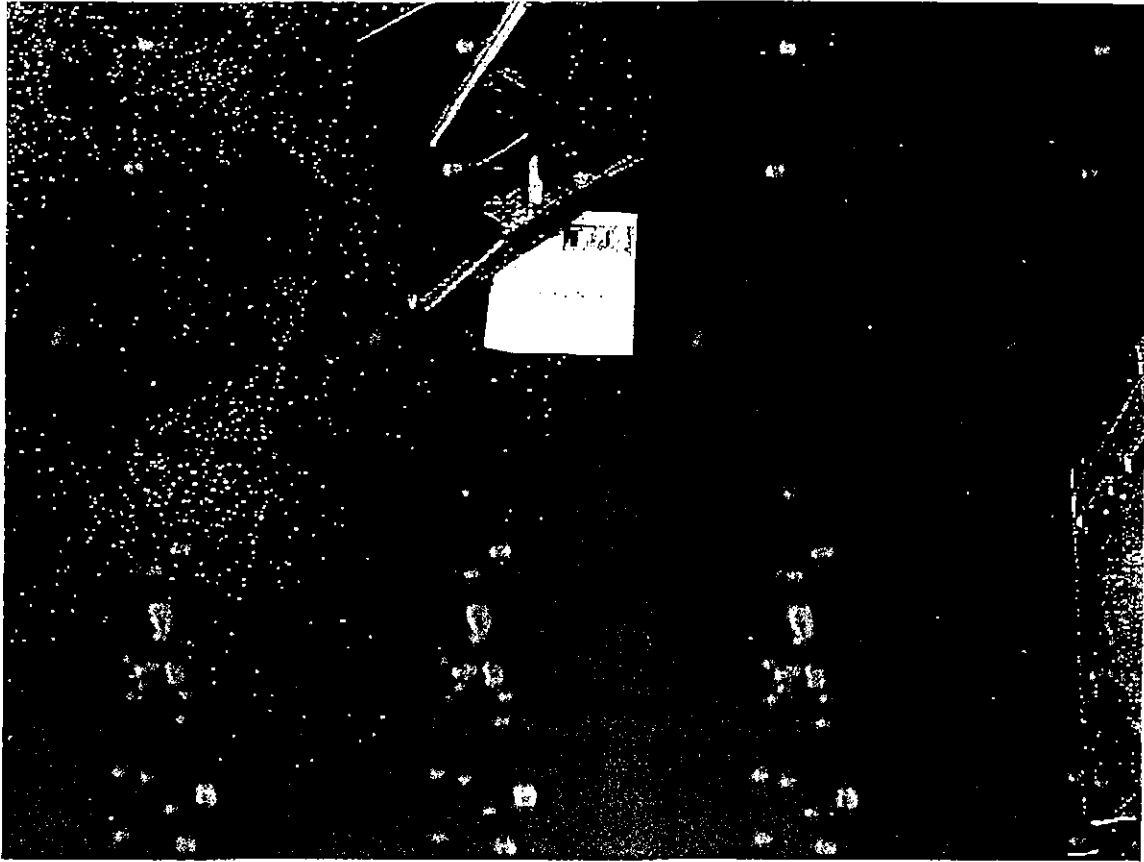
Slider/Direction	Condition										Median
TRRL / A	Wet	75	75	75	74	74	73	73	73	73	73
TRRL / B	Wet	73	73	72	72	72	71	71	71	71	71
TRRL / C	Wet	75	74	74	74	73	74	74	74	74	74

Mean TRRL / Wet 73

Surface Roughness of test area (Random direction)

54.5	47.3	49.1	67.4	69.2	63.5	74.3	65.7	57.6	67.2	
									Mean	61.6 μm

4.4 Test site 4 – Densiphalt Quartz Sand (5)



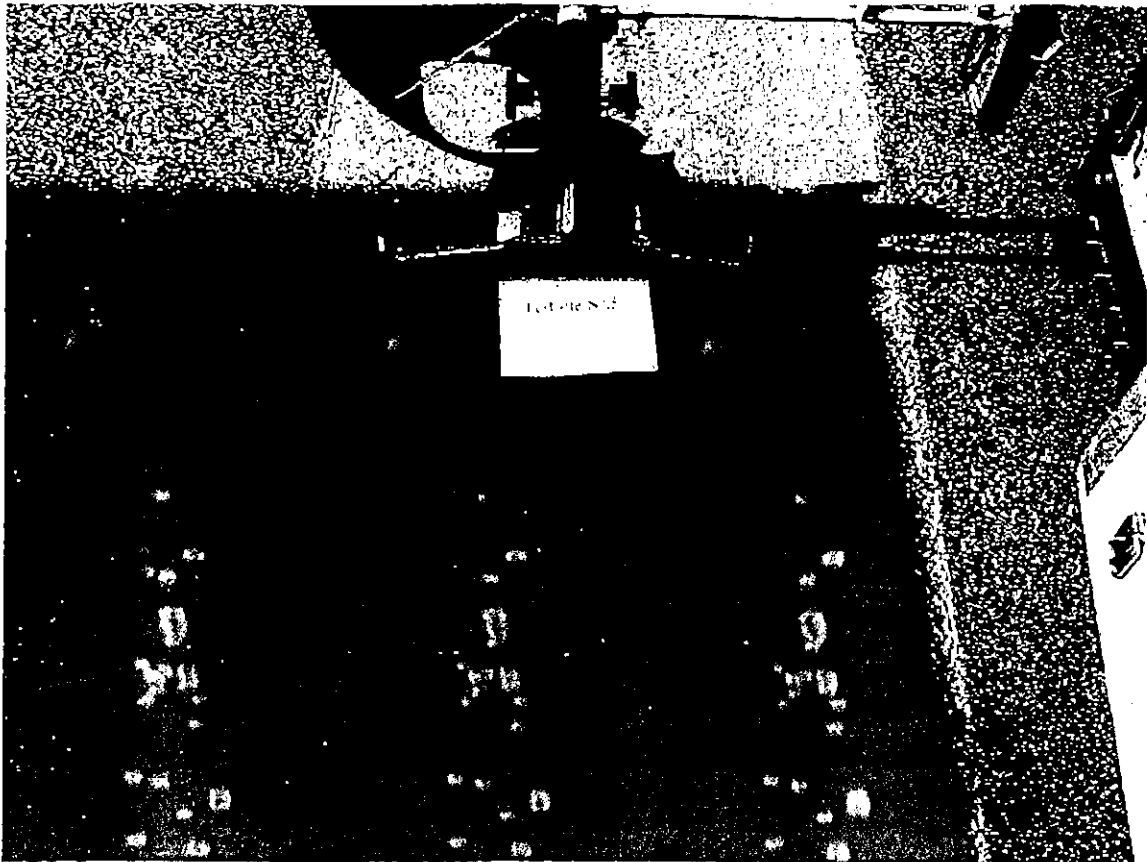
Pendulum Test

Slider/Direction	Condition										Median
TRRL / A	Wet	80	80	79	79	79	79	79	79	79	79
TRRL / B	Wet	82	81	80	79	79	80	79	79	79	79
TRRL / C	Wet	81	80	80	79	79	79	79	79	79	79
Mean TRRL / Wet		79									

Surface Roughness of test area (Random direction)

84.7	51.1	65.2	69.6	85.7	70.2	41.9	76.1	81.3	57.9		
									Mean	68.4	µm

4.5 Test site 5 – Densiphalt Quartz Sand (3)



Pendulum Test

Slider/Direction	Condition									Median
TRRL / A	Wet	78	78	79	79	81	81	81	82	81
TRRL / B	Wet	79	80	81	82	82	81	81	81	81
TRRL / C	Wet	79	79	80	80	81	81	82	82	81

Mean TRRL / Wet 81

Surface Roughness of test area (Random direction)

51.7	57.9	49.3	56.7	76.5	91.4	52.7	63.9	71.2	64.0
									Mean 63.5 μm

5. DISCUSSION

During the evaluation it was not possible to take any dry measurements due to the wet weather conditions.

In accordance with the UK Slip Resistance Group's criteria for wet or contaminated conditions, the wet TRRL and Four S rubber pendulum results indicate that floors would be classified as follows;

Material designation	Pendulum result		Classification	
	Four S	TRRL	Four S	TRRL
Densiphalt Standard	63	81	Satisfactory	Excellent
Densiphalt Quartz Stone	37	-	Satisfactory	-
Densiphalt Quartz Sand (7)	-	73	-	Satisfactory
Densiphalt Quartz Sand (5)	-	79	-	Excellent
Densiphalt Quartz Sand (3)	-	81	-	Excellent

Although the classification for the Densiphalt Quartz Stone is stated as satisfactory, this only takes into account the Four S pendulum value. Looking at the surface roughness result of 10 μm , this would indicate that the flooring might be potentially unsatisfactory in wet or contaminated conditions.

The industry accepts that a coefficient of 0.4 (Pendulum value ~35) should be achieved if slipping is to be avoided in wet or contaminated conditions.