



LABORATORIES, INC.
Contamination Prevention and Control

March 18, 2005

Mr. Don LoCoco
Crocs Footwear
7175 Rustic Trail
Boulder, CO 80301

Mr. LoCoco,

Crocs shoes were tested by CPC Laboratories, Inc. to evaluate the material's compatibility with cleanroom environments. Tests included gamma sterilization compatibility, ESD properties, skid resistance and chemical compatibility. Chemstat 939+ soles, which are commonly used in cleanroom environments, were also tested as a benchmark. Four lab reports, summarizing the test results, are attached.

The test results indicate that, overall, the Crocs footwear performs as well as the Chemstat 939+ sole. Both products would, therefore, be compatible in the same types of environments. Crocs footwear outperformed the Chemstat 939+ sole in the areas of chemical compatibility and skid resistance.

Please contact me at 949-582-3236 if you have any questions.

Sincerely,

A handwritten signature in cursive script that reads "Larry Ranta".

Larry Ranta
President
CPC Laboratories, Inc.



LABORATORIES, INC.
Contamination Prevention and Control

TEST REPORT

Project 121604-2A

Prepared For:

Jen Stapleton
Crocs Footwear

March 18, 2005



LABORATORIES, INC.
Contamination Prevention and Control

Request

Comparison of the skid resistance of Crocs footwear and Chemstat 939+ soles

Sample Description

- A) Crocs Highland model shoe - Black, left, size XL
- B) Crocs Metro model shoe - Tan, left, size 10
- C) Crocs Metro model shoe - Tan, right, size 10

- X) Chemstat 939+ cleanroom sole - gray, size S
- Y) Chemstat 939+ cleanroom sole - gray, size S
- Z) Chemstat 939+ cleanroom sole - gray, size S

Test Method

Each sample was weighted with a 5 pound weight and placed on the following substrates:

- 1) Perforated stainless steel (to simulate a raised floor in a microelectronics-type cleanroom)
- 2) Dry linoleum (to simulate many Class 100 and higher cleanrooms)
- 3) Wet linoleum (to simulate pharmaceutical cleanrooms with wet floors)

The substrate was slowly lifted at one end until the shoe or sole began to slide. The angle at which the sliding began was determined using a protractor.

Results

The test results are given in the attached table.

Conclusion

The Crocs shoe required a greater angle to begin skidding than the Chemstat 939+ sole on each of the substrates tested. The Crocs shoe is the more skid resistant of the two products tested.

Reference

Project 121604-2

Report Issued By/Date

Jay Ranta 3/18/05



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Project 121604-2A
Skid Resistance

<u>Flooring Substrate</u>	<u>Shoe/Sole Type</u>	<u>Angle at Start of Slide, degrees</u>	
Perforated Stainless Steel	Crocs - A	45.3	
	Crocs - B	39.3	
	Crocs - C	36.7	
	Crocs Average	40.4	
	Chemstat 939+ - X	38.0	
	Chemstat 939+ - Y	37.7	
	Chemstat 939+ - Z	38.0	
	Chemstat Average	37.9	
	Dry Linoleum	Crocs - A	48.0
		Crocs - B	47.0
Crocs - C		44.0	
Crocs Average		46.3	
Chemstat 939+ - X		43.7	
Chemstat 939+ - Y		42.0	
Chemstat 939+ - Z		39.3	
Chemstat Average		41.7	
Wet Linoleum		Crocs - A	35.0
		Crocs - B	31.0
	Crocs - C	30.0	
	Crocs Average	32.0	
	Chemstat 939+ - X	30.0	
	Chemstat 939+ - Y	29.0	
	Chemstat 939+ - Z	29.7	
	Chemstat Average	29.6	



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Report Conditions

Reports are submitted to clients on a confidential basis. Test results are applicable only to the samples tested, within the limits of the testing procedures, and are not necessarily representative of the characteristics of other samples from the same or other lots. CPC Laboratories, Inc. shall not be liable under any circumstances for any amount in excess of the cost of the tests performed.



LABORATORIES, INC.
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TEST REPORT

Project 121604-2B

Prepared For:

Jen Stapleton
Crocs Footwear

March 18, 2005



LABORATORIES, INC.
Contamination Prevention and Control

Request

Chemical resistance of Crocs footwear and Chemstat 939+ soles

Sample Description

- A) Crocs Highland model shoe – black, right, size XL
- B) Chemstat 939+ cleanroom sole – gray, size M

Test Method

Several 1-square inch samples were prepared from the Crocs shoe and the Chemstat 939+ sole. The samples were preweighed, then immersed in each of the following chemicals for two hours:

- 1) Deionized water (DIW)
- 2) Concentrated hydrochloric acid (HCl)
- 3) Concentrated sulfuric acid (H₂SO₄)
- 4) Concentrated ammonium hydroxide (NH₄OH)
- 5) Concentrated sodium hydroxide (NaOH)
- 6) Isopropyl alcohol (IPA)
- 7) Methanol
- 8) Acetone

After the two hour exposure, the samples were rinsed thoroughly with water, allowed to dry and reweighed to determine the quantity of extractable matter. Observations were made regarding the physical changes to each sample. Possible physical changes include swelling, smearing, softening, discoloration and brittleness.

Results

The test results are given in the attached table.

Conclusion

The Crocs shoe had less than 0.3% extractable matter in each of the solvents tested. No physical changes were noted following 2 hours of chemical exposure. The Chemstat 939+ sole had extractable matter levels greater than 2% with one strong acid and three organic solvents. Physical changes were noted following exposure to concentrated sulfuric acid.

The Crocs shoe material was more chemical resistant than the Chemstat 939+ sole.

Reference

Project 121604-2B

Report Issued By/Date

Jenny Raita 3/18/05



LABORATORIES, INC.
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**Project 121604-2B
 Chemical Resistance**

I. Extractable Matter (% weight loss)

	<u>Crocs Shoe</u>	<u>Chemstat 939+ Sole</u>
WATER		
DI Water	0.16 %	0.79 %
STRONG ACIDS		
Con HCl	0 %*	2.19 %
Con H ₂ SO ₄	0 %*	0 %*
STRONG BASES		
Con NH ₄ OH	0.15 %	0.83 %
Con NaOH	0.17 %	0.72 %
ORGANIC SOLVENTS		
Isopropanol	0.28 %	2.17 %
Methanol	0.26 %	3.37 %
Acetone	0.25 %	12.89 %

II. Physical Changes to Material

	<u>Crocs Shoe</u>	<u>Chemstat 939+ Sole</u>
WATER		
DI Water	None	None
STRONG ACIDS		
Con HCl	None	None
Con H ₂ SO ₄	None	Discoloration, brittleness
STRONG BASES		
Con NH ₄ OH	None	None
Con NaOH	None	None
ORGANIC SOLVENTS		
Isopropanol	None	None
Methanol	None	None
Acetone	None	None



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LABORATORIES, INC.
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TEST REPORT

Project 121604-2C

Prepared For:

Jen Stapleton
Crocs Footwear

March 18, 2005



LABORATORIES, INC.
Contamination Prevention and Control

Request

Determination of ESD properties of Crocs soles and Chemstat 939+ soles

Sample Description

- A) Crocs Pomostat 953 sole -- black
- B) Crocs Pomostat 954 sole -- black
- C) Chemstat 939+ sole -- gray

Test Method

Each sample was preconditioned at 72 ± 3 degrees F and $50 \pm 3\%$ relative humidity for 24 hours prior to testing. Samples were tested for:

- 1) Surface resistivity per ASTM D257 (10 volt and 100 volt charge)
- 2) Foot to Ground Resistivity per ASTM D257 (10 volts and 100 volt charge)
- 2) Static Decay Time per FTM 101C, Method 4046.1 (5000 volts discharged to 50 volts)

Results

The test results are given in the attached table.

Conclusion

All three sole types had surface resistivity readings in the anti-static range. The Chemstat 939+ sole had a slightly lower surface resistivity than the two Crocs soles. Foot to ground resistivity readings were in the anti-static range for the two Crocs soles and in the static dissipative range for the Chemstat 939+ sole. The two Crocs soles had static decay times of 0.1 seconds, while the Chemstat 939+ sole had a static decay time exceeding 0.5 seconds.

The Chemstat 939+ sole was slightly better than the Crocs soles in regard to resistivity. The Crocs soles had better static decay times.

Reference

Project I21604-2C

Report Issued By/Date

Jay Rota 3/18/05



LABORATORIES, INC.
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Project 121604-2C
ESD Tests

	<u>Crocs Pomostat 953</u>	<u>Crocs Pomostat 954</u>	<u>Chemstat 939+</u>
Surface Resistivity, ohms/square			
10 volts	10^{11}	$10^{10} - 10^{11}$	10^{10}
100 volts	10^{11}	$10^{10} - 10^{11}$	10^{10}
Foot to Ground Resistivity, ohms/square			
10 volts	10^{11}	10^{10}	10^9
100 volts	$10^{10} - 10^{11}$	10^{10}	10^9
Static Decay Time, seconds			
5000 \rightarrow 50 volts	0.1	0.1	0.58



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LABORATORIES, INC.
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TEST REPORT

Project 121604-2D

Prepared For:

Jen Stapleton
Crocs Footwear

March 18, 2005



LABORATORIES, INC.
Contamination Prevention and Control

Request

Sterilization (Gamma) compatibility of Crocs and Chemstat 939+ soles, as measured by Taber abrasion

Sample Description

- A) Crocs Highland model shoe – tan, size XXL
- B) Chemstat 939+ cleanroom sole – gray, size M

Test Method

New and gamma sterilized samples were tested for abrasion resistance using the Taber method. Each sample was tested for 1000 cycles using an H-22 abrasive wheel and a 1000 gram load. The percent weight loss during the 1000 cycles was calculated and used as an indicator of the effect of the gamma radiation on the shoe/sole material.

Sterilized samples were subjected to a cumulative dose of gamma radiation (160 KGy) equivalent to five to six typical sterilization cycles.

Results

The test results are given in the attached table.

Conclusion

The % weight loss of the Crocs shoe was 2.3% when new and 3.2% following 160 KGy of gamma radiation. These values do not reflect significant degradation of the material as a result of radiation exposure. The % weight loss of the Chemstat 939+ sole was 1.4% when new and 1.2% following gamma exposure.

The test data indicates that the Crocs shoe material is compatible with a gamma radiation dose equivalent to 5-6 sterilization cycles. This study will continue until a dose equivalent to 15-20 sterilization cycles is reached. 15-20 sterilization cycles reflects a typical usage by an end-user over a one-year period.

Reference

Project 121604-2D

Report Issued By/Date

Fay Raut 3/18/05



LABORATORIES, INC.
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Project 121604-2D
Gamma Comptability

Taber Abrasion (% Weight Loss)

	<u>Crocs Shoe</u>	<u>Chemstat 939+ Sole</u>
New (Unsterilized)	2.3 %	1.4 %
160 KGy (5-6 sterilization cycles)	3.2 %	1.2 %



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